Using patients' lay knowledge to guide the treatment of vitamin D deficiency: Perceptions and experiences of general practitioners and patients.

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I declare that this thesis is my own work and has not been submitted for the award of a higher degree elsewhere

Declaration

I declare that this thesis is all my original work and I am the sole author. This work has not previously been published or presented for an award. All sources are acknowledged as references.

Abstract

The worldwide prevalence of vitamin D deficiency is high despite all efforts and availability of effective treatment options. Literature unraveled the existance of a relationship between patients' behaviour, their social, environmental and cultural contexts and vitamin D deficiency. Hence, heightening the visibility of patients' contexts through lay knowledge could help provide more sensible medical advice. Thus, this thesis aims to: a) explore how patients' contexts affect their experiences with vitamin D b) explore the current practice regarding vitamin-D medical consultation in terms of utilising lay knowledge for customisation purposes, c) explore the perceptions of participants regarding the use of lay knowledge to customise and contextualise medical advice. To achieve the objectives, a qualitative methodology was adopted, where general practitioners and patients were recruited purposely and interviewed using semi-structured interviews. Braun and Clarke's (2019) thematic analysis was then used to analyse the data.

Participants reported on a number of contextual factors that might have affected their experience including: motherhood, culture and religion, weather and indoor lifestyle, urbanisation and immigration, work-family demands, autonomy and more. These factors were found to be complex, subjective, dynamic, interactive and in certain instances hidden. Although the majority of participants valued the use of lay knowledge to contextualise medical advice, the current practice says otherwise, which could be due to the conflict between technical and lay knowledge. Combining lay knowledge with the socio-ecological model helped unravel holistic and hidden experiences, deep meanings, ideologies, values and beliefs. These are important to consider during the vitamin D-related medical consultation to render the medical advice more sensible, and accordingly heighten compliance. Hence, civic intelligence, which entails combining lay with technical knowledge is the way forward, and should govern the

medical consultation for vitamin D deficiency. Yet more efforts are needed to adopt it and overcome the identified barriers.

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Acronyms

Dubai Health Authority’s (DHA)

United Arab Emirates (UAE)

General practitioners (GPs)

Social, environmental and cultural context (S-E-C context)

Ministry of Health and Prevention (MOHAP)

Dubai Healthcare City (DHCC)

Coronavirus (COVID-19)

United Kingdom (UK)

National Health Service’s (NHS)

Ultraviolet (UV)

Vitamin D deficiency (VDD)

Lancaster University (LU)

Socio-ecological model (SEM)

Population-issue-context-outcome (PICO)

Cumulative Index to Nursing and Allied Health Literature (CINAHIL)

Elton B Stephans Company (EBSCO HOST)

Z Electronic Table of Contents (ZETOC)

Crowe Critical Appraisal Tool (CCAT)

Vitamin D deficiency (VDD)

Subjective Objective Assessment and Plan (SOAP)

Thematic analysis (TA)

Chapter One

Introduction

This chapter sets the scene for this thesis by discussing its purpose, the background and position of the researcher and how the researcher developed an interest in the topic investigated. It then provides background information about the topic and context of the research, highlights the research questions and objectives of the research, and discusses its rationale and significance. Finally, it briefly outlines the remaining chapters.

1.1 Purpose

This thesis explores the experiences of patients with vitamin D deficiency, and its preventive methods and options for treatment within their unique social context. It also explores what occurs during medical consultations for vitamin D deficiency at the primary healthcare centres of Dubai Health Authority (DHA) in the United Arab Emirates (UAE), especially in terms of utilising lay knowledge to contextualise and customise the medical advice of general practitioners (GPs). It also explores the perception of GPs and patients regarding contextualising the medical advice based on patients' lay knowledge.

1.2 Researcher's background and position

I began my career as a clinical pharmacologist in the UAE, where most of my work mainly focused on optimising treatment plans and providing therapeutic options for various health conditions. Since I primarily and objectively dealt with hospitalised patients, the overall setting (for example, the hospital) was controlled. Hence, I assessed the effectiveness of my interventions through the numerical figures on monitors/machines, laboratory reports and observations. In other words, my practice was merely driven by what I can measure or observe.

Eventually, when I moved to the ambulatory clinics and, more specifically, the blood clinic, my method of assessment 'measure and/or observe' was challenged. I never thought of the outside world when dealing with hospitalised patients, as my colleagues and I were treating them in isolation, in the context of being hospitalised. However, I started meeting patients who regularly visited the clinic (weekly or biweekly), to get their laboratory tests done to ensure that the medication level namely warfarin in the blood was safe and effective. In this regard, the effectiveness of warfarin is influenced by a wide range of food products, including green leaves (Holbrook et al., 2005). During the winter, people in the UAE heavily consume a specific type of green leaf known as *Rumex obtusifolius*, which only grows in the desert after the rain. It is also when Emirati patients, whose medications and their levels in the blood were previously controlled, start coming to the clinic or emergency department with significant fluctuations in their blood medication concentration levels. Since I come from the same cultural background and share similarities in terms of the social, environmental and cultural context (hereafter referred to as the S-E-C context), I began asking patients about their consumption of *Rumex obtusifolius*, due to its suspected food-drug interaction, and in fact, it was the cause of their problems.

In this case, my cultural competence helped me ask the right questions specifically about the patient's context and what happens outside the premises of the clinic in order to understand the patients' problems. However, this was specifically for Emirati patients, given that I share a similar context or culture. But, what about the patients of other cultures? Are we treating patients at the clinics too narrowly in a controlled setting? Are we selecting their medication regimes in a specific setting (for example, clinic/hospital), without considering that it will be taken in a different setting (for example, the patients' S-E-C context)?

I then entered academia and started teaching therapeutics courses, after which my perspective regarding treatment continued to evolve. For example, while teaching about hypertension, diabetes and other chronic illnesses, I found myself repeatedly talking about lifestyles and the importance of behavioural changes and interventions. These were indeed part of the international treatment protocols and guidelines of these conditions. Since these aspects are so important, why do we ‘healthcare professionals’ provide healthcare regimes in isolation of the S-E-C context?

Overall, I have a specific interest in vitamin D deficiency as a condition, having been diagnosed with it more than a decade ago. When I was first diagnosed, I was advised to expose my arms and legs in the sun for at least 20 minutes a day. However, I never did this, due to the heat, my conservative attire, my extremely busy schedule and my keen interest in skincare. After I was given supplements, I eventually stopped for no apparent reason. In my line of work, I also noticed that many people were vitamin D-deficient and had the same compliance issues for various reasons. Moreover, in 2017, the Dubai Health Authority published a report declaring that 90% of a sample from the UAE population were vitamin D-deficient (Chaudhary, 2017), despite the availability of sunlight, and the wide range of campaigns conducted by the government and health authorities to combat such deficiency.

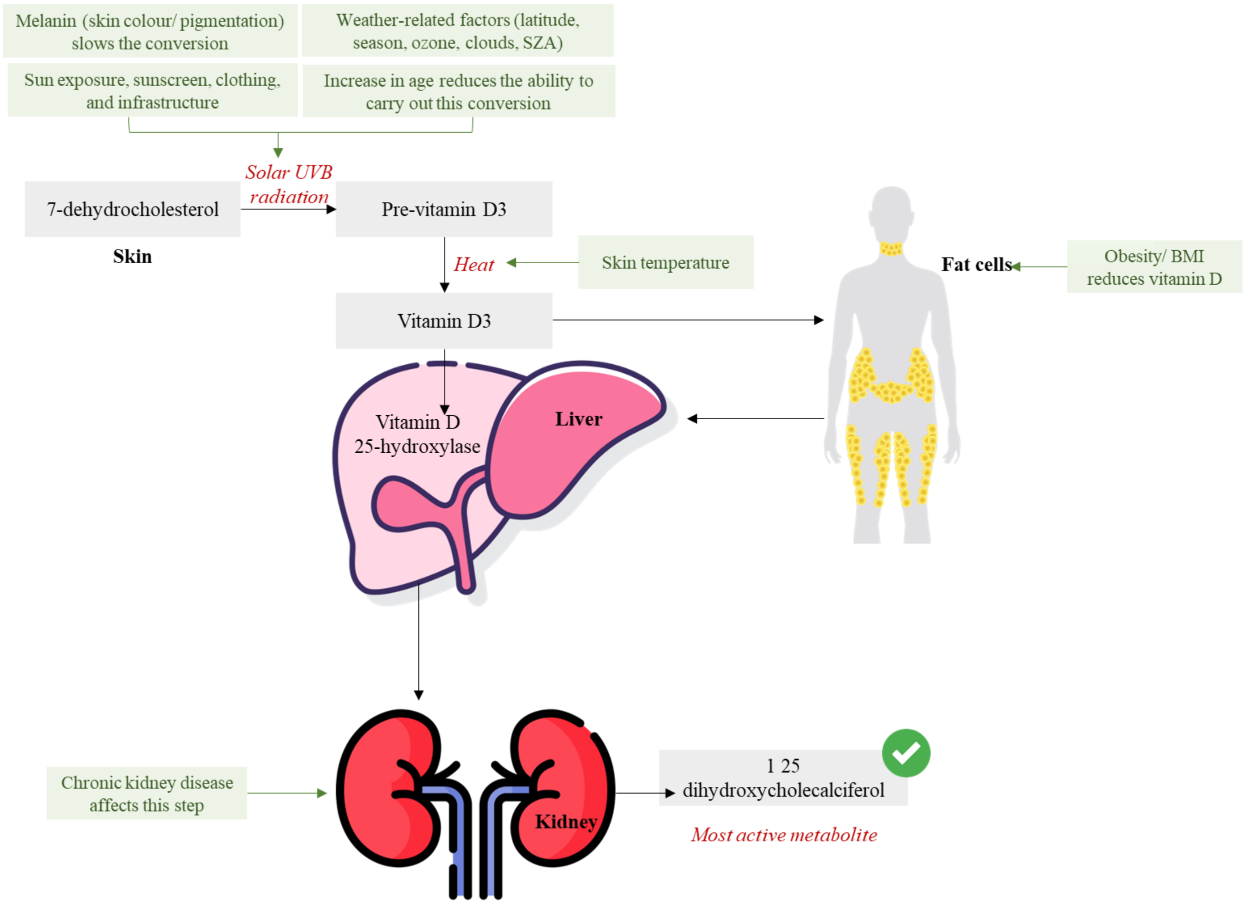
1.3 Background

1.3.1 Vitamin D deficiency

Vitamin D or the ‘sunshine vitamin’ is available from various sources, such as supplements, fortified products and certain types of oil-rich fish, including salmon, mackerel and herring (Holick, 2007). Yet, skin exposure to sunlight remains the predominant pathway, accounting for 80% to 90% of endogenous vitamin D synthesis (Holick, 2007). In addition, cutaneous synthesis depends on the direct exposure of skin to sunlight, and is affected by certain obscuring factors, such as climate, attire, lifestyle, infrastructure, and more, as seen in Figure 1.1, in the green boxes. Despite the availability of vitamin D from a wide array of sources, the worldwide prevalence of the deficiency remains high, rendering it a global public health concern (Al Zarooni et al., 2019; Bezuglov et al., 2019; Malacova et al., 2019; Mogire et al., 2020; Palacios & Gonzalez, 2014; Teixeira et al., 2019; Xie et al., 2019).

Research in vitamin D deficiency started gaining momentum in the late 20th century, and it continues to attract researchers today because of its role in various health conditions, such as autoimmune and infectious diseases, internal cancers and cardiovascular, respiratory, musculoskeletal and psychological disorders (Adams et al., 1982; Fraser & Kodicek, 1970; Holick, 2007; Holick et al., 1980). Recent evidence has also highlighted the relationship between vitamin D deficiency and coronavirus (COVID-19) severity (Grant et al., 2020; McCartney & Byrne, 2020; Merzon et al., 2020; Rhodes et al., 2020). Specifically, these studies have suggested that lower levels of vitamin D are associated with a higher risk of COVID-19, greater severity of symptoms and higher mortality (Grant et al., 2020; McCartney & Byrne, 2020; Merzon et al., 2020; Rhodes et al., 2020). In addition to the health consequences, there are economic consequences. For instance, in the United Kingdom (UK), it has been estimated that treating adults (>65 years old) with vitamin D (800 IU/day) could reduce the National Health Service's (NHS) expenses by approximately £1.2 billion (Poole et al., 2015). This is primarily due to the reduction in falls, long-term care and premature deaths linked to vitamin D deficiency (Poole et al., 2015). Moreover, Kamudoni et al. (2016), found that addressing the deficiency amongst pregnant women could reduce pre-eclampsia by 4,126 cases per year, thus saving about £18.6 million for the NHS in England and Wales.

Figure 1.1 Cutaneous synthesis of vitamin D (obtained from Holick, 2007)



Note: The factors affecting the process are presented in green. SZA: Solar zenith angle. BMI: Body mass index.

1.3.2 How have countries reacted to vitamin D deficiency

The prevalence of vitamin D deficiency and its health and economic consequences have created an abiding interest, both nationally and internationally. For example, multiple countries have focused on raising awareness about vitamin D deficiency (BetterYou, 2019; NICE, 2016; www.ETHealthworld.com, 2014), while other initiatives have targeted increasing sun exposure (Bureau, 2018; GulfNews, 2019), encouraged testing and promoted the daily intake of vitamin D supplements (Altaher, 2016; Daynurseries, 2012; Lind, 2015; nutraingredients-usa.com, 2016; Price, 2014; Punter, 2016). However, despite these efforts, the worldwide prevalence continues to be high (Al Zarooni et al., 2019; Bezuglov et al., 2019; Malacova et al., 2019; Mogire et al., 2020; Palacios & Gonzalez, 2014; Teixeira et al., 2019; Xie et al., 2019).

1.4 The context of the study location 'UAE'

1.4.1 The seven emirates

The UAE is composed of seven emirates: Abu Dhabi, Dubai, Sharjah, Ajman, Um Al-Quwain, Fujairah and Ras Al-Khaimah. In 1971, the emirates were united and Sheikh Zayed Bin Sultan AlNahyan was appointed as the president. The capital is Abu Dhabi, with Dubai as the second largest emirate and the leading economic hub in the UAE and the Middle East (Culture of United Arab Emirate, 2020; United Arab Emirates Country Profile, 2018).

1.4.2 Language, religion and social custom

The official language in the UAE is Arabic, but the majority speak English, since 80% of the population consists of expatriates. Islam is the primary religion of the UAE, although other religions are respected and freely practiced (United Arab Emirates Country Profile, 2018). Regarding social customs, Emirati females and males wear conservative traditional clothing.

Specifically, females must ensure that they cover their hair, body and sometimes face, which is now becoming less common among young females (Culture of United Arab Emirate, 2020; United Arab Emirates Country Profile, 2018), while males can wear western clothing outside of the workplace.

1.4.3 Families, marriage and workforce

In general, Emirati families extend the meaning of family to include grandparents, parents, children and sometimes in-laws in one household (Culture of United Arab Emirate, 2020; United Arab Emirates Country Profile, 2018). Arranged marriages are the norm, with marriage to a cousin or within one's class being the preferred form (Krause, 2008). Meanwhile, family members carefully restrict women's conduct as they mostly spend time at home (Krause, 2008; United Arab Emirates Country Profile, 2018). However, as younger women are becoming more educated, they have started playing a wider role in society. Despite the new employment opportunities, most women opt for marriage and raising children as UAE society places high value on these roles (Krause, 2008; United Arab Emirates Country Profile, 2018).

As for male–female interactions, they are very conservative, where males and females only shake hands with members of the same gender, and men rarely introduce their wives in public or to their male friends. Moreover, such conservative cultural attitudes have led females to seek jobs that do not involve mixing with males or commuting far from home (Krause, 2008; United Arab Emirates Country Profile, 2018). Subsequently, most females are employed in education, health and civil services (Culture of United Arab Emirate, 2020; United Arab Emirates Country Profile, 2018). As the UAE government is ensuring equal rights and opportunities between genders, females also started getting employed in a wide range of other sectors. Yet, although official statements affirm that males and females have equal rights and opportunities to advance themselves and the nation (Krause, 2008), patriarchy, as a generalised ideology, is still visible in social life. For instance, males usually have the highest authority in their families and receive employment preferences in high state administration and private businesses (Krause, 2008). Furthermore, although the government is introducing significant changes to ensure equity, females still play a minor role in politics and religious life as these areas are considered male domains (Culture of United Arab Emirate, 2020; Krause, 2008; United Arab Emirates Country Profile, 2018).

1.4.4. Urbanisation, classes and castes

All villas and apartments are air-conditioned, given the heat, long summers and short winters. In addition, due to the massive modernisation following the discovery of oil, towns have been transformed from mud-walled communities into commercial capitals integrated into the global economy. Hence, UAE cities now have skyscrapers in the commercial city centres, multi-story residential buildings, large shopping malls, wide boulevards, extensive highway networks and new sprawling suburbs (Culture of United Arab Emirate, 2020; United Arab Emirates Country Profile, 2018). The cities also have a multi-ethnic composition, with segregated housing according to class, social power, ethnicity and nationality (Culture of United Arab Emirate, 2020; United Arab Emirates Country Profile, 2018).

Overall, UAE society is divided into two social categories: nationals and foreign immigrants. Nationals are sub-divided into four main social classes (Culture of United Arab Emirate, 2020; United Arab Emirates Country Profile, 2018):

- Ruling families: those holding the highest political positions and power, with immense wealth and prestige.
- Merchant class: those selling international consumer goods and investing in properties.

- New middle class: represented by increasing numbers of professionals who have benefitted from free state education.
- Low-income groups: represented by newly settled Bedouin nomads and former pearl divers and oasis farmers.

As for the immigrants, they are sub-divided into three social classes (Culture of United Arab Emirate, 2020; United Arab Emirates Country Profile, 2018):

- Top professionals and technocrats with international contracts, who earn high salaries and other benefits.
- Mid-range professionals such as school teachers, skilled technicians and company salesmen.
- Low-paid semi-skilled and unskilled workers, primarily Asian.

1.4.5 Healthcare regulating authorities

Various health systems function within the UAE and its seven emirates. For example, the Ministry of Health and Prevention (MOHAP) is responsible for overseeing healthcare in the country. However, the situation in Abu Dhabi and Dubai is marginally different. Specifically, the Department of Health oversees the healthcare sector in Abu Dhabi, while in Dubai, there are three regulating bodies: DHA, Dubai Healthcare City (DHCC), and MOHAP (United Arab Emirates Country Profile, 2018).

1.5 Vitamin D deficiency in the UAE

The prevalence of vitamin D deficiency in the UAE is particularly high (approximately 90%), as per reports published by the DHA in 2017 (Chaudhary, 2017). This was also confirmed by another study conducted in Dubai, which revealed that 72.8% of the males and 58.1% of the females had vitamin D levels between 10 and 30 ng/mL (Abdelgadir et al., 2016). However, as there are seven emirates, and given the different health regulating bodies, it is also worth discussing the prevalence in the remaining emirates. Numerous studies conducted in the various emirates have confirmed that the prevalence is high. For example, in a study conducted in Abu Dhabi, 72% of the participants were vitamin D-deficient, 10% were vitamin D insufficient and only 4.1% had normal vitamin D levels (Al Zarooni et al., 2019). Such findings were not only among the adults. Furthermore, according to a study that targeted adolescents in Al Ain – Abu Dhabi, 65% of the participants had vitamin D levels of < 30 ng/ml (Muhairi et al., 2013). Additionally, in a study conducted on female students at the University of Sharjah, 48% were found to be deficient (Nimri, 2018).

In sum, although the aforementioned participants were living in a sunny region, the prevalence of vitamin D deficiency was high. This could be due to various factors, including the avoidance of sun exposure, air pollution, lack of physical activity in sunlight, clothing (hijab and/or veil), cultural and dietary habits, and the short winters and/or long summers (Al Anouti et al., 2011; Al Zarooni et al., 2019; Al-Anouti et al., 2013; Nimri, 2018).

1.6 Addressing the gap

Because of my interest in vitamin D deficiency, and its high prevalence, I started searching the literature to better understand the issue. As a result, I found that the quantitative vitamin D literature focused on several aspects related to vitamin D and vitamin D deficiency such as: the prevalence, biological aspects, treatments and their effectiveness (for example, supplements, sun exposure, dietary sources and fortified food); testing methods and techniques; public health campaigns/ initiatives and their effectiveness in combating the deficiency, and the barriers and facilitators toward the acquisition of vitamin D. The literature also found that the level of knowledge and awareness towards vitamin D deficiency, the treatment and preventive options (sunlight, supplements, dietary sources), and the consequences of it were generally low to moderate (Al Bathi et al., 2012; Alamoudi et al., 2019; Anwar et al., 2019; Arora et al., 2016; Bani-issa et al., 2017; Boland et al., 2015; Eid Al Agha & Alorabi, 2016; Ho-Pham & Nguyen, 2012; Ibrahim et al., 2019; Salmanpour et al., 2016; Tariq et al., 2020; Vu et al., 2010; Walker et al., 2014; Zareef & Jackson, 2021). Furthermore, studies also found that the attitude, practice and behaviour of people towards vitamin D deficiency, and towards obtaining it through various sources were in general negative (Anwar et al., 2019; Boland et al., 2015; Eid Al Agha & Alorabi, 2016; Habib et al., 2021; Ho-Pham & Nguyen, 2012; Ibrahim et al., 2019; Jamil et al., 2019; Zareef & Jackson, 2021; Zhou et al., 2016). Consequently, an overall emphasis was placed on the importance of having more health promotion campaigns and educational interventions to encourage adopting behaviours that would treat and/ or prevent vitamin D deficiency, as seen in the successive section. Yet, despite the health promotion and awareness campaigns, the prevalence remained high, as noted earlier.

On the other hand, both the quantitative and qualitative literature shed light on the pivotal role of the patients’ social, environmental and cultural contexts in the behaviour causing vitamin D deficiency, and interfering with the acquisition of vitamin D. For instance, the deficiency in the UAE is mainly due to the limited dietary intake, conservative attire, limited outdoor activities, high temperatures and infrastructure (Al Anouti et al., 2011; Laleye et al., 2011). However, when compared with the UAE, Australians intentionally protect their skin against skin cancer, in response to various skin cancer campaigns (Sinclair & Foley, 2009), while East-Asian immigrant women in Australia avoid sunlight not because of skin cancer but because of their beliefs about fair skin and beauty (Jang et al., 2013). In a related research study, African immigrants mentioned that living in apartments means having limited private spaces for sun exposure (Pirrone et al., 2013). Non-compliance with supplements might also be tied to financial barriers and convenience (for example, hospital visits, laboratory testing and supplements), knowledge gaps and beliefs, such as concerns about drug interactions and side effects (Lim et al., 2005). In addition, fortified products with vitamin D, although available, might be inefficient as large quantities must be consumed (Laleye et al., 2009, 2011), while vitamin D rich foods, such as cod liver oil and salmon, are limited in certain areas and countries (Laleye et al., 2009, 2011). It is worth mentioning that the S-E-C context in this thesis refers to environmental, physical, emotional, mental, social (for example, demographic and socio-economic status), cultural, religious, occupational and financial factors.

This discussion confirms that people's subjective S-E-C context affects the behaviours causing or preventing vitamin D deficiency. Hence, it is not as simple as conducting a health promotion and awareness campaign, and expect people to change their behaviour. To address this deficiency, a better understanding of people’s or patients’ S-E-C context must be acquired. This can be achieved by holding conversations and enabling an interaction between physicians and patients. In other words, not only technical knowledge but also patient-specific lay knowledge, which captures their lived experiences within their S-E-C context, is necessary to create a treatment regime (Evans & Plows, 2007; Prior, 2003). This is how I determined that the patients at the blood clinic had food–drug interactions. Thus, utilising patients’ lay knowledge alongside technical knowledge is suitable for this person-centric approach, which advocates considering treating patients from clinical, emotional, mental, social and financial perspectives (Epstein & Street, 2011; Leplege et al., 2007).

Finally, it is important to note that previous studies have discussed the need for the current vitamin D guidelines and sun-related messages to be balanced, and frequently updated to incorporate various factors, such as skin type, amount of sun exposure, time of day, ultraviolet (UV) rating, season, latitude and attire (American Academy of Dermatology and AAD

Association, 2009; Osteoporosis Australia, 2014). However, despite its significant role, these suggestions did not include recommendations about incorporating patients' S-E-C context (Bonevski et al., 2013).

1.7 Research questions

The research questions of this thesis are as follows:

1. How does the social, environmental and cultural context of patients affect their vitamin D status as well as their treatment and prevention of vitamin D deficiency?
2. To what extent do GPs utilise lay knowledge to understand patients' social, environmental and cultural context and contextualise vitamin D deficiency medical advice and treatment?
3. What are GPs' and patients' perceptions regarding the use of lay knowledge to understand different contexts and experiences and contextualise medical advice?

1.8 Thesis rationale

Vitamin D deficiency continues to exist in high proportions, despite the tremendous efforts exerted by the countries and respective governments, and the year-round sunny climate of the Middle East, which is ideal for the cutaneous synthesis of vitamin D (Al Zarooni et al., 2019; Al-Mogbel, 2012; Batieha et al., 2011; Molla et al., 2005; MR & NU, 1996). The promotion campaigns conducted by countries and health authorities have attempted to encourage people to adopt certain behaviours, such as increasing their sun exposure, testing for vitamin D deficiency and consuming fortified products and supplements. However, the behaviours resulting in or preventing vitamin D deficiency are a product of the interaction between individuals and their unique S-E-C context (Kelly & Barker, 2016). This justifies the first research question, which entails exploring the experiences of vitamin D-deficient patients within their unique S-E-C contexts.

Customisation is defined as tailoring treatment to the psychological, social, and cultural dimensions of the patients (Ansmann & Pfaff, 2017). In order to provide customised treatment plans/solutions that better suit patients, these subjective and diverse contextual elements must be explored by capturing patients' lay knowledge (Popay & Williams, 2006). This will also enable healthcare professionals to provide better advice that can be used by patients in their own lifeworld (Britten, 2008). To capture lay knowledge in the context of this thesis, there is a need for collaboration between physicians and patients in which treatment plans are evaluated within a patient-specific context instead of treating them objectively (Doherty & Thompson, 2014; Laird et al., 2015; Leplege et al., 2007; Popay & Williams, 2006). In fact, Irwin (1995), asserted that medical decision-making problems are mainly caused by a fundamental social gap between various forms of understanding and expertise. Consequently, patients might resist physicians' advice if it does not suit their social contexts, experiences and realities (Britten, 2008; Van Teijlingen & Hundley, 2002). In other words, capturing contextual factors through lay knowledge and utilising it during medical consultations can help ensure consideration of patients' S-E-C context (Janssen et al., 2009). This justifies research questions two and three, which are primarily centred on exploring the goings-on during medical consultations for vitamin D deficiency in respect of utilising lay knowledge from the perspective of both patients and GPs, and the perception of both parties towards contextualisation of medical advice. This shall help provide baseline information related to the current practice, which shall foster future interventions and recommendations

1.9 Significance of this thesis

The prevalence of vitamin D deficiency in the UAE remains high despite the abundant sunlight (Chaudhary, 2017). Most of the studies conducted in the UAE were mainly quantitative, targeting the public's prevalence and behaviour or knowledge (Al Anouti et al., 2011; Bani-issa et al., 2017; Salmanpour et al., 2016). However, the current study is qualitative and approaches vitamin D deficiency from a different angle, as mentioned in the research questions. Moreover, the UAE, and in particular, Dubai, is specifically known for its unique multicultural heterogeneous populations (>200 nationalities), when compared with the rest of the Middle East (United Arab Emirates Country Profile, 2018). Hence, they have multiple S-E-C contexts, based on the different cultures, religions, beliefs, infrastructure and housing styles, socio-economic status, food preferences, etc. Thus, vitamin D studies conducted elsewhere cannot be extrapolated to the UAE. However, the findings of this thesis can be used to inform other studies on patients' S-E-C context in different settings. Furthermore, the findings of this thesis can be helpful for medical practices related to a wide range of chronic health conditions affected by the context of patients, beyond vitamin D deficiency (for example, hypertension, diabetes mellitus, cardiac diseases, and more).

1.10 Summary

The worldwide prevalence of vitamin D deficiency remains high, despite all of the exerted efforts. It also continues to be a research interest, given the wide range of consequences. However, it is clear that there is a missing piece of the puzzle. The evidence has indicated a relationship between patients' behaviour, S-E-C context and vitamin D deficiency. Even though previous studies have identified the barriers and facilitators toward acquiring vitamin D through various sources and behaviours, such deficiency remains an issue. In this regard, lay knowledge has much to offer, since it renders patients' S-E-C context more visible and enables healthcare professionals to better incorporate it in treating and preventing vitamin D deficiency.

1.11 Thesis outline

Literature review

The literature review chapter synthesises the published literature, using the meta-study approach of Paterson et al. (2001), to explore the interplay between patients' S-E-C context and their experiences with vitamin D deficiency. It also examines how the S-E-C context has been described in the literature. This approach is used not only to obtain a holistic understanding and interpretation of the issue, but also to identify the literature gaps, set the research questions and provide guidance for the remaining sections of this thesis (for example, methodology, results, discussion, etc.).

Theoretical framework

This chapter discusses the theoretical and conceptual framework of this thesis, introducing the socio-ecological model (SEM), and drawing on tenets of lay knowledge. It also discusses the various approaches identified by literature that were used to understand health-related behaviour, including social–psychological.

Methodology

This chapter explains the methodology and methods used in this thesis. Specifically, it first shed light on the research aims and then discusses the following choices to meet these aims: the philosophical paradigm, methodology, study design, location and setting, population, sampling, recruitment and sample size, data collection, reflexivity, quality and rigour, data analysis and ethics.

Results

This chapter presents the findings through four main sections: 1) the participants' demographics; 2) the effect of patients' S-E-C context on the acquisition of vitamin D deficiency, and its treatment and preventive options; 3) the current practice in terms of the use of lay knowledge to understand patients' S-E-C context during vitamin D-related medical consultations and 4) the perceptions of the participants (GPs and patients) regarding the use of lay knowledge to contextualise the vitamin D-related medical advice.

Discussion

This chapter discusses the findings in light of the existing literature, the theoretical and conceptual framework and the reflections of the researcher. It first sheds light on vitamin D quantitative and qualitative literature, then discusses the contributions related to the process of obtaining and understanding lay knowledge, and the contributions related to civic intelligence. After that, it discusses the current practice in terms of obtaining, understanding and utilising lay knowledge to complement technical knowledge during vitamin D-related medical consultation, what undergirds the current practice and the perceptions attached to it. Finally, the reflexivity is discussed, and a set of recommendations are put forward.

Conclusion

This chapter provides an overview of the entire thesis.

Chapter Two

The social, environmental and cultural context in the vitamin D literature

As seen in the previous chapter, behaviour is affected by a wider social context, which influences the individual’s vitamin D status. Thus, this literature review explores the interplay between patients’ S-E-C context, the development of vitamin D deficiency and the acquisition of vitamin D through various sources. This is done by reviewing studies using the meta-study approach of Paterson et al. (2001). It also explores how the S-E-C context has been utilised in previous studies in order to engender a holistic understanding of the issue and identify any gaps in the literature.

2.1 Existing literature and rationale

Before embarking on this systematic review, a scoping search was conducted, which confirmed that the S-E-C context is a major player in developing or preventing vitamin D deficiency, and is a cornerstone for acquiring vitamin D through its various sources. This search also revealed that a majority of the published systematic reviews focused on quantitative evidence concerned with vitamin D sources and the prevalence, causes and consequences of vitamin D deficiency (Anglin et al., 2013; Autier & Gandini, 2007; Elamin et al., 2011; Hilger et al., 2014; Holick, 2007; Ma et al., 2011; Martineau et al., 2017; Mitri et al., 2011; Murad et al., 2011; Nnoaham & Clarke, 2008; Parker et al., 2010; Pittas, 2010). However, despite recognising that such deficiency is closely tied to human behaviour, which is affected by the wider S-E-C context (Duncan et al., 1996; Laleye et al., 2011; Zullo, 2007), this relationship has not been the focus of any systematic review. Thus, this literature review addresses this gap.

2.2 Review questions and objectives

2.2.1 Review questions

1. How does the social, environmental and cultural context affect patients' experiences with vitamin D deficiency, and the treatment and preventive options?
2. How has the social, environmental and cultural context been described and utilised in vitamin D deficiency-related studies?

2.2.2 Objectives

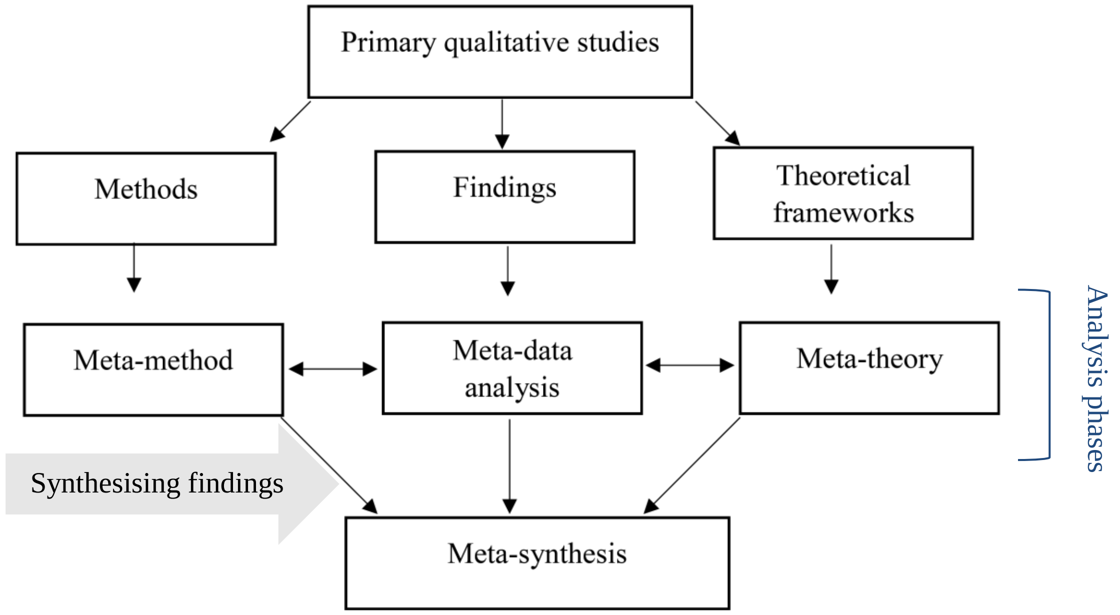
1. To examine the role of the social, environmental and cultural context in the acquisition of vitamin D and the development of vitamin D deficiency, by focusing on participants' lived experiences.
2. To determine how the social, environmental and cultural context is described and utilised in vitamin D deficiency-related studies.

2.3 Methods

2.3.1 Type of review

Paterson et al.'s (2001) meta-study approach was adopted to conduct this qualitative systematic review. The approach incorporates four phases: the meta-theory, meta-method, meta-data, which are analysis phases, followed by a meta-synthesis phase (see Figure 2.1). The reasons for choosing this approach are further discussed below in points a to c, which are related to having a four-layered approach, interpretivist philosophical paradigm, and having the freedom to choose the data analysis method.

Figure 2.1 Meta-study approach (obtained from Paterson et al., 2001, p. 9)



a) Four-layered approach

As explained earlier, meta-study incorporates four phases in total. Hence, in comparison to other review methods, meta-study provides in addition to the data analysis phase that is common across all review methods, three phases which are the theory and methods analysis phases, and the synthesis phase. The importance of these additional phases is further discussed in the successive text.

The meta-theory explores the underlying structures on which the research is grounded by specifically focusing on the philosophical, cognitive and theoretical aspects underlying the research design strategies (Ritzer, 1990). It also examines the sources and assumptions inherent in a theory, and considers the relationship between the theory and the larger sociocultural, historical, and political context in which it has been generated (Ritzer, 1990). The scoping search identified a very small number of potential studies, which gave the sense that literature is scarce. Furthermore, this literature review serves as a chapter in this thesis, hence the meta-theory was thought would help with the choice of the theory adopted during this thesis, as seen in chapter 3. That is because meta-theory helps analyse the implications, strengths and weaknesses of the theories used by the included studies. Furthermore, it explores how theories were adopted, to further understand the impact of the chosen theory on all stages of research. This includes the impact on selecting the research question and the phenomenon of interest, the impact on the choice of the methodology, data collection and analysis, and the impact on how findings are presented and how conclusions are drawn (Sandelowski, 1993b). This is particularly important for the current thesis as it helps understand how certain underlying assumptions have impacted the outcomes of previous research, and accordingly use this information to produce new (or expanded) understandings about a theory in a substantive area 'vitamin D literature'. Hence, aid with selecting the most suitable theoretical framework for this thesis, but also critique previous theories to adopt a more suitable and applicable version of an existing theory (Pawson, 1989; Ritzer, 1990) as seen in the discussion section of this chapter, and in chapter 3.

Next is the meta-method phase, which examines the epistemological soundness of the research methods of the included studies, by assessing the methods and methodology (Richman, 1983; Zhao, 1991). This is crucial because methodological decisions play a significant role in directing the research and, consequently, the outcome. As mentioned earlier, this review is serving as a chapter in this thesis, hence, conducting meta-methods was thought to help make appropriate methodological choices and decisions pertaining to this thesis as demonstrated in chapter 4. That is because the meta-method analysis phase compares the findings engendered by different methodological approaches, hence determining the influence of methods and methodologies adopted by the included papers on the findings (Richman, 1983; Zhao, 1991). Therefore, understanding how the methodology has shaped the current literature about vitamin D deficiency. This information can then be used to make empirical decisions related to the methodology of this thesis as seen in chapter 4. In addition, this phase enables conducting a historical review of research methods adopted in vitamin D literature, and the implications of these methodological choices in shaping the overall body of knowledge (D'Antonio, 1997). This specifically provided an ample opportunity not only to make empirical decisions related to the methodology, but also to identify the knowledge gap in literature which were then the focus of this thesis.

The third phase is the meta-data phase, where during this phase, the researcher can choose any of the qualitative review methods to analyse the findings. This is further discussed in point c. While conducting the scoping search before the start of this literature review, it was brought to my attention that the review questions were never directly asked before by any of the identified studies. Meta-data analysis indeed addresses this by allowing to re-examine the findings of primary studies with a new focus, and reconstruct the primary evidence systematically to answer new questions that were not asked before (Zhao, 1991). Yet, meta-study, compared to other review methods, provides an opportunity to carry out the data analysis while taking into account the outcomes of the other analysis phases, rendering the analysis more contextualised (Paterson et al., 2001).

Fourth is the meta-synthesis phase which brings together the outcomes of the other three analysis phases to engender a new interpretation related to the aims and questions of this literature review (Paterson et al., 2001; Thorne et al., 2002). In doing so, it creates a foundation on which insights can be expressed regarding the implications of certain theoretical, methodological and structural aspects of past, present and future research about the phenomenon.

Overall, as the meta-study approach provides three layers of analysis, followed by a synthesis phase (as seen in Figure 2.1), it moves away from simply compiling the findings of studies, and considers highly significant ways in which the data, theories, methods and contexts have shaped the results (Paterson et al., 2001). According to previous research, this method incorporates not only theory, research methods and data but also the historical, socio-cultural and ideological contexts that shaped these components (Barnett-Page & Thomas, 2009; Paterson et al., 2001). Zhao (1991, p. 381), described the meta-study approach as the process of ‘remapping the cognitive status’ of a changing field of study by considering its theoretical, methodological and epistemological bases within a historical and socio-cultural context. This is crucial for the current literature review as it focuses on exploring the lived experiences of vitamin D-deficient patients within their social, environmental and cultural contexts. Moreover, using this approach enables us to determine how the literature on vitamin D deficiency and the S-E-C context has been influenced by factors such as theoretical frameworks, different research methods and various interpretive frames. In doing so, it helps us demonstrate how more socially relevant and effective representations of the phenomenon can be used to differentiate the subjective and objective realities, as well as the speculative and probable truths in real-world applications.

b) Philosophical paradigm

In general, the meta-study approach adopts an interpretive constructivist perspective. Hence, a singular objective reality is not expected to be found, but rather multiple, coexisting and even sometimes incongruous realities related to the phenomenon (Paterson et al., 2001). This is suitable for the aims and questions of this literature review, since participants' experiences are been explored here. Moreover, the constructed interpretations will not only incorporate the influences of the social, cultural, historical and ideological contexts in which they occur, but also the primary researchers' social and political contexts, which leads to a deep and authentic understanding' (Denzin, 1989). Hence, the notion of this perspective is particularly relevant for this thesis and review, because the objective is to critically examine and reshape the knowledge regarding the social, environmental and cultural context in the vitamin D literature. It also allows us to accommodate previously polarised perspectives and coordinate a comprehensive understanding of complex social and human phenomena (Ritzer, 1992).

c) Freedom to choose the data analysis method, and meta-ethnography

During the meta-data phase, a specific approach for systematically synthesising and analysing the findings must be adopted. As mentioned earlier, the meta-study enables choosing the specific type of analysis the researcher wants to use to analyse the findings during meta-data analysis. Thus, while comparing all of the possible approaches for data analysis, the meta-ethnography of Noblit & Hare (1988), was found to be the most suitable for achieving the literature review and research objectives. To illustrate, the grounded theory method of Glaser & Strauss (1967), and the critical interpretive synthesis of Dixon-Woods et al. (2006), are mainly used to build or generate a theory. Meanwhile, thematic synthesis is used to generate a hypothesis and to address questions related to the need, accessibility, appropriateness and effectiveness of an intervention (Thomas & Harden, 2008). In the same vein, ecological triangulation is mainly used to build evidence to determine which interventions work for certain types of outcomes, individuals and conditions (Banning, 2003). Although textual narrative synthesis is very similar to meta-ethnography, it does not identify the commonalities (Lucas et al., 2007). As for other methods, the meta-narrative is mainly used to inform complex policy questions (Greenhalgh et al., 2005), while the framework synthesis of Pope et al (2000), is primarily used to provide a framework for analysing data in a structured manner. On the other hand, meta-interpretation although is not very common, it is used to generate or create more theoretically dense conceptualisations (Finfgeld, 2003).

Accordingly, the meta-ethnography of Noblit and Hare (1988), was chosen because it is an interpretive, qualitative synthesis approach that is suitable for synthesising participants’ views and experiences. In addition, it enables generating a deep conceptual understanding of complex healthcare issues, similar to the one under investigation in this review, and thesis (France, Cunningham, et al., 2019; France et al., 2015; France, Uny, et al., 2019). Furthermore, the meta-ethnography helps identify common trends and polarised perceptions by working with, comparing and interpreting the findings from different or heterogeneous studies, which is what the scoping search has unraveled, and what this review aims to become acquainted with. This also goes in line with the overall tenets of the meta-study approach in terms of viewing results through different layers. In addition, the meta-ethnography enables to interpret data to produce a new third-order interpretation by breaking down the data, and then bringing together the separated parts to form the whole and provide answers to these questions. This is an important feature since the review questions were not asked before. The parts that need to be put together include participants' findings, authors’ interpretation and individual interpretive accounts (Noblit & Hare, 1988). It is also considered the most common and leading method, where no existing meta-ethnography is conducted on this topic. Additionally, most qualitative synthesis approaches or methods are based on meta-ethnography (Hannes & Macaitis, 2012). Moreover, a standardised tool 'eMERGE' is available as a guide to ensure streamlining the analysis when working with heterogeneous studies, such as the case in this thesis (France, Cunningham, et al., 2019).

2.3.2 Characteristics of the included primary evidence

Methodology, philosophy, design and methods of the included primary evidence

Participants' experiences with vitamin D deficiency within their subjective and diverse S-E-C contexts are the foci of this literature review. Hence, any qualitative study underpinned by an interpretivist paradigm (subjectivism epistemology and relativism ontology) that has data matching the literature review's objectives was suitable for inclusion. Although several useful quantitative studies were found during the scoping search, they did not discuss how participants' S-E-C context affected their experiences with vitamin D deficiency (Skull et al., 2003; Von Hurst et al., 2010; Webb et al., 1988). Moreover, in regard to the methods, studies identified during the scoping search mainly used semi-structured interviews and/or focus groups, with minimal information on their research designs. Thus, it was determined that if the study was qualitative in nature, used one or both methods, and has data that matches the review aims, it was considered eligible for inclusion.

2.3.3 Search strategy

a) Key terms and the inclusion criteria.

The qualitative PICO (population-issue-context-outcome) framework (Table 2.1), review questions and outcome of the scoping search were used to create the inclusion criteria and the key terms used for searching the databases. Specifically, the PICO framework was used to ensure comprehensiveness as few studies were identified during the scoping search (Cooke et al., 2012; Methley et al., 2014). Moreover, this framework helped to achieve cohesiveness, locate relevant evidence, improve transparency and reproducibility and ameliorate subjectivity (McDonagh et al., 2013). In addition, studies that have targeted students were included as well, as the scoping search revealed that students were the subjects of focus in several potential studies.

Table 2.1. Qualitative PICO and inclusion criteria (Aveyard et al., 2016).

PICO term	Description
P – population	Participants with or without vitamin D deficiency, or having a history of it; both genders; those aged 18 years or above; no restriction on nationality, religion, educational level and specialty. No limitations with respect to any medical condition, except skin cancer.
I – issues	• The development of vitamin D deficiency. • Compliance to vitamin D treatment and/ or preventive options, and sources of vitamin D (for example, sunlight, supplements, fortified food, dietary sources).
C – context	Community
O - outcome	Impact of contexts on vitamin D levels, the development of vitamin D deficiency, and compliance to its treatment and/ or prevention.

Hence, I included studies that met the following inclusion criteria and were available as full text:

1. Study design or type of study: Primary studies using a qualitative methodology (semi-structured interviews and/ or focus groups).
2. Study population: Participants of both gender, ≥ 18 years old, with or without vitamin D deficiency, or having a history of it; no restriction to nationality, religion, educational level and speciality. No limitations with respect to any medical condition, except for skin cancer.
3. Study aim: to include data that captures participants' experiences concerning the impact of their social contexts on the following:
    - Vitamin D levels
    - Development of vitamin D deficiency
    - Compliance to vitamin D treatment and/ or preventive options, and sources of vitamin D (for example, sunlight, supplements, fortified food, dietary sources).
4. Outcomes: Experiences, perception, beliefs, feelings, thoughts, or attitude of participants towards the phenomenon of interest.
5. Years of publication: no limitations to the years of publication
6. To be published in English, published as a full article, or able to source as a full text.

And the exclusion criteria are as follow:

7. Study design or type of study: Review papers, pilot studies, abstract/ conference proceedings, and papers that are not peer-reviewed.
8. Study population: Participants < 18 years old, and/ or have skin cancer.

9. Study aim: to include data that is not focused on participants' contextual experience in relation to vitamin D levels, development of vitamin D deficiency and compliance to vitamin D treatment and/ or preventive options as well as sources of vitamin D.
10. Not published in English, or as a full article, or unable to source as a full text.

b) Search strategies.

The search in this literature review entailed electronic and additional search strategies, as described below.

Electronic search:

Overall, two approaches were used to search the seven electronic databases listed in Table 2.2:

a. Free text
b. Keyword/MESH 'controlled'

With regards to the key terms, these were identified as mentioned earlier through PICO, the review questions, and the outcome of the scoping search. Accordingly, the following combinations of key terms were used to search the seven databases, and this included using MeSH/ controlled keywords:

- ((Perception* OR opinion OR awareness OR viewpoint OR knowledge OR understand* OR assumption* OR attitude OR practice* OR behavior* OR lifestyle OR complain*)) AND (vitamin D [Title/Abstract] OR vitamin D deficiency [Title/Abstract] OR sunlight vitamin [Title/Abstract]).
- [Perception* OR opinion OR awareness OR viewpoint OR knowledge OR understand* OR assumption* OR attitude OR practice* OR behavior* OR lifestyle OR complain*] AND [vitamin D OR vitamin D deficiency OR sunlight vitamin].

- (Perception* OR opinion OR awareness OR viewpoint OR knowledge OR understand* OR assumption* OR attitude OR practice* OR behavior* OR lifestyle OR complain*) AND (vitamin D OR vitamin D deficiency OR sunlight vitamin).
- (Perception* OR opinion OR awareness OR viewpoint OR knowledge OR understand* OR assumption* OR attitude OR practice* OR behavior* OR lifestyle OR complain*) AND (vitamin D OR vitamin D deficiency OR sunlight vitamin).

As there was a risk of omitting recently published or pre-published studies (as the indexing is performed manually), the electronic search was carried out several times in the following months: April 2019, July 2019, August 2019, May 2020, June 2021 and February 2022 (Aveyard et al., 2016).

Table 2.2. Electronic databases.

Databases for biomedicine and health sciences	1. PubMed/Medline 2. UK PubMed Central 3. CINAHIL/EBSCO HOST 4. EMBASA 5. ZETOC 6. Global Health Library (Global Index Medicus)
General databases	7. Google Scholar

Additional search:

The reference lists of the included papers were cross-checked, and relevant journals were hand-searched. Moreover, citation tracking and an author search, through Google Scholar, SCOPUS and the Web of Science, were performed to identify any relevant papers (Gough et al., 2012). The search also included grey literature.

c) Conducting the search process, and the outcome of it:

The steps for conducting electronic and manual searches are presented in PRISMA Figure 2.2. The seven electronic databases were searched using the combination of key terms specified above and in Figure 2.2 (presented in the yellow box). This resulted in identifying 11,534 records (presented in blue in Figure 2.2). Then, the titles were screened (presented in red in Figure 2.2) for inclusion of the terms specified earlier (for example, vitamin D or an alternative term AND perception or an alternative term). During this phase, if the study title alludes to using a quantitative methodology or declared an aim that does not match the review objectives, the study was excluded. Next, was the abstracts screening (presented in red in Figure 2.2), and during this phase the inclusion criteria was applied. The abstract was also screened in case of doubts during the title sifting phase. The final step was the full text inspection, where the potential papers identified through the abstract screening were inspected for their eligibility as per the inclusion criteria (presented in red in Figure 2.2). The full text was also screened if the abstract was insufficient for determining the relevance during the abstract sift phase. Any duplicated studies identified during the various stages were removed. Figure 2.2, also includes the additional search (presented in the green box).

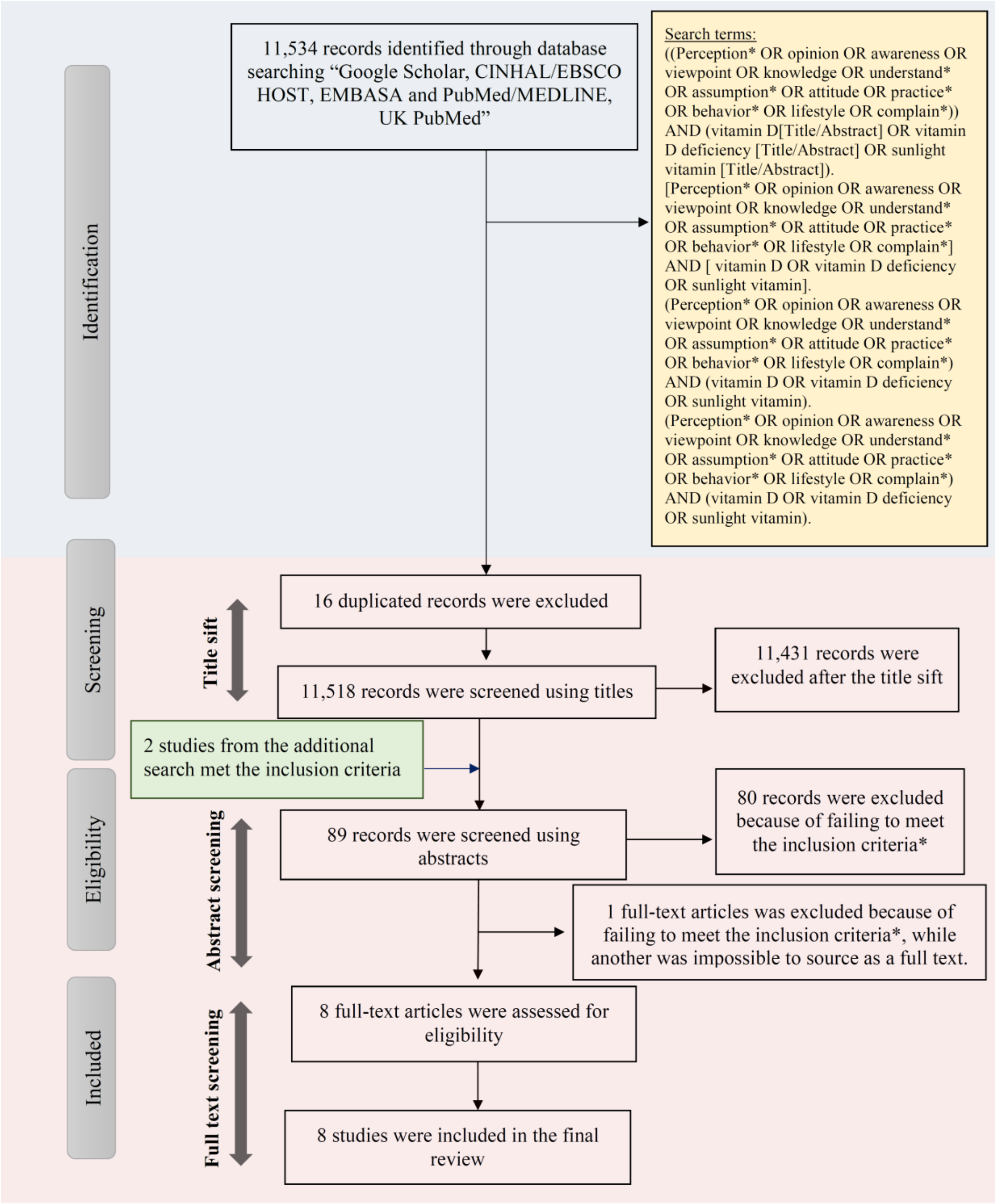
2.3.4 Quality assessment

A quality assessment was undertaken, as part of the first three phases of analysis, as these three phases require to critically analyse every single aspect of the primary evidence to amalgamate data interpretively as seen later in the text. In this regard, the Crowe Critical Appraisal Tool (CCAT) version 1.4 (see the Appendix) was used, as it provides a detailed systematic guide, it optimises inter-rater consistency, it avoids missing salient elements and saves time (Crowe, 2015; Crowe & Sheppard, 2011; Devereaux et al., 2002). The tool enables examining each section in detail to heighten accuracy (Booth et al., 2016; Crowe et al., 2015). CCAT also consistently assesses the heterogeneous studies similar to those identified in the scoping search and our review, thus rendering the quality assessment more uniform and manageable (Booth et al., 2016; Crowe et al., 2015). Furthermore, CCAT was generated based on the observations and flaws of other tools, and was tested for its validity and reliability (Crowe & Sheppard, 2011). Yet, given the small number of potential studies identified (Figure 2.2), the outcome of the quality assessment was not used to determine inclusion, but rather to be part of the analysis and synthesis.

2.4 Results

A total of eight studies were included in this literature review (see Figure 2.2). This section presents the findings, starting with the meta-method phase, followed by the meta-data, and meta-theory phases. Finally, the meta-synthesis phase will represent the discussion.

Figure 2.2. PRISMA flow chart (Moher, 2009)



* A study that cannot be sufficiently assessed using the abstract, and is available as a full text, is assessed with the latter.

2.4.1 Overall characteristics of the studies

Out of the eight selected studies (published between 2008 and 2017), five were conducted in Australia, two were conducted in Saudi Arabia and one was conducted in the UK. These studies mainly explored the barriers and facilitators toward acquiring vitamin D through various sources, and the development of vitamin D deficiency. They also identified strategies that can be used in the future through health promotion campaigns to ameliorate or address vitamin D deficiency, as discussed later in the text. The focus of the included studies was mainly on the attitudes, beliefs, perceptions, knowledge and practices toward vitamin D deficiency, sun exposure, supplementation, fortification, testing and information sources. As none of the studies targeted the same review questions, the data needed to be deconstructed and amalgamated again with a new focus to answer the review questions.

2.4.2 Phase one: Meta-method analysis

As stated earlier on page 34, during this phase, the primary studies were appraised by exploring their methodologies and methods, in terms of their methodological soundness, quality and influences on the findings (Paterson et al., 2001). Meta-method analysis was also useful towards identifying the particular methods used within this field, thereby helping with making empirical decisions and informing the Methodology section of this thesis, as seen later. The meta-method analysis was carried out by exploring the research question(s), methodology, sample/population, location, data collection methods and the researcher’s roles. The CCAT was also used during this phase, and observations related to the quality of the methods of included studies were incorporated in the following sub-sections (a to e) and in the challenges and limitations sections page 75.

a) Methodology and study design

All of the studies were qualitative, and all have not specified the design except Brand et al. (2008), who declared using grounded theory (see Table 2.3 in Appendix). However, Brand et al. (2008) probably referred to the data analysis technique as ‘thematic analysis’ since no theory was generated from the results. In general, the methodology used in all studies was suitable to achieve their aims.

b) Data collection method

In terms of the data collection methods, four studies used focus groups (Bonevski et al., 2013; Brand et al., 2008; Kotta et al., 2015; Pirrone et al., 2013), three used face-to-face individual semi-structured interviews (Aljefree et al., 2017; Durvasula et al., 2010; Jang et al., 2013), and only one used both approaches (Christie & Mason, 2011) (see Figure 2.3 and Table 2.3 in appendix). Overall, these data collection methods were deemed suitable for achieving the studies’ aims, and congruent with the overall qualitative methodology and interpretivism. However, a number of factors seemed to have affected the nature of the findings, which were also useful insights for making decisions in this thesis. For example, it was observed that the studies using semi-structured interviews engendered more findings on personal experiences with the S-E-C context and sun exposure. Specifically, there were more discussions about cultural and religious barriers in comparison to the focus groups, with the exception of Brand et al. (2008). On the contrary, it was observed that the focus groups had more discussions about knowledge, awareness and attitude, and less on personal experiences, despite the fact that the focus groups were homogenous in terms of gender, religion, nationality or occupation.

In addition, although the semi-interviews were relatively shorter (see Figure 2.3), it was observed that the number of interviews was higher than that of the focus groups (see Figure 2.3

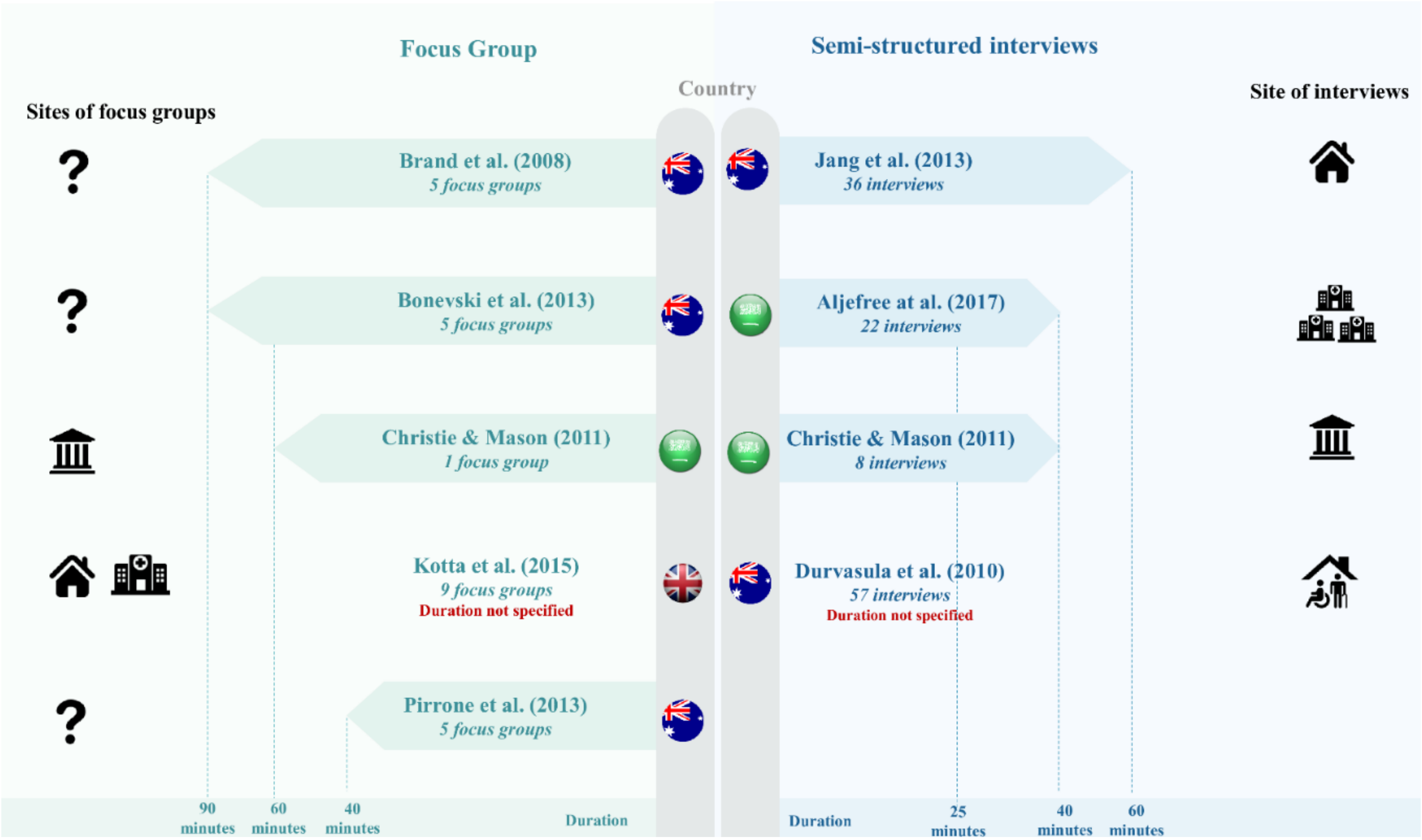
and Tables 2.3 in appendix). Yet, it is important to also note that two studies did not disclose the duration of the interviews or focus groups (Durvasula et al., 2010; Kotta et al., 2015).

All of the studies used audio-recording devices, with the exception of Brand et al. (2008), which used a manual documentation technique. It was not possible to know why Brand et al. (2008), used manual documentation, and the impact of this technique was not discussed in the Discussion section of the paper.

c) Location

In terms of the locations of the interviews and focus groups, three studies did not specify the locations (Bonevski et al., 2013; Brand et al., 2008; Pirrone et al., 2013) (see Figure 2.3). As for the remaining studies, the locations were university classrooms, homes and clinics, hospitals, care facilities and the homes of the participants in Christie and Mason (2011), Kotta et al. (2015), Aljefree et al. (2017), Durvasula et al. (2010) and Jang et al. (2013), respectively (see Figure 2.3). It was observed that the interview durations were shorter in the studies conducted in hospitals, clinics and universities (Aljefree et al., 2017; Christie & Mason, 2011; Kotta et al., 2015). In addition, the locations seemed to have had an impact on the type and nature of the findings. To illustrate, the study conducted in the females' medical campuses focused on technical knowledge related to vitamin D, supplements, fortified foods and sun exposure (Christie & Mason, 2011). They also discussed contextual factors, such as cultural and religious ones, since it was conducted in females-only campus due to cultural and religious obligations and because Muslim Arab females were interviewed (Christie & Mason, 2011). As for the other studies, the interviews in Aljefree et al. (2017), although conducted in three hospitals, still shed light on contextual information, given the strong cultural and religious influences in the study's context (Saudi Arabia). The interviews in Kotta et al. (2015), although conducted in the homes of participants, yet participants were recruited from hospitals. Hence, the focus was more on the participants’ attitudes towards testing for vitamin D deficiency, taking supplements/fortified products and complying with recommendations, which were very much related to the recruitment location. Furthermore, interviews in Durvasula et al. (2010), were conducted in an in-home care facility, hence discussed the factors pertaining to the facilities (see Figure 2.3). While, the interviews in Jang et al. (2013), conducted in the participants’ homes, brought more cultural information, such as their preference for fair skin and beauty, excessive use of sun protection and indoor lifestyle (see Table 2.5). This could also be attributed to the specific interest of these ethnic groups towards having fair skin, as discussed later. These observations were useful insights, which were taken into account when designing the methodology of this thesis.

Figure 2.3. Methods and locations



Legend:

?	**Not mentioned**	🏠	**Participants' Homes**	♿	**Resident/ Home care facility**	🇸🇦	**Saudi Arabia**
🏛	**University classrooms**	🏥	**Hospitals/ Clinics**	🇦🇺	**Australia**	🇬🇧	**United Kingdom**

d) Sampling and population characteristics

Overall, two main recruitment techniques were used in the included studies: purposeful and convenience sampling. In this regard, six of the eight studies mentioned or alluded to their recruitment technique. Specifically, convenience sampling was used in four studies (Aljefree et al., 2017; Christie & Mason, 2011; Jang et al., 2013; Pirrone et al., 2013), while purposeful sampling was used in the remaining two studies (Bonevski et al., 2013; Kotta et al., 2015). Overall, the recruitment techniques used by the studies seem suitable for achieving the overall objectives, and gathering suitable data. Yet, it is worth mentioning that purposeful sampling ensures the recruitment of information-rich cases, unlike convenience sampling, which might result in information-poor cases (Merriam & Tisdell, 2015).

The characteristics of the participants and the recruitment locations also influenced the outcomes and the amalgamated data (see Tables 2.4 to 2.6). Participants in Kotta et al. (2015), for example, as seen in page 50, were recruited from hospitals, hence the findings were more geared towards testing for vitamin D deficiency, taking supplements/fortified products and complying with recommendations. In Brand et al. (2008) and Pirrone et al.(2013), as the researchers targeted African–Muslim immigrants, there were heavy discussions about cultural and religious norms as well as their experiences with immigration. Christie and Mason (2011), mainly targeted Muslim female students between the ages of 20 and 25, most of whom were Saudi, while Aljefree et al. (2017), recruited Saudis mainly living in urban areas. Hence, in both, the findings were more related to the culture of Arabs, Middle Easterners and Muslims. In addition, in Jang et al. (2013), the Korean and Chinese participants revealed certain aspects particular to each nation (for example, the preference for fair skin amongst East Asians). Whereas, Bonevski et al. (2013), who recruited primary and secondary teachers, office workers and the elderly living in residential care (see Table 2.3), found that the findings mainly discussed their knowledge and awareness as well as their unique routines, lifestyles and S-E-C contexts. As for the sample in Durvasula et al. (2010), it included older adults (70 years of age and above) residing in a home care facility. Hence, it explored their attitudes and behavioural changes over the course of their lives as well as some aspects related to the hostel where they are living. However, in their study, as older adults were interviewed, there were some concerns regarding their information recall. Yet, the validity of the findings could not be verified as this was not discussed in the study. Interestingly, only Brand et al. (2008) and Jang et al. (2013), mentioned that their participants were mostly vitamin D-deficient, whereas Durvasula et al. (2010), excluded those taking vitamin D supplements (see Table 2.3). In sum, the characteristics of the participants were suitable for the aims of the included studies, yet excluding vitamin D-deficient patients in some studies might have obstructed certain findings and hindered the authenticity of their experience with VDD. Finally, although the participants had diverse characteristics, it is worth mentioning that the focus groups were homogenous in all five studies (Bonevski et al., 2013; Brand et al., 2008; Christie & Mason, 2011; Kotta et al., 2015; Pirrone et al., 2013) (see Table 2.3). This discussion brought to light some important aspects related to the population, sample and recruitment that have informed the methodology of this thesis.

e) Characteristics of the researcher(s)

Qualitative research is a product of the researcher as much as it is that of the researched. Thus, it is important to assess the researcher’s impact on the findings. Table 2.3 in appedix delineates the details regarding the characteristics of the researcher(s). Linguistically, two of the studies only recruited participants who spoke English (Bonevski et al., 2013; Kotta et al., 2015). In the other studies, they used an interpreter for translations (Brand et al., 2008; Pirrone et al., 2013) or had a researcher who could speak the language of the participants (Christie & Mason 2011; Jang et al., 2013; Pirrone et al., 2013; Aljefree et al., 2017). Regarding the characteristics of the field researcher, in Brand et al. (2008), Christie and Mason (2011), Aljefree et al. (2017)

and Jang et al. (2013), the researcher shared a cultural background similar to that of the participants. The exceptions in this regard were Kotta et al. (2015), Pirrone et al. (2013), and Durvasula et al. (2010). In addition, it was also not possible to be assertive regarding the cultural background of researchers in Bonevski et al. (2013), as this was not clearly mentioned. In general, a major observation was that all of the included studies lacked researcher reflexivity.

2.4.3 Phase two: Meta-data analysis

During this phase, findings were deconstructed and then systematically amalgamated with a new focus to answer the review questions. This was a useful and critical practice since the review questions were never asked before.

Overall findings

Overall, the studies included in this systematic review amalgamated findings regarding the knowledge and awareness of vitamin D, vitamin D deficiency, and supplementation and testing. They also focused on the participants' experiences, perceptions and attitudes towards vitamin D deficiency, the various sources of vitamin D, as well the available preventive and treatment options.

1. Getting started.
2. Deciding what is relevant to the initial interest.
3. Reading the studies.
4. Determining how the studies are related.
5. Translating the studies one to the other.
6. Synthesising the translation.
7. Expressing the synthesis.

Box 2.1. Seven Steps of Noblit & Hare (1988).

a) Meta-ethnography

As mentioned earlier, in the meta-data phase, the researcher has the freedom to choose the review method. Hence, Noblit and Hare's (1988), seven-step meta-ethnography (Box 2.1) was adopted to achieve the review objectives discussed earlier on page 37. It also goes well with the philosophical positions of this meta-study and primary studies. In addition, it is also worth mentioning that the meta-ethnography reporting guidance (eMERGE) was adopted as a meta-ethnography reporting tool as seen in Box 2.2, and below (France, Cunningham, et al., 2019).

eMERGE checklist, phases (page number):

1. Phase 1 –Selecting meta-ethnography (pages 32-39)
2. Phase 2 – Deciding what is relevant (pages 31-32, 55-57)
3. Phase 3 – Reading included studies (pages 55-57)
4. Phase 4 – Determining how studies are related (pages 55-57)
5. Phase 5 – Translating studies into one another (pages 55-57)
6. Phase 6 – Synthesising translations (pages 55-57)
7. Phase 7 – Expressing the synthesis (pages 58-68)

Box 2.2. eMERGE (France, Cunningham, et al., 2019).

b) Operationalising meta-ethnography

A summary of Noblit and Hare's (1988) seven-step is provided in this section, and eMERGE was followed throughout the entire process as seen in Box 2.2 and below.

First, the initial scoping search helped start this literature review by indicating which areas should be the subjects of focus. Accordingly, the review questions were identified, as well as the choice for adopting meta-ethnography as seen in pages 31 and 39. A decision was made to synthesis the studies in order to explore the effect of the patients' S-E-C context on their acquisition of vitamin D and the development of vitamin D deficiency, and explore how S-E-C context was handled and discussed in vitamin D literature. Then, the studies were read three times to identify the main concepts (context impact on knowledge and awareness, contextual-factors and solutions). After that, certain details pertaining to studies, such as the methodology/ methods, study setting/ location, participants, sample size, recruitment, population, data collection tools, data analysis, and the results, were recorded in a tabulation format. In other words, the information about the methodology or methods sections of the included studies were compiled, and the results of these studies were also added to a separate column within the same table. This was extremely helpful to allow inspection of the methodology across all studies,, and simultaneously getting immersed in the results of included studies. This not only help determine the common or recurring concepts and how studies are related to each other, but also provided a context for the findings (for example, methodology), which is expected to enhance the interpretations and explanations of the collated data from studies. The studies were then translated into one another by entering the data regarding each study's concept/theme into a separate column in their respective tables, while maintaining the authors' words and terminologies. Then, the actual concepts described in each study were identified, after which their key concepts were used to label the row in the grid (theme). Thus, it was possible to establish that each study's concept was encompassed by one of the key concepts or themes in the grid, thereby, confirmed the main concepts or themes. Below are the three main themes with the interpretation of each:

- Theme 1: Impact of the S-E-C context on knowledge and awareness regarding vitamin D, vitamin D deficiency and sun exposure vs. skin cancer. This includes data related to the impact of S-E-C on knowledge and awareness concerning these topics.
- Theme 2: S-E-C context-related factors as barriers or facilitators: This includes data related to contextual factors been identified by participants as barriers and/or facilitators.
- Theme 3: Proposed solutions by participants towards the identified barriers: This includes any data related to proposing solutions towards the identified barriers.

Then the phase of synthesising the translations started, where by reading the concepts or themes and their interpretations in the grid, it was possible not only to determine the relationships between these studies, but also reconstruct, synthesis, present and interpret the findings with a new focus to answer the review questions.

The final phase was expressing the synthesis, which was done by taking into consideration the review questions and focus, the methodology, and all other elements that could have affected the final interpretation. This phase is the meta-synthesis or discussion section which incorporates taking into account the outcomes of the three analysis phases as seen in page 70 onwards.

c) Outcome of meta-data analysis

Overall, three main themes and sub-themes were identified as mentioned earlier, presented below and in Tables 2.4, 2.5 and 2.6. The tables also include examples of the participants' responses. It is important to note that the data were amalgamated into themes to help answer the review questions and to help identify any gaps in the literature.

Theme 1: Impact of the S-E-C context on knowledge and awareness regarding vitamin D, vitamin D deficiency and sun exposure vs. skin cancer.

Table 2.4 displays the three main sub-themes that capture theme 1, which are: 1) the impact of change in individual's context on the amount of information received regarding vitamin D, 2) the impact of context and location on the amount of information received regarding skin cancer 3) the impact of context and location on the awareness and beliefs regarding the harmful effects of sun.

As per the literature, the S-E-C context and individual characteristics had an impact on participants' knowledge, and awareness and, consequently their behaviour towards the acquisition of vitamin D and the development of vitamin D deficiency (see Table 2.4). In this regard, one participant stated that becoming pregnant meant greater exposure to information about vitamin D and an increased tendency to get tested for vitamin D deficiency (Aljefree et al., 2017; Brand et al., 2008; Pirrone et al., 2013). Hence, the context 'becoming pregnant' had an effect in terms of the amount of information she received, which, in turn, affected her knowledge and, consequently behaviour towards vitamin D deficiency (Aljefree et al., 2017; Brand et al., 2008; Pirrone et al., 2013). The location and context have resulted in variations in knowledge and beliefs about skin cancer and the harmful effect of the sun. Being in countries such as Australia heightened knowledge and awareness about SunSmart campaigns, making some participants more concerned about skin cancer than they were about vitamin D deficiency (Bonevski et al., 2013). Such concerns might have also encouraged the use of sunscreen (Bonevski et al., 2013; Durvasula et al., 2010). Yet, some of the participants expressed confusion regarding the health authorities' conflicting messages about sun exposure, vitamin D and skin cancer (Kotta et al., 2015). On the other hand, some immigrants believed that the sun is more harmful in Australia than it was in their home country in Africa (Pirrone et al., 2013). This was probably due to fewer campaigns about skin cancer in Africa when compared with Australia (Pirrone et al., 2013). Hence, the amount of information they received about the harmful sun rays after immigrating to Australia was higher in comparison to what they received when they were in their home countries.

Table 2.4. Theme 1: Impact of the S-E-C context on knowledge and awareness regarding vitamin D, vitamin D deficiency and sun exposure vs. skin cancer.

Sub-themes:	Examples of the participants' responses
Sub-theme 1.1: Impact of change in individual's context on the amount of information received regarding vitamin D (Aljefree et al., 2017; Brand et al., 2008; Pirrone et al., 2013).	• 'I heard about it when I was pregnant' (Brand et al., 2008, p. 16). • 'There is no information before you are pregnant' (Brand et al., 2008). • 'After I gave birth to my daughter, the doctor asked me to do a blood test' (Aljefree et al., 2017, p. 4).
Sub-theme 1.2: Impact of context and location on the amount of information received regarding skin cancer (Bonevski et al., 2013; Durvasula et al., 2010; Kotta et al., 2015).	• 'Conflicting messages' (Kotta et al., 2015, p. 3). • 'The consequences, I think, are greater. It's [skin cancer] deadly, and you die a lot quicker from cancer than you can from vitamin D deficiency' (Bonevski et al., 2013, p. 920).
Sub-theme 1.3: Impact of context and location on the awareness and beliefs regarding the harmful effects of sun (Pirrone et al., 2013).	• 'But when we were in our countries, we were exposed to the sun a lot. Our sun is very healthy. We don't have cancer. We don't have cancer, we don't have cancer

	in the in the skin', (Pirrone et al., 2013, p.295).

Theme 2: S-E-C context-related factors as barriers or facilitators

This theme explores how contextual factors affect vitamin D status and its acquisition through the seven sub-themes presented in Table 2.5, and the discussion below. Based on the results of the studies in this review, the following contextual factors were identified by the participants, which influenced their behaviour towards the acquisition of vitamin D and the development of vitamin D deficiency.

Among the various factors, climate affected the participants' behaviour towards sun exposure. They identified it as a barrier, due to the excessive heat, cold weather and/or absence of sunlight (Aljefree et al., 2017; Bonevski et al., 2013; Christie & Mason, 2011; Pirrone et al., 2013). This was further complicated by the indoor lifestyle and long work hours associated with indoor working environments (Aljefree et al., 2017; Brand et al., 2008; Christie & Mason, 2011; Durvasula et al., 2010; Jang et al., 2013; Pirrone et al., 2013).

The majority of participants, especially the females, also mentioned that culture and religion impacted their sun exposure habits (Aljefree et al., 2017; Brand et al., 2008; Christie & Mason, 2011; Durvasula et al., 2010; Jang et al., 2013; Pirrone et al., 2013). Specifically, such exposure was restricted by the availability of private spaces in the absence of males, since they had to wear conservative attire in public in the presence of males. Moreover, females in certain cultures were not allowed to leave the house freely, unless it was absolutely necessary (for example, grocery shopping) (Aljefree et al., 2017; Brand et al., 2008; Christie & Mason, 2011; Durvasula et al., 2010; Jang et al., 2013; Pirrone et al., 2013). Interestingly, three studies mentioned the role of females as mothers and caregivers (Aljefree et al., 2017; Brand et al., 2008; Pirrone et al., 2013). In this regard, several females mentioned that due to the prioritisation of the family and their needs, it was not only a barrier towards sun exposure, but also for taking any vitamin D supplements.

The participants also talked about the physical environment, such as infrastructure, urbanisation and immigration, which affected their exposure to sunlight (Brand et al., 2008; Pirrone et al., 2013; Aljefree et al., 2017; Durvasula et al., 2010). For instance, most participants lived in apartments, and even if they lived in villas, private spaces were not easily found. This was mainly due to urbanisation and immigration, which increased the population and tightened the distance between neighbouring apartments or villas.

Some studies also identified certain social and individual factors (see Table 2.5), as barriers toward sun exposure. For example, the preference for fair skin, especially amongst the Saudi and East-Asian populations is a notable factor (Aljefree et al., 2017; Christie & Mason, 2011; Jang et al., 2013). In addition, the concerns about skin damage, and dark patches among these populations do not encourage sun exposure. This resulted in excessive use of sunscreen, and adopting an indoor lifestyle. Moreover, some of the participants talked about some health-related factors as barriers to sun exposure. For instance, in one study, elderly participants discussed having mobility limitations (Durvasula et al., 2010), while in another study, some participants shed light on the fear of sun burn due to sensitive skin, headaches and dizziness as discouraging factors (Aljefree et al., 2017).

Table 2.5. Theme 2: S-E-C context-related factors as barriers or facilitators

Sub-themes:	Examples of the participants' responses
Sub-theme 2.1 Climate: Hot or cold weather (Aljefree et al., 2017; Bonevski et al., 2013; Christie & Mason, 2011; Pirrone et al., 2013)	• 'Here the environment doesn't really encourage exposure to sun. It's either too hot or you're in a place where you just can't expose' (Christie & Mason, 2011, p. 24). • 'No. I don't think in winter I would in a day. Especially when you have a week, like days of rain and... I don't think in winter' (Bonevski et al., 2013, p. 920).
Sub-theme 2.2 Culture/religion and conservative attire (Aljefree et al., 2017; Brand et al., 2008; Christie & Mason, 2011; Durvasula et al., 2010; Jang et al., 2013; Pirrone et al., 2013).	• 'It's basically only at home, we don't have outside space. We don't have places to go and just take off the hijab/headscarf]' (Christie & Mason, 2011, p. 24). • 'Because we wear black abayas to cover our bodies outside our homes, we may not be exposed to the sun's rays during the day' (Aljefree et al., 2017, p.8).
Sub-theme 2.3 Infrastructure, architecture, urbanisation and immigration (Brand et al., 2008; Pirrone et al., 2013; Aljefree et al. (2017); Durvasula et al., 2010)	• 'It is because you have to stay covered here in Saudi, even if you go outside, you have to stay covered. So, it's kind of difficult to pull up your sleeves and get some sun' (Christie & Mason, 2011, p. 24).

	• ‘When I go to my family’s house, I walk freely on their private terrace and expose myself to sunlight; however, I cannot do this at my home because I live in a small unit’ (Aljefree et al., 2017, p. 17). • ‘Previously (I was) in unit – was out more playing golf, bowls’ (Durvasula et al., 2010, p. 97).
Sub-theme 2.4 Indoor lifestyle and work environment (Aljefree et al., 2017; Brand et al., 2008; Christie & Mason, 2011; Durvasula et al., 2010; Jang et al., 2013; Pirrone et al., 2013).	• ‘We’re stuck here, housebound, can’t do anything. It’s alright if you have a car’ (Durvasula et al., 2010, p. 97). • ‘And now the lifestyle is different because we are on the 20th floor and you only go out when you have to. You don’t go out here for relaxation. You just go out here to grab something or go get something. You are in a rush’ (Pirrone et al., 2013, p. 294).
Sub-theme 2.5 Beauty, cosmetic-related factors and the preference for fair skin (Aljefree et al., 2017; Christie & Mason, 2011; Jang et al., 2013).	• ‘Because I’m dark-skinned and most people I hang out with also have a dark complexion, we don’t like the idea of going out in the sun because we’re scared of getting darker’ (Christie & Mason, 2011, p. 25).

Sub-theme 2.6 Health-related factors (Aljefree et al., 2017; Durvasula et al., 2010).	• ‘I prefer being outside, but when you get old, you can’t get out as much’ (Durvasula et al., 2010, p. 97).
Sub-theme 2.7 The role of females as mothers and caregivers (Aljefree et al., 2017; Brand et al., 2008; Pirrone et al., 2013).	• ‘I am too busy with housework, cooking and cleaning’ (Brand et al., 2008, p. 11).

Theme 3: Proposed solutions by participants towards identified barriers

This theme focuses on solutions as suggested by the participants of the included studies to address the barriers they identified. These mainly stemmed from their experiences with the condition within their specific contexts (see Table 2.6).

Sub-theme 3.1: Proposed solutions related to contextual factors affecting participants' behaviour and attitude

In general, the solutions and suggestions made by the participants were mainly directed towards specific issues related to their S-E-C contexts (see Table 2.6). For instance, the hostel residents' solutions included providing aid to hostel residents and amending the infrastructure to improve mobility, hence enable outdoor sun exposure (Durvasula et al., 2010). In addition, some mothers suggested creating community areas without roofs and providing childcare to enable them to take a walk in sunlight, while leaving their children in safe hands (Brand et al., 2008). In another study, office workers and teachers suggested increasing the use of fortified foods and incidental sun exposure (for example, parking far away, taking brief walks at lunch and eating outside) (Bonevski et al., 2013), which should help interweave these practices in their daily routine. Moreover, the participants who were recruited from hospitals mainly suggested more testing and supplements, which indicates that the context from which they were recruited played a role (Kotta et al., 2015).

Sub-theme 3.2: Suggestions related to the dissemination of knowledge

Regarding the provision of information and health education, the participants suggested that such information should be individualised (Kotta et al., 2015), and that it should be provided through community networks, especially those for immigrants (Pirrone et al., 2013). This could be because they feel they can relate to each other contextually and culturally. Another study suggested that such information should be delivered by healthcare professionals or males, which could be related to the perceptions of authority and power (Brand et al., 2008). To illustrate, Brand et al. (2008), mentioned that suggesting healthcare professionals to deliver the information could be because they usually hold a higher status and possess more technical knowledge. However, in regard to specifying males, this could be because the participants in Brand et al. (2008), were from a masculine society, where males hold a higher status and are consequently more trusted (Hofstede, 2001). Moreover, some of the participants mentioned that health information should be simplified and delivered using appropriate channels and tools to maximise the distribution of information (for example, television, newspapers/magazines, social media, the Internet, etc.) (Bonevski et al., 2013).

Table 2.6. Theme 3: Proposed solutions by participants towards identified barriers

Sub-theme 3.1: Proposed solutions related to contextual factors affecting participants' behaviour and attitude	Examples of the participants' responses
a) *Proposed solutions by hostel residents* (Durvasula et al., 2010). *b)* *Proposed solutions by mothers* (Brand et al., 2008). c) *Proposed solutions by workers/employees* (Bonevski et al., 2013). d) *Medical solutions by participants recruited from hospitals: fortified foods (*Bonevski et al., 2013), testing and supplements (Kotta et al., 2015)	• ‘There are chairs out there, but not as comfortable” (Durvasula et al., 2010, p. 98) • ‘A community area with no roof’ (Brand et al., 2008, p. 21).
Sub-theme 3.2: Suggestions related to the dissemination of knowledge	Examples of the participants' responses

a) *Suggestions related to personnel disseminating information* *(Pirrone et al., 2013; Bonevski et al. (2013); Brand et al., 2008).* b) *Suggestions related to simplicity and the channels used to disseminate information* *(Bonevski et al., 2013).*	- 'A male or a professional to deliver the message on the radio' (Brand et al., 2008, p. 21).

2.4.4 Phase three: Meta-theory analysis

As most of the included studies did not report the use of a theory (see Table 2.3 in appendix), the meta-theory analysis was carried out by exploring the underlying theoretical assumptions, philosophical/conceptual frameworks and their impact on the choice of research questions, data collection and interpretations. Specifically, in six of the studies, no theory was mentioned in the text or cited in the bibliography (Aljefree et al., 2017; Brand et al., 2008; Christie & Mason, 2011; Durvasula et al., 2010; Jang et al., 2013; Kotta et al., 2015). As for the remaining two studies, Bonevski et al. (2013), used the health belief model (HBM) and social cognitive theory (SCT), while Pirrone et al. (2013), only used the HBM to guide their research. Both models (the HBM and SCT) were underpinned by an interpretivist paradigm, which aligns with the overall philosophical perspective of this meta-study.

a) Underlying assumptions

Despite the absence of a theory in a majority of the studies, in the background sections of seven studies, there was a clear indication that culture, religion, beliefs and contexts are important for vitamin D (Aljefree et al., 2017; Bonevski et al., 2013; Brand et al., 2008; Christie & Mason, 2011; Durvasula et al., 2010; Jang et al., 2013; Pirrone et al., 2013). This could be because these studies were targeting specific populations (for example, East Asians, Africans and immigrants), were these points are considered major players. However, Kotta et al. (2015) was preceded by a quantitative study that mainly examined the effect of supplements on a specific population, and accordingly, the background section mainly discussed the medical and biological aspects of vitamin D deficiency. Overall, most studies acknowledged the importance of the participants' S-E-C context, and all used an interpretivist paradigm and a qualitative methodology.

The underlying theoretical and conceptual frameworks were also inspected by examining the results and discussion sections of the included studies. The findings of a majority of studies included a discussion about participants' S-E-C contexts such as: culture, religion, housing, physical environment, financial status, sense of belonging, community activities, lifestyle and weather (Aljefree et al., 2017; Bonevski et al., 2013; Brand et al., 2008; Christie & Mason, 2011; Durvasula et al., 2010; Jang et al., 2013; Pirrone et al., 2013). Moreover, these contextual factors are at the micro, meso and macro levels. In addition, the complexity of the S-E-C context was discussed in some studies by advocating for a tailored multi-faceted approach (for example, as set out in the Ottawa Charter for Health Promotion) to deal with the various subjective barriers, ranging from targeting individuals to providing a suitable environment and having an appropriate policy in place as an enabler (Brand et al., 2008; Christie & Mason, 2011; Durvasula et al., 2010; Jang et al., 2013).

Conversely, some studies also focused on the knowledge and awareness of the participants. In this regard, they were indirectly affected by some social–psychological theories, since such theories emphasise the role of knowledge and awareness in behaviour (Bandura, 2001; Bonevski et al., 2013; Christie & Mason, 2011; Kotta et al., 2015; Pirrone et al., 2013), as further discussed in chapter three. However, Pirrone et al. (2013), who used the HBM (a social–psychological theory), noted that being knowledgeable does not ensure a change in behaviour, since behaviour is much more complicated. This complexity was captured by Pirrone et al. (2013), through the females' experiences and in the discussion of gender equity and women's health. On the other hand, Bonevski et al. (2013), mainly focused on the participants' attitude as well as the constructs of the HBM and SCT, since it was underpinned by these two theories. Moreover, as Kotta et al. (2015), was preceded by a quantitative study that was investigating the effect of vitamin D supplements, it focused more on the participants' views regarding the medical and biological aspects of vitamin D (for example, testing and supplements).

Regardless of whether a theory was actually used, there was an overall acknowledgement of the importance of the participants' subjective S-E-C contexts in relation to vitamin D. Yet, despite acknowledging the impact of the S-E-C context, its subjectivity, complexity and multidimensional nature, the results of the included studies were still presented and discussed in segments, and as separated variables. This indicates that there was an attempt to categorise or reduce the findings, rather than exploring them holistically or in relation to each other. As, all of the studies mentioned that their ultimate aim was to use the findings to create health promotion campaigns that address the contextual barriers identified by the participants, this could have also been the reason for presenting findings in segments or as factors.

2.5 Discussion

2.5.1 Phase four: Meta-synthesis analysis

This phase includes synthesising the outcomes of the first three analysis phases in order to answer the review questions, develop an interpretation and synthesise new knowledge on the subject of focus. The meta-synthesis will also serve as the discussion section for this literature review. It is worth noting that the examples used in this section are not exhaustive, and were used for demonstration purposes.

a) The complex, subjective, multi-level S-E-C context is the cornerstone for the treatment and prevention of vitamin D deficiency:

As humans exist within a particular socio-cultural milieu, the interplay between individuals and the context is what brings about behaviour and will be constituted differently under different times and contexts (Burke et al., 2009). In this regard, the S-E-C context is crucial as these connections are situation-specific. Hence, a contextualised understanding of health-related behaviour is imperative (Kelly & Barker, 2016). Overall, all of the studies in this review indicated the importance of context in relation to vitamin D. It should also be noted that the participants in the included studies did not lack technical knowledge (Christie & Mason, 2011; Kotta et al., 2015; Pirrone et al., 2013). However, as vitamin D deficiency and the acquisition of vitamin D from its various sources are far more complicated, simply having knowledge and awareness does not necessarily ensure compliance (Popay & Williams, 1996).

The participants in the included studies discussed various contextual factors which emphasised the need for tailored health promotion campaigns that consider the public's S-E-C context. These contextual factors identified by participants were at the micro, meso and macro levels. For example, the findings at the micro level included knowledge, literacy, awareness, attitude, behaviour, age, gender, religion, identity, race/ethnic group, values, goals and expectations. At the meso level, the findings included family, friends, peers, co-workers, religious networks and customs/traditions. As for the macro level, the findings were related to transportation, building environment, organisations and social institutions (for example, work). In this section, a few examples will be discussed, and the remaining will be explored in the successive section. The cultural role of females has an impact, where family health is always prioritised well before the mother's health (Aljefree et al., 2017; Brand et al., 2008; Pirrone et al., 2013). Thus, despite the availability of supplements, some mothers continued to consider their intake of supplements as less important than their family’s demands, resulting in forgetfulness (Pirrone et al., 2013). In masculine societies, each gender is highly involved in their specific roles (Hofstede, 2001), with females serving as caregivers who prioritise their families and perform housework (Van de Vijver, 2007). Hence, the vitamin D status of mothers in this case is affected by factors coming from the micro and meso levels. However, males although were not the foci of the majority of the included studies, they seem to generally exhibit less adherence to supplements than females do (Aljefree et al., 2017). This could be attributed to masculine norms, where hegemonic masculinity suggests that males should not publicly show interest in their own health, as it is a feminised concern (Robertson, 2007). Hence, their adherance is affected by factors stemming from the micro and meso levels.

Another example are the elderlies living in hostels, whose sun exposure was affected due to their age, health and mobility status and the hostel infrastructure. These contextual barriers in this example stem from micro and macro levels (Durvasula et al., 2010). Hence, acknowledging the complexity, subjectivity and multi-layered features of S-E-C context is important.

b) *The intersectional and dynamic nature of S-E-C context*

Although all of the studies followed a qualitative methodology and an interpretivist approach, there was a tendency to reduce the qualitative data into variables, which prevented capturing and discussing the dynamic, complex and intersectional nature of the S-E-C context and its’ factors. In other words, studies focused on a particular aspect/s and presented them in segments/categories (as separated themes). Therefore, these factors were envisaged as if they operate independently, while they actually intersect and overlap in people’s lived experience. In addition, patients are reflexive and complex agents, which might not present only one factor, but rather a collection of factors (Wyke, 1992). Furthermore, exploring findings in segments also obscure the underlying assumptions and deeper meanings from being visible. The following section illustrates how gender intersects with cultural norms and responsibilities, the built environment and the climate to collectively impact people's ability to prevent VDD. Climate, immigration and urbanisation had an influence in which, despite the participants' knowledge of the importance of sunlight, these contextual factors collectively implicated their sun exposure (Aljefree et al., 2017; Christie & Mason, 2011). So, for example, if the climate was not an issue, then getting exposed in the absence of males, due to cultural and religious reasons, was not always feasible for females (Aljefree et al., 2017; Christie & Mason, 2011; Jang et al., 2013; Pirrone et al., 2013). In the same vein, the hot climate encouraged an indoor lifestyle such as primarily using cars for transportation, spending time at indoor malls and failing to take advantage of public parks/walking trails (Aljefree et al., 2017; Durvasula et al., 2010).

The context is dynamic and changing, and the impact of such a change appeared in various aspects of participants' lives. For example, urbanisation in Saudi Arabia dramatically changed housing styles. Traditional houses used to have private inner spaces that allowed sun exposure, unlike the current smaller compounds (Aljefree et al., 2017). Similarly, immigration and apartments with no private spaces was an issue in Pirrone et al. (2013). The impact of immigration and urbanisation was seen not only in the physical environment but also in the participants' daily activities. For example, the participants mentioned that their lifestyles were different in their home countries, where people used to walk to the market on a daily basis, thus facilitating unintentional exposure (Pirrone et al., 2013). Also, since the immigrants moved for job opportunities, their work environments and long working hours became barriers to sun exposure. Another example was home care facilities, where the participants found that the buildings themselves did not encourage spending time outside (Durvasula et al., 2010).

Compliance to treatment and supplements, and the contexts in which they are enacted cannot be disentangled (Burke et al., 2009). Indeed, the context is not static meaning the status of an individual can change (Kelly & Barker, 2016). Alongside the examples above on immigration and urbanisation, is another example of change in context that occurs within the individual. Several studies showed that becoming pregnant meant receiving more technical knowledge and getting tested more frequently for vitamin D deficiency (Aljefree et al., 2017; Brand et al., 2008; Pirrone et al., 2013). Hence, in this case, the context of the participants changed from being a female to a mother-to-be, and this change was rather beneficial.

Based on the aforementioned discussion, there is clearly a need for a theoretical framework that allows a comprehensive exploration and presentation of the impact of the S-E-C context on patients' experiences related to vitamin D, while maintaining the intersectional nature of the contextual factors. This framework should also incorporate all levels (micro, meso and macro), go beyond the subjectivity/complexity of this context and explore the underlying assumptions.

2.6 Gap in the literature

Developing an understanding of the complex and subjective S-E-C context will require patients to share their experiential or lay knowledge. Although such knowledge is considered important, there has been a tendency as seen in the literature to simplify and reduce the qualitative data, obscuring the intersectional and complex nature of contexts, experiences and people. Hence, there is a need for a theory that acknowledges the complexity, interactivity and subjectivity of the S-E-C context as well as the micro, meso and macro levels of the contextual factors in relation to patients' vitamin D deficiency.

There was a major emphasis placed on creating tailored health promotion campaigns to address vitamin D deficiency. However, medical consultations for vitamin D deficiency are suitable moments for providing contextually sensitive and customised medical advice and treatment plans, since VDD gets first diagnosed at the physician’s office. Yet, the studies in this review did not consider what occurs during vitamin D-related medical consultations, despite that some emphasised the importance of physicians’ active involvement. While speaking about medical consultations, none of the studies included GPs as participants in order to explore their experiences with providing healthcare and treating VDD. Furthermore, although the participants of the included studies acknowledged the importance of the S-E-C context for vitamin D deficiency, none of them considered the perceptions of GPs and patients regarding the use of lay knowledge in customising the vitamin D-medical advice.

Hence, the research questions for this thesis are as follows:

1. How does the social, environmental and cultural context of patients affect their vitamin D status as well as their treatment and prevention of vitamin D deficiency?
2. To what extent do GPs utilise lay knowledge to understand patients’ social, environmental and cultural context and contextualise vitamin D deficiency medical advice and treatment?
3. What are GPs’ and patients’ perceptions regarding the use of lay knowledge to understand different contexts and experiences, and contextualise medical advice?

2.7 Challenges and limitations

There are several challenges and limitations that should be noted. First, regarding the meta-data analysis, where the analysed data was only obtained from the published texts of the included primary research reports, which could have been subject to personal filtering by the respective researchers (Paterson et al., 2001). Consequently, what was identified as 'meaningful data' in this meta-study was possibly influenced by the views of these researchers. In addition, the diversity of the studies might be associated with the risk of getting the findings of this review diluted (Kelly et al., 2018). Hence, remaining focused on the aim and having a clear inclusion/ exclusion criteria was of prime importance. Furthermore, there is a risk associated with decontextualising data due to removing them from the emotional and physical context within which they were originally constructed (Paterson et al. 2001). This point was taken into consideration during this review, by paying close attention to the sociocultural and historical context as seen in the meta-method and meta-theory sections. Second, regarding the meta-theory analysis, since many of the studies did not declare their theoretical frameworks, this section was mainly carried out by exploring the underlying assumptions that were identified only while reading the papers (Paterson et al., 2001). In addition, as the primary studies were citing one another, this might have resulted in examining similar concepts or using similar approaches, as seen in Aljefree et al. (2017), and Christie and Mason (2011). Third, in regard to the meta-method analysis, where the included studies did not report everything. The meta-method analysis is highly affected by the quality of reporting and the primary researcher's ability to articulate the research design and findings. Hence, although attempts were made to assess the impact of certain aspects of the methodology on the findings, it was impossible to fully examine them, given the lack of some of the information provided (for example, the location and duration of interviews in some studies and more). In addition, the lack of reflexivity was another issue, where none of the studies discussed reflexivity, which is an essential part of every qualitative study. Along the same lines, the meta-study is a lengthy review method, and it involves making plenty of decisions throughout the various phases of the review (Paterson et al., 2001). Therefore, it relies on the ability of the primary researchers to document and communicate the decision-making process (Massey & Williams, 2020;

Paterson et al., 2001). Using the eMERGE was a useful addition to address this concern and heighten the quality of reporting.

2.8 Summary

In sum, the behaviours resulting in vitamin D deficiency and the adherence to treatment and preventive options is affected by the interaction between individuals and their social, environmental and cultural context (Kelly & Barker, 2016). Since these factors are subjective, complex, and interactional, customisation is essential. In the recommendations sections of the included studies, it was declared that there is a need to develop customised health promotion campaigns. However, medical consultations are suitable moments for the customisation of treatment and preventive plans. Therefore, these subjective, diverse, dynamic, interrelated and intersectional contextual elements should be explored at GPs offices by accessing patients’ lay knowledge (Popay & Williams, 2006). Indeed, this highlights the importance of a collaborative effort between physicians and patients. This meta-study also helped provide guidance for the remaining sections of this thesis, including the theoretical framework and methodology, based on the outcome of the four phases as further seen in the upcoming chapters.

Chapter Three

The socio-ecological model

One of the main limitations of the current literature is the absence of an appropriate theoretical and conceptual framework that acknowledges the complexity and the dynamic interrelation of the social, environmental and cultural context relating to vitamin D deficiency. Hence, this chapter discusses the theoretical and conceptual frameworks used in this thesis in order to answer the research questions, address the concerns that emerged in the literature chapter, and provide a blueprint for the remaining chapters. The main framework for this thesis is the socio-ecological model. This chapter starts by providing a historical snapshot of how the literature has approached and discussed health-related behaviour. Then, it focuses on social–psychological models, the socio-ecological model and lay knowledge.

3.1 A historical snapshot regarding the literature on health-related behaviour

3.1.1 The biomedical perspective

Historically, approaches toward health-related behaviour have undergone a series of changes, based on various perspectives (Duncan et al., 1996; Kuipers et al., 2013). Starting with the biomedical perspective, which was mainly concerned with biological factors, and it excluded psychological, social and environmental factors (Duncan et al., 1996). One exception to this was a narrow range of behavioural risk factors such as smoking, drinking, diet and exercise (Duncan et al., 1996). However, the biomedical perspective regarded these factors as an individual responsibility (at the micro level) that was unrelated to the broader context (Duncan et al., 1996). As a result, this perspective was criticised, due to its tendency towards victim-blaming (Allison, 1991) and its reductionist approach (Wyke, 1992). In addition, since this perspective did not draw on the dynamic relationship between the S-E-C context and people, individuals were simply viewed as automata, rather than complex, reflexive and unique agents

(Short & Mollborn, 2015; Wyke, 1992). Along the same lines, health promotion campaigns in general have been criticised for introducing changes and interventions that ignore patients' experiences and their contextual factors (Golden & Earp, 2012). The same applies to vitamin D deficiency in which campaigns did not include patients' experiences or contextual factors (Bureau, 2018; GulfNews, 2019), although the studies in literature were aiming to identify such factors for designing customised health promotion campaigns.

3.1.2 Social-psychological models

Due to the aforementioned criticism, two research streams emerged which have focused on health-related behaviour: social–psychological models and the socio-ecological model. In the majority of the social–psychological theories of health behaviour, although the S-E-C context was considered, it has received less attention, with more emphasis on how individuals interpret behavioural information and how they value such information (Bandura, 2001; Frohlich et al., 2001; Krumeich et al., 2001; Singer & Weeks, 1996; Williams, 1995). In other words, they focus on initiating behavioural change at an individual level by envisaging that behaviour is an individual act (micro level). This suggests that behaviour manifests from an external environment, stimulating individuals in a unidirectional and linear manner (Bandura, 2001; Frohlich et al., 2001; Krumeich et al., 2001; Singer & Weeks, 1996; Williams, 1995).

The most influential and common health behaviour theories are the HBM (Becker, 1998; Rosenstock et al., 1988), the theory of reasoned action/theory of planned behaviour (Ajzen, 1985, 1991), the trans theoretical model (Prochaska et al., 1992) and social cognitive theory (Bandura, 1989; Glanz et al., 2008). The focus of these theories is that everything is under an individual's control and through their conscious awareness as seen in the following constructs: self-regulation (Frohlich et al., 2001); cognition (Ajzen & Fishbein, 1980; Becker, 1974); confidence in the ability to act (Bandura, 2004); strength in one's intention (Ajzen & Fishbein,

1980) and volition and self-control (Baumeister et al., 1996). Although these theories considered the S-E-C context, it was still demoted to the background.

SCT is the only one of these theories that incorporates contextual factors alongside individual factors (Bandura, 1986, 1997, 2004). Specifically, it views human behaviour as a product of the interaction between personal factors (including cognitions and personal characteristics) and the environment in which the behaviour is performed (Bandura, 1986). Although this dynamic nature is advantageous in comparison with the other social–psychological models, individuals are still considered the ones controlling the factors and affecting behaviour. In other words, behaviour is still considered an individual act (Bandura, 1986).

Finally, as per Burke et al. (2009), a vast majority of the empirical studies that have used SCT or any of the aforementioned social–psychological models have followed an approach that is more simplified and reductionist in isolation of the dynamic nature of the S-E-C context. This indeed is similar to the approach observed in the studies included in the literature chapter. However, the context in this thesis does not only refer to its structural aspect, and it is not entirely based on self-efficacy and independent variables (Bandura, 1994). Hence, social–psychological theories were not found to be suitable for this thesis, since they envisage context as a complementary factor, rather than being a cornerstone, and has a unidirectional nature of relationship where individuals being the main controllers or influencers.

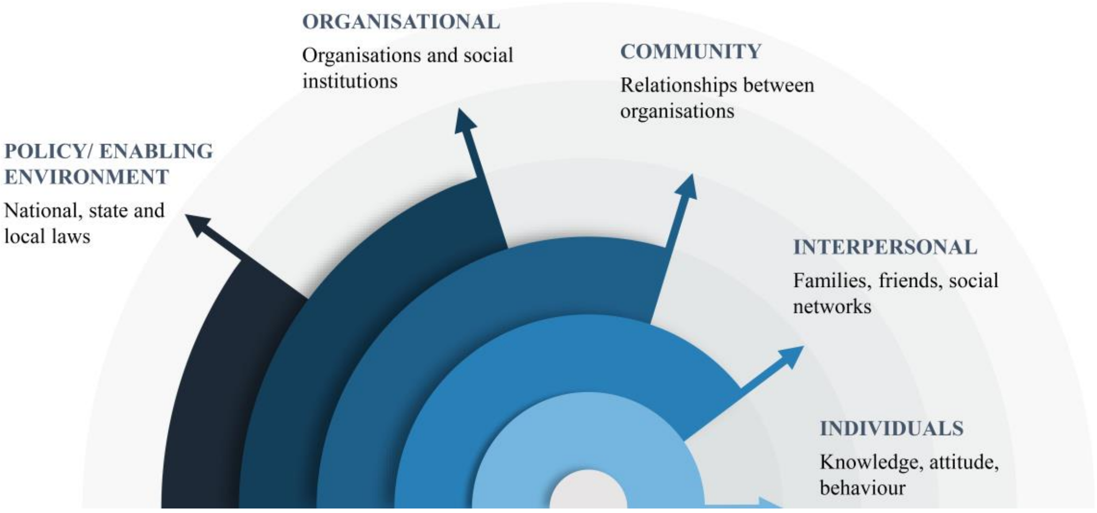
3.1.3 Socio-ecological model

A major drawback identified in the literature is how behaviour is considered static, and an individual act, and consequently, findings were presented as independent variables or separated segments. In fact, the studies in the literature review indicated an absence of acknowledging the complexity, interactivity and subjectivity of the S-E-C context, and how contextual factors are multi-layered (micro, meso and macro). The absence of this thinking hindered exploring the contextual factors through the different layers, and how they interact and interrelated. Therefore, the socio-ecological model was chosen to underpin this empirical research. In contrast to social–psychological models, SEM aim to develop a better understanding of people's health behaviour, within the context of their daily lives and the socio-cultural forces that shape their everyday experiences (Burke et al., 2009; Krug et al., 2002). This model maintains the subjectivity and co-constitutive nature of the contextual factors, and appreciates that they are formed in relation to and by one another (Burke et al., 2009). This indeed addresses a drawback seen in the social–psychological models and the studies in the literature chapter.

Specifically, the SEM is a theory-based framework that focuses on exploring, understanding and addressing the multi-faceted and interactive effects of personal, cultural, social and environmental factors on behaviour (Golden & Earp, 2012; Stokols, 1996). It also examines the dynamic interrelations among the various contextual factors in order to overcome the narrow scope of uni-level interventions (Golden & Earp, 2012; Stokols, 1996). It emphasises that to understand the whole, the parts need to be explored and understood, while appreciating the co-constitution between the parts (Golden & Earp, 2012; Stokols, 1996). As for the S-E-C context, this model considers it a cornerstone and includes five hierarchical levels to meet this assumption: individual, interpersonal, community, organisational and policy/enabling (at the micro, meso and macro levels) (see Table 3.1 and Figure 3.1). In addition, it emphasises the interdependence and interconnection between these levels (Golden & Earp, 2012; Stokols, 1996). Thus, it goes beyond considering individuals and their consciousness (micro level) as the major controllers for understanding the wide range of interdependent contextual factors that influence health behaviour (Golden & Earp, 2012; Stokols, 1996). This addresses the concerns that emerged in the literature review chapter.

Its multi-level approach encompasses a comprehensive range of contextual subjective factors and acknowledges that individuals are embedded within a larger multi-layered system, for example, the S-E-C context (see Figure 3.1) (Golden & Earp, 2012; Krug et al., 2002; McLeroy et al., 1988; Stokols, 1996). Moreover, it not only articulates level-specific and multi-level influences on health behaviour (Golden & Earp, 2012; Krug et al., 2002; McLeroy et al., 1988; Stokols, 1996), but it also addresses the major drawback concerning vitamin D deficiency and health promotion campaigns, which is if an intervention is not cognisant of the importance of all the influences and forces within the model it is unlikely to be effective or sustainable.

Figure 3.1 Socio-ecological Model



Source: Obtained from the Centres for Disease Control and Prevention (CDC); The Socio-Ecological Model: A Framework for Prevention (Krug et al., 2002).

Table 3.1. Socio-ecological model, Obtained from (Krug et al., 2002).

SEM level	Description
Individual	Characteristics of an individual that influence behaviour change, including: knowledge, attitudes, behaviour, self-efficacy, developmental history, gender, age, religious identity, racial/ethnic identity, sexual orientation, economic status, financial resources, values, goals, expectations, literacy, stigma, etc.
Interpersonal	Formal (and informal) social networks and social support systems that can influence individual behaviours, including; family, friends, peers, co-workers, religious networks, customs, etc.
Community	Relationships among organisations, institutions and informational networks within defined boundaries, including: the built environment (for example, parks, accommodations), village associations, community leaders, businesses, transportation, etc.
Organisational	Organisations or social institutions with rules and regulations for operations that affect how and how well services are provided to an individual or group.
Policy/Enabling Environment	Local, state, national and global laws/policies.

There are several versions of the SEM model, most notably in the literature those devised by Bronfenbrenner (1977), and McLeroy et al. (1988). The latter version was adopted for this thesis, since it is more concerned with human behaviour and health-related issues, compared to the former, which focuses on human and child development. Yet, there are similarities between the two in terms of their layers. Specifically, McLeroy et al.'s (1988), model was built on the multi-level framework of Bronfenbrenner (1977), as seen in Figure 3.1 and Table 3.1.

Collectively, the SEM was adopted for the following reasons: its holistic approach towards understanding the context (at the micro, meso and macro levels); it considers the S-E-C context a cornerstone of human behaviour; it acknowledges that behaviours result from the experiences of people's daily lives and it notes the interactivity and interdependence between the person, socio-cultural factors and the model's levels.

3.2 Importance of lay knowledge

3.2.1 Importance of experience and the S-E-C context

As seen in Chapter Two, a number of diverse and subjective contextual factors were identified by the participants of the included studies. For instance, in the literature, some of the participants were more concerned about conservative clothing (Aljefree et al., 2017), whereas others were more concerned about fair skin (Jang et al., 2013). Indeed, Irwin (1995), mentioned that although patients expect professionals to be clear about their health management, the best approach is acknowledging patients' preferences. Besides, patients can resist the advice of physicians by assessing its suitability against their contexts, experiences and social realities (Van Teijlingen & Hundley, 2002). Thus, an accurate understanding of the S-E-C context must be established, to remain attentive to social relationships and contexts, which will ensure that the received information is acknowledged and acted upon (Janssen et al., 2009). And as Britten (2008), mentioned treatment plans are designed in a certain context which is the healthcare setting, but they are utilised in another context which is patients' lives.

Chapter Two also showed that the S-E-C context cannot be fully captured unless patients disclose this information. In order to develop a better understanding of these contextually and situationally specific factors, an individual with first-hand experience with vitamin D deficiency should be involved. Patients share their contextual-related information and experiences through their lay knowledge. Lay knowledge is the patient-specific knowledge developed through their lived experiences with a disease within their subjective and unique context (Evans & Plows, 2007; Prior, 2003). Creating narratives is vital for understanding the rich explanations about a patient's health, experiences and meanings attached to them, and in fact, lay knowledge is all about story-making (Popay & Williams, 1998; Stainton-Rogers, 1993).

One of the aims of this thesis is to explore patients' experience with vitamin D deficiency within their S-E-C context. This provides an ample opportunity for all participants to share their subjective and diverse experiences or lay knowledge with VDD within their S-E-C contexts. This will also help demonstrate how GPs can access lay knowledge during their medical consultation. The thesis also aims to prompt participants to share their experience with vitamin D-related medical consultations in terms of obtaining and utilising lay knowledge. This will help shed light on the current practice, and what is underpinning such a practice and the way forward. It also aims to explore the perceptions of patients and GPs regarding the use of lay knowledge to better understand the social context and contextualise the medical advice. Collectively, all of this indeed will require participants to carry an assessment by reflecting on their experience with the current practice pertaining to vitamin D-medical consultation, and also their experience trying to apply the medical advice received through consultations within their contexts and their lives. Hence, using merits of lay knowledge was thought to be important and suitable.

3.2.2 Supporting lay knowledge with SEM

The literature chapter shed light on the complex and dynamic interrelation nature of patients' experiences with VDD within their S-E-C context. Allowing patients to narrate on their experience is crucial; however, a holistic understanding will require capturing and presenting the experience the way it appears, as a case rather than a list of variables. Hence, using both SEM and lay knowledge in this thesis is congruent and aligned. Furthermore, using SEM alongside lay knowledge helps to ensure that all SEM levels are explored. This is in the sense that although it might not be feasible to address all SEM levels, lay knowledge will help identify the relevant ones to that specific patient therefore, create a more customised plan (Stokols, 1996).

3.3 Summary

Vitamin D deficiency is a result of health-related behaviour, and attempting to treat/prevent it requires behavioural changes (Kelly & Barker, 2016). However, as human behaviour occurs in social environments and contexts, behaviour should not be considered a simple individual act and at an individual level (Glasgow & Schrecker, 2015). As presented earlier, the aims of this thesis are three-fold: to uncover how the S-E-C context affects vitamin D status as well as the compliance to its treatment and preventive options; to determine the extent to which lay knowledge is obtained and used to contextualise vitamin D advice during vitamin D-related medical consultations and to capture the perceptions of patients and GPs regarding the use of lay knowledge to better understand the social context and contextualise the medical advice. Therefore, the SEM was selected for this thesis to capture the subjectivity, complexity and dynamic interrelation nature of S-E-C context and its impact on patients' experience and vitamin D deficiency. In the meanwhile, acknowledging that participants’ experiences and their lay knowledge is the most important source for understanding their S-E-C contexts, their experiences with vitamin D-medical consultations and achieving the research aims.

Chapter Four

Methodology

This chapter begins by explaining the research aims, then it moves on to discuss the methodological choices relating to the philosophical paradigm, methodology, location and setting, population, sampling, recruitment and sample size, data collection method, reflexivity, data analysis, quality and rigour and ethics.

4.1 The research questions

Based on the gaps identified in the literature, the research questions are as follows:

1. How does the social, environmental and cultural context of patients affect their vitamin D status as well as their treatment and prevention of vitamin D deficiency?
2. To what extent do GPs utilise lay knowledge to understand patients' social, environmental and cultural context and contextualise vitamin D deficiency medical advice and treatment?
3. What are GPs' and patients' perceptions regarding the use of lay knowledge to understand different contexts and experiences, and contextualise medical advice?

4.2 The philosophical position

A research paradigm is a set of beliefs shared amongst researchers about how problems should be understood and addressed (Kuhn, 1970), which encompasses ontology, epistemology, methodology and methods (Lincoln & Guba, 1985). The choice of the research paradigm is of paramount importance, since it directs the research process and influences every step in it (Mertens, 2014).

This study is located within an interpretivist paradigm with an ontology that acknowledges that human experiences are not static but multiple, subjective, diverse, and shaped by socio-cultural forces (Berger & Luckmann, 2011; Burke et al., 2009; Mutch, 2005). Hence, reality is a product of individuals' relationships with their S-E-C context and consequently does not exist independently or externally, as explicated by the concept of 'relativism'(Berger & Luckmann, 2011; Mutch, 2005). Understanding reality this way privileges the lived experiences of participants as the experts in their own realities (Creswell, 2012, 2013; Guba & Lincoln, 1994; Lincoln & Guba, 1985; Punch & Punch, 1998).

Epistemology is concerned with knowledge, how it is obtained, the relationship between the would-be knower and what can be known (Carson et al., 2001; Guba & Lincoln, 1994; Scotland, 2012). To align with an ontology that recognises reality as subjective and multiple, a subjectivist epistemology is adopted in this thesis. This is based on the belief that knowledge is created through an interaction between the researcher and the researched (Guba & Lincoln, 2000; Maxwell, 2013; Merriam & Tisdell, 2015). Thus, it provides an opportunity to view the world as constructed, interpreted, and experienced by individuals in their interactions with one another, and with wider social systems (Guba & Lincoln, 2000; Maxwell, 2013; Merriam & Tisdell, 2015).

Accordingly, these ontological and epistemological stances go well with the thesis objectives and the type of reality and knowledge this thesis aims to capture.

4.3 Qualitative methodology

"[Qualitative research] is an effort to understand situations in their uniqueness, as part of a particular context" (Patton, 1985, p. 1). The aim of this thesis is not to capture data quantitatively, but rather to understand patients' experiences and perceptions, which are subjective, variable and multidimensional; hence, an explorative qualitative approach was adopted. This methodology enables interactional activity between the researcher and the researched to construct the findings and capture the experiences through participants' eyes. Furthermore, qualitative research provides the flexibility to enable participants to freely express themselves and narrate their experiences, thus engendering rich, authentic findings grounded within their natural and unique settings (S-E-C context) (Crotty, 1998; Lincoln & Guba, 1985; Merriam & Tisdell, 2015). In other words, it enables capturing how people make sense of their world and their experiences, and allow the researcher to develop an understanding through their eyes, experiences, narratives and the meanings that they have constructed holistically (Austin & Sutton, 2014; Guba & Lincoln, 2000). This is important, as those who experience a phenomenon can disclose the most information about it, which also helps address the how and why questions (Koch, 1996; Lincoln & Guba, 1985).

The choice of the methodology is qualitative, however, in terms of the design, this study has adopted a generic qualitative design. As this study does not align fully with one of the established designs. To be more specific, ethnography was not found to be suitable because it focuses on exploring the social customs, beliefs, behaviours, and practices of a specific group of people (Merriam & Tisdell, 2015). However, in this thesis, the target is a heterogeneous population from two sub-groups (GPs and patients) to explore the variations in their social contexts, and its impact on their experiences and perceptions. Also, the objectives of this thesis were not found to be aligned with the objectives of grounded theory and phenomenology designs. That is because the former focuses on utilising the data to develop a theory, while the latter focuses on exploring the lived experience in-depth, with close attention to the inner dimensions, textures, qualities, and structures of the cognitive processes

(Merriam & Tisdell, 2015). Yet, it is worth mentioning that this thesis mainly focuses on the experiences related to outer-world content rather than the inner dimensions. Furthermore, phenomenology is more commonly adopted to explore in depth a lived experience related to a condition or situation that is associated with a strong emotional component (Merriam & Tisdell, 2015). Case study was also not found to be suitable as it is more focused on an in-depth investigation and exploration of a case with clear boundaries that differentiate it from other instances (Merriam & Tisdell, 2015). Yet, this is not the case in this thesis. Given the earlier discussion, it was thought that the generic qualitative methodology and design would be more suitable for this thesis, as the current thesis does not fall entirely within a specific design (Kahlke, 2014).

Using generic qualitative methodology is not new, and in fact it shares some similarities with the established designs (Kahlke, 2014; Percy et al., 2015). To illustrate, it is underpinned by an interpretivist paradigm, and it seeks to understand how people interpret, construct, or make meanings from their world and their experiences (Kahlke, 2014; Percy et al., 2015). This is done by exploring their subjective opinions, attitudes, beliefs, or reflections on their experiences (Kahlke, 2014; Percy et al., 2015). Furthermore, as it focuses on having a rich description of the phenomenon under investigation, it uses methods and approaches that are generally highly inductive, as seen later in the data collection section (Hoon Lim, 2011). This goes in hand with the inquiry of this thesis. However, the added advantage is that the generic approach allows blending congruent tools and techniques from different designs or methodologies. Therefore, it draws on the strengths of the established designs while maintaining the flexibility to make individualised choices related to the techniques or methods that would suit this thesis.

4.4 Discussion with stakeholders

Before starting the actual thesis and even before submitting for ethics approval, I conducted a very brief informal discussions with stakeholders. This mainly entailed having discussions with 3 GPs working at DHA, who were approached through LinkedIn, and three persons within the researcher's circle, who received care for VDD in DHA. The aim of this was to assess the suitability of the topic guide in gathering the required information, to identify the best technique to approach and access the targeted population, and to identify the gatekeepers (clinic managers) and the co-supervisor (Dr. Abdulla AlRasasi). This phase was completely informal, was not recorded, and only notes were taken. In addition, these stakeholders were completely excluded from the actual study. The outcome was that the researcher was able to identify the best way to gain access to DHA clinics (through the gatekeepers), was able to identify the co-supervisor, and amend the topic guide to further ensure that it engenders deep, rich, interconnected and holistic information, moving away from the downsides identified in the literature.

4.5 Location

This study was conducted in Dubai (the researcher's hometown), and Dubai is divided into nine geographical sectors, as seen in Figure 4.1(a). Within Dubai, there are two main regulating health authorities: Dubai Health Authority, covering all nine geographical sectors and Dubai Health Care City, overseeing the private hospitals and clinics in Sector 3. The average population of Emiratis in the nine geographical sectors is approximately 13%, except for Sectors 5 and 6, which have a higher percentage of expatriates (Dubai Annual Health Statistical Report, 2015).

For this thesis, the Dubai Health Authority's public facilities were chosen because they cover the majority of the sectors in Dubai, and the same practices govern all of the facilities, thus ensuring consistency. As per the DHA 2015 report, the DHA oversees 13 public primary healthcare centres and four public hospitals (Dubai Annual Health Statistical Report, 2015). The primary health centres provide family medicine services, including diagnosing and treating vitamin D deficiency, rendering them suitable locations for this thesis. The 2015 report also showed that family medicine services, were provided to 595,412 Emiratis and 152,053 non-Emiratis annually. In addition, the majority of the patients were ≥25 years old (59.5%), which was suitable for achieving the research aims as seen later in section 4.6 – population (Dubai Annual Health Statistical Report, 2015). Another reason for choosing the DHA health care centres was to increase the chances of recruiting Emiratis, as they make up the minority of Dubai’s population (13% to 15%) (Dubai Annual Health Statistical Report, 2015).

The 13 healthcare centres were similar in terms of the services provided, and are distributed in different sectors (except for Sectors 5 and 9), offering a coverage ratio of one centre for every 30,000 individuals (Dubai Annual Health Statistical Report, 2015). As shown in Figure 4.1(b), two healthcare centres were chosen to conduct this research and recruit the participants: the AlBarsha (western side of Sector 3) and Nad AlHamar clinics (Sector 4). Currently, Sectors 5 and 6 do not have any clinics, and consequently, the closest is the AlBarsha clinic. Technically, this clinic provides services to patients in Sectors 3, 5, 6 and partially 9. It also offers 24-hour services, compared to other clinics that close on Fridays and close after 13:00 on Saturdays. Hence, when the other clinics are closed, patients in the western region of Dubai seek this clinic. Moreover, the AlBarsha clinic was selected because Sectors 5 and 9 are more populated with expatriates than other sectors, based on the statistics in the DHA report (Dubai Annual Health Statistical Report, 2015). This also increased the chances of including expatriates who are less likely to access the DHA’s services, compared to Emiratis.

Nad AlHamar clinic, which resides in Sector 4 and covers the eastern region of Dubai, was chosen as well because it is similar to AlBarsha clinic but covers the eastern region of Dubai. Therefore, similarly to AlBarsha, it provides 24-hour services, hence, when the other clinics are closed, patients from the Northern Emirates and other sectors in the eastern region of Dubai seek this clinic.

Furthermore, these two clinics were purposely selected to cover Dubai’s western and eastern regions, which are populated by tall buildings and villas, respectively. Therefore, it ensures including participants with variable characteristics, experiences and S-E-C contexts, which lend richness in understanding the phenomenon under investigation. It is worth mentioning that plenty of changes were introduced to the study locations during the pandemic, which did not affect this study as the recruitment and interviewing were concluded before the pandemic.

Figure 4.1 (a). Dubai's land sectors (Dubai Municipality, 2016)

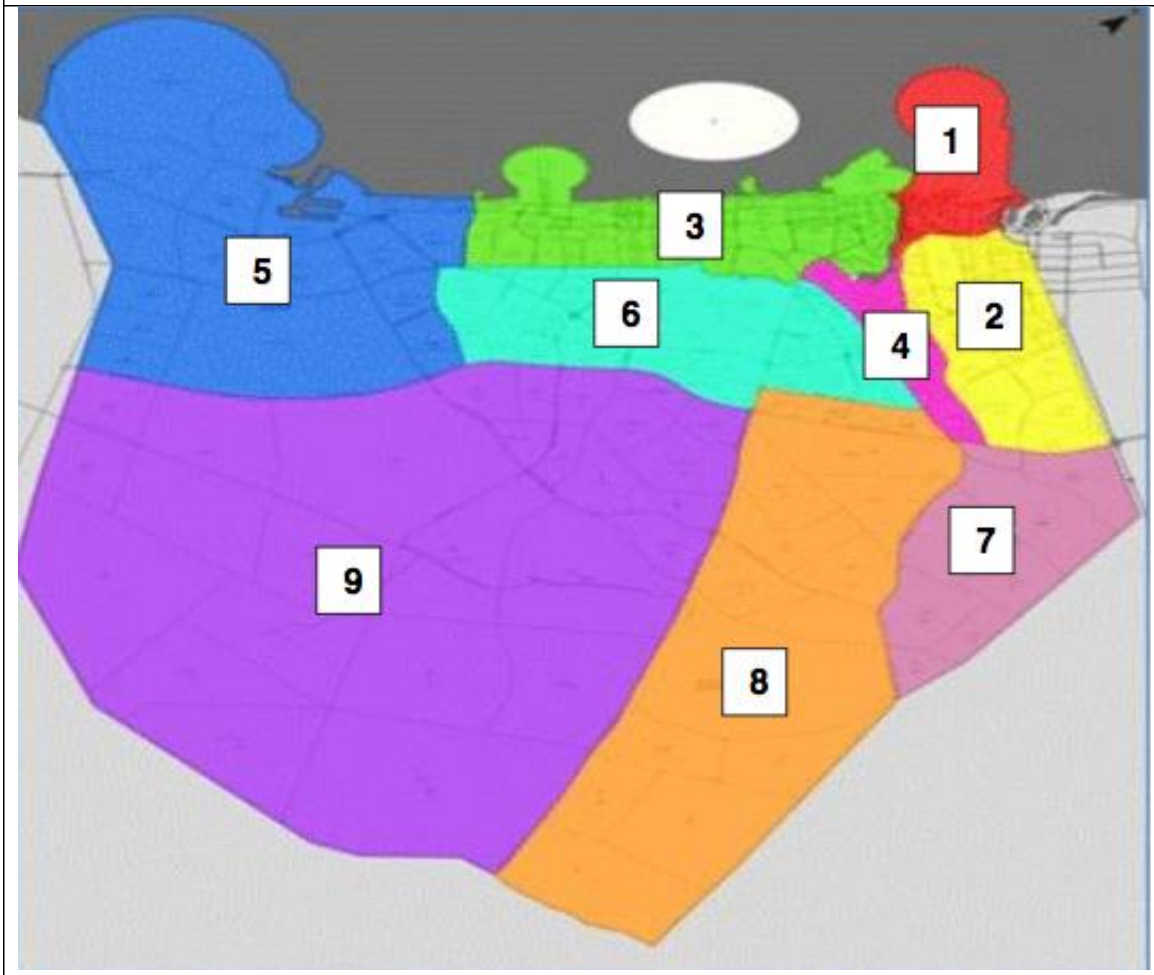
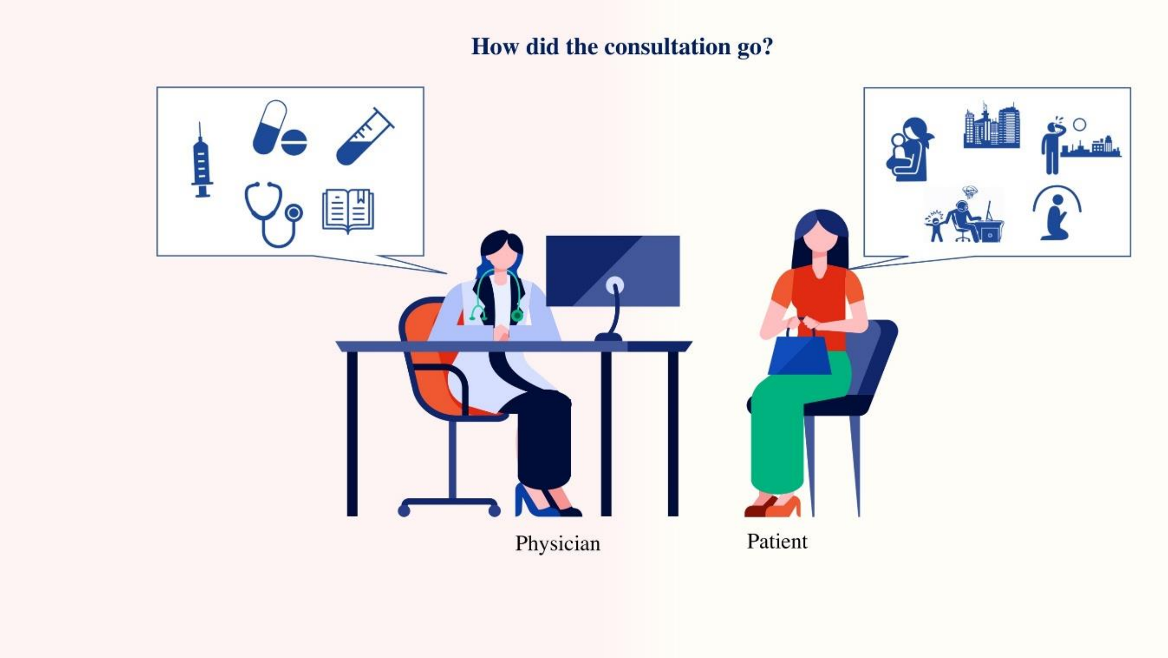


Figure 4.1 ***(b). The DHA's 13 healthcare centres (the starred pinpoints) and the Nad AlHamar and AlBarsha clinics (the red arrows)***

4.6 Population, sampling, recruitment and sample size

Two populations were included in this study: GPs and patients. These two groups were included to ensure achieving the objectives of this research by capturing the experiences and perceptions of both parties related to the deficiency and the medical consultations for vitamin D (see Figure 4.2). GPs, rather than other specialists, were chosen because the former primarily manage vitamin D deficiency in the DHA.

Figure 4.2 How did the consultation go?



4.6.1 General practitioners

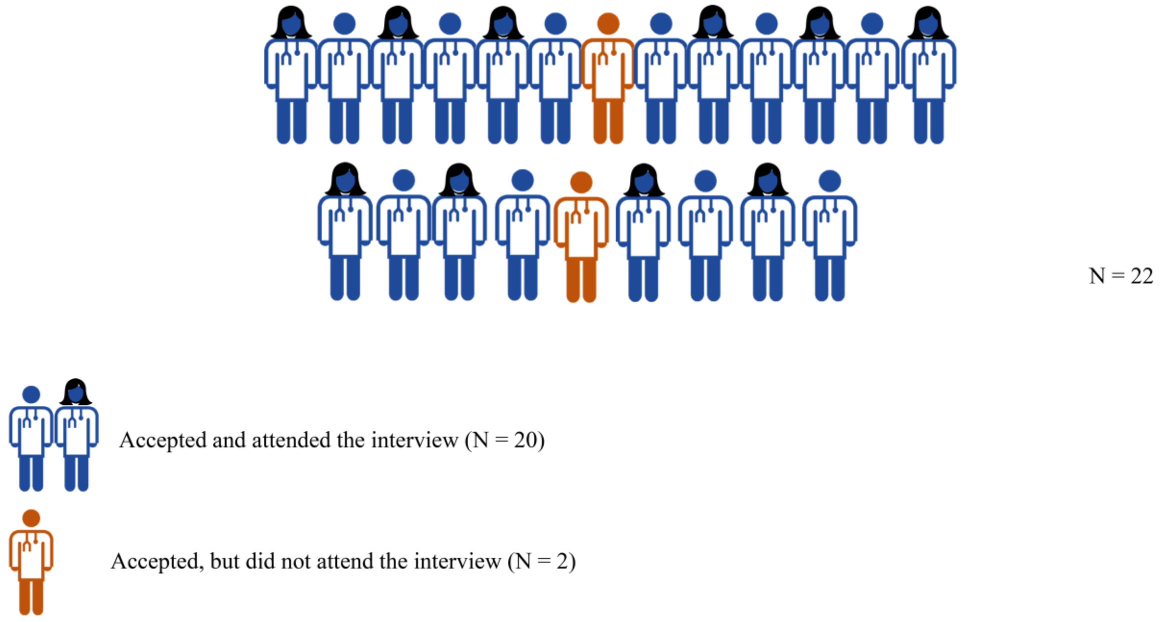
Once ethical approval was obtained from the DHA and Lancaster University (LU), I approached and personally invited the GPs in both clinics. Before doing so, the gatekeepers announced that a researcher would come to the clinic and approach them to invite them to participate. While approaching the GPs, I presented my business card to establish rapport and provide assurance that I am not affiliated with the DHA. This was done to reduce the feeling that their participation might impinge upon their career. These two clinics provide 24-hour services, and the GPs do not have specific offices or fixed duties (for example, they work in shifts). Thus, recruitment was performed over two-and-a-half months, with regular visits to the clinics (every other day, including weekends) to ensure that all of the GPs were given the same opportunity to participate. Meanwhile, the clinic managers/gatekeepers shared GPs' duty schedules, which facilitated access to the vast majority of the GPs. In certain instances, the snowballing technique was used to recruit the GPs through their colleagues and to ensure that no one was left out (Sadler et al., 2010). Invitations were delivered to the GPs, with a brief verbal explanation of the research, alongside a pack containing the information sheet, consent form and expression of interest sheet (see Appendix). All of the GPs asked me to go through the information sheet with them, after which they made their decision to participate and signed the consent form. Their eligibility was assessed at the same time by using the expression of interest sheet (Appendix) according to the following inclusion criteria:

- Working at either the Nad AlHamar or AlBarsha clinic, as a GP (family medicine specialist or resident).
- No restrictions to age, gender, ethnic group, nationality, years of experience or year of graduation.
- Speaks English and/or Arabic.

The GPs were recruited using maximum variation to ensure heterogeneity and explore more divergent perspectives (Stake, 2005). Maximum variation meant recruiting from different age groups, genders, nationalities, ethnic groups, cultural backgrounds, educational levels, housing, occupation and years of experience. These characteristics were chosen on the basis of the findings of the literature review, and according to the outcome of the discussions with stakeholders. Maximum variation was important because otherwise, for example, in the AlBarsha clinic, the sample would have been overwhelmingly Emirati and/ or female.

Those eligible to participate were asked to suggest a date, time and location for the interview, based on their convenience. Their names and cell phone numbers were obtained to send reminders of the scheduled interviews the night before. All the GPs decided to conduct their interviews during working hours and in their offices. This was useful for maintaining a natural setting, since the interviews occurred in the same locations as the vitamin D-related medical consultations (Figure 4.2). Furthermore, the respective clinics facilitated the interviews by allowing the registry to block the GPs for 45 to 60 minutes. In total, 22 GPs agreed to be interviewed. However, one of them rescheduled several times and then went on leave, while the other one initially accepted the invitation, but could not conduct the interview, since the clinic was extremely busy (see Figure 4.3).

Figure 4.3 GP recruitment interview attendance



4.6.2 Patients

Patients were not recruited through their GPs in order to prevent them from feeling that their participation might affect their current or future treatment. Instead, the participants were recruited by approaching them either in the waiting rooms, but mostly within the public area of the clinic as they were leaving. That is because it was observed that in the majority of times these moments were when they appeared to be more relaxed and willing to respond. While approaching the potential participants, I presented my business card to establish rapport and provide assurance that I am affiliated with a trusted body (college and university). This is important as people in UAE are more conservative (Culture of United Arab Emirate, 2020; United Arab Emirates Country Profile, 2018). The recruitment of the patients took longer than that of the GPs (more than five months), for various reasons, including patients' lower response rate in comparison to GPs, the conservative nature of the population, and gender-related constraints. Although they were given the written invitation (see Appendix), but similar to GPs, all of the participants were more interested in hearing about the research verbally. They were also given the pack with the consent form, expression of interest and participant information sheet, and were informed of its contents. After their initial approval, their eligibility was assessed using the expression of interest sheet (Appendix), according to the following criteria:

- History of visiting a DHA clinic (not necessarily the Nad AlHamar or AlBarsha clinic) for vitamin D deficiency (currently or ≤3 months) or reporting vitamin D deficiency (currently or ≤3 months).
- No restrictions to age, gender, educational level, ethnic group, nationality, occupation and living in any emirate/city.
- Speaks English and/or Arabic.

In addition, they were specifically chosen to have VDD to ensure that they had vitamin D-related conversations with their GPs, and had attempted to implement such medical advice within their contexts and lives. Specifically, choosing that the patients were either experiencing vitamin D deficiency or had experienced it within the last three months was established to avoid recall bias, a concern surfaced in the literature review (Durvasula et al., 2010). Participants were purposely recruited, and maximum variation was maintained to ensure a heterogeneous patient population. Those eligible to participate in this research were asked to suggest a date, time and location for the interview, based on their convenience. Overall, 36 patients were approached, of which 27 potential participants agreed to be interviewed, and 20 eventually attended the interview, as seen in Figures 4.4. (a) and (b).

Figure 4.4 (a). Patients' recruitment

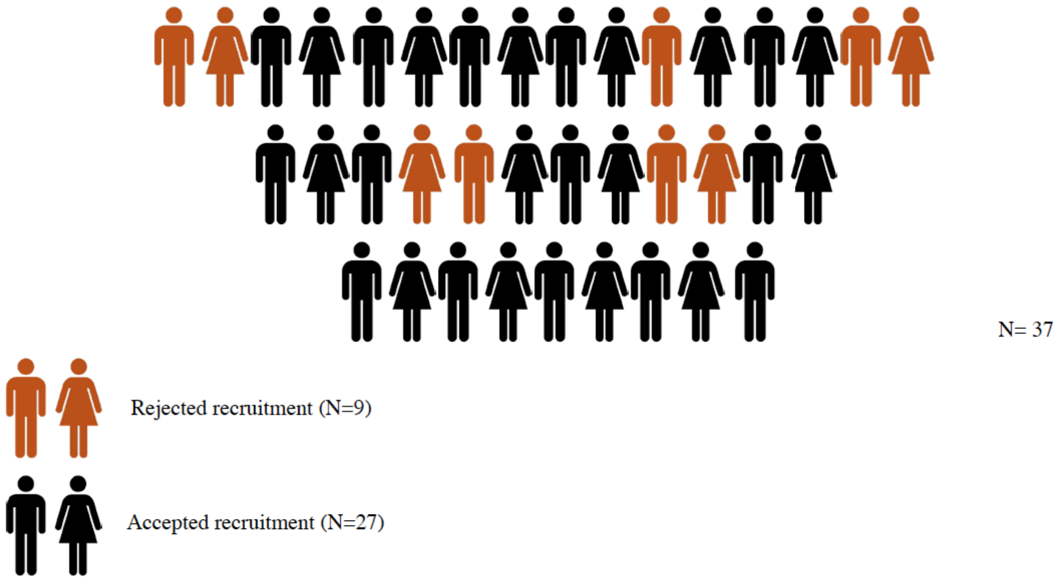
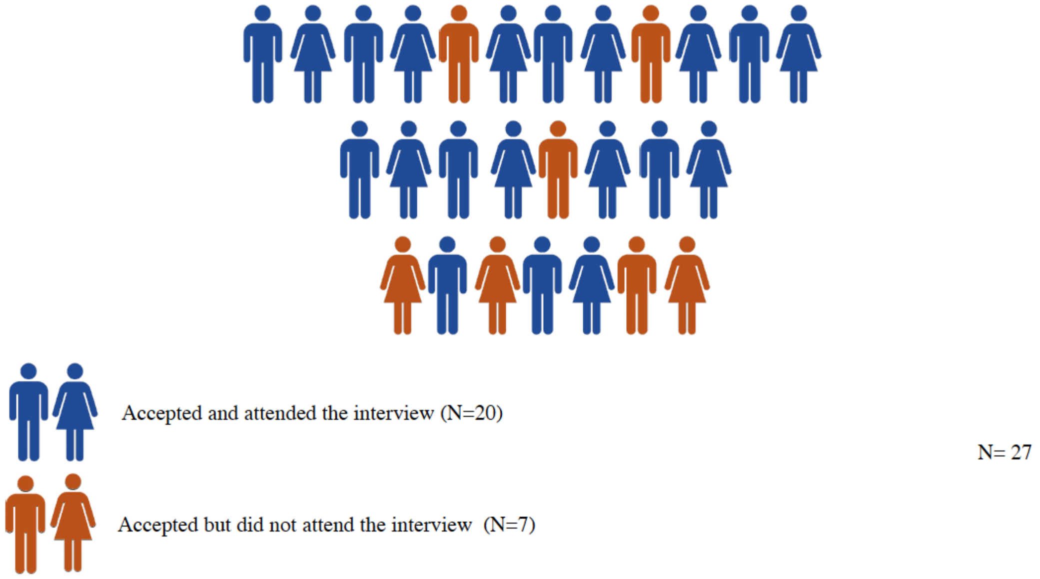


Figure 4.4 (b). Patients attending the interview



4.6.3 Sample size

Sample sizes can vary in qualitative research (Merriam & Tisdell, 2015), as findings are not intended to be generalisable, but transferable. The generic qualitative approach aims to obtain data from a representative sample targeting specifically a broad range of experiences and opinions (Percy et al., 2015), which is the case in this thesis. In addition, as seen later in the data analysis section, this study is adopting a reflexive thematic analysis (TA) which is also in line with wanting to capture rich data that encompasses a wide range of perspectives (Braun & Clarke, 2019). Hence, in addition to having a heterogeneous population recruited through purposeful sampling with maximum variation, the sample size has to be marginally large. To be more specific, the sample size in this research was 40; 20 GPs and 20 patients. Based on the literature and discussions with stakeholders, this was an acceptable sample size, and at the upper limits of the proposed range in the proposal (between 6 and 20 per sub-population) (Aljefree et al., 2017; Bonevski et al., 2013; Dworkin, 2012; Hamilton et al., 2016; Kotta et al., 2015; Mason, 2010; Pirrone et al., 2013; Wijsman-Grootendorst & Van Dam, 2005). In addition to the justification provided above, page 110, section 4.10, provides a discussion explaining how I ended up with a sample size of 40.

4.7 Data collection

4.7.1 Method

As indicated earlier, an interaction needs to be established between the researcher and participants to access their experiences. There were two main methods used in literature which are the focus groups and semi-structured interviews. For this thesis, semi-structured interviews were used to allow the participants to narrate their experiences (Morse & Field, 1995). That is because this flexible approach also helped maintain focus on the topic (Bryman, 2012) and enabled comparison across interviews as it imposed a degree of standardisation without restricting the order and flow of the discussion (Minichiello et al., 2000). Structured interviews were rejected as they lack the flexibility to explore complex phenomena from the perspective of the participant. This also carries the risk of reducing a complex phenomenon and envisaging it as a collection of variables, which was a major drawback identified in the literature. In addition, one-on-one interviews were conducted instead of focus groups, since the heterogeneity of the population might prevent the interviewees from freely discussing their issues related to the S-E-C context. This decision was also gender-related since Emiratis do not freely interact with people from opposite gender (United Arab Emirates Country Profile, 2018), which would hinder the richness of the findings. As for the GPs, such interviews were more effective than focus groups, since they might have worried about being criticised by others given the fact that the interview entails questions related to their practice (Yin, 2015). Moreover, focus groups are unsuitable for conservative and/or shy participants, especially when discussing sensitive topics (Yin, 2015), and where there are concerns about power imbalances as in this case where both senior and junior GPs were recruited (McMillan & Anderson, 1997). Focus groups create additional challenges in capturing non-linguistic parameters, especially if the pace of the discussion is rapid. Thus, face-to-face, semi-structured interviews were preferred (McMillan & Anderson, 1997; Yin, 2015).

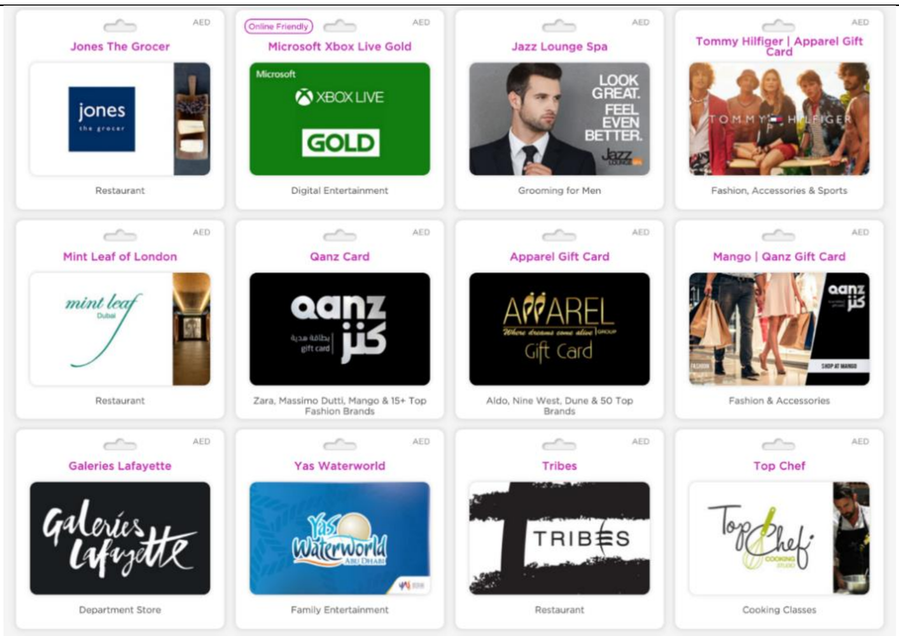
After the discussion with stakeholders, the topic guide was amended to incorporate the merits of the theoretical and conceptual frameworks. The topic guide was designed to allow participants to settle initially while confirming their demographic information, and that they had signed the consent form. This was followed by a brief conversation to establish rapport (for example, about their occupation). The interviews were audio-recorded and guided by the topics and theoretical frameworks (see the Appendix). When necessary, probing questions were used to expand on some of the narratives, as seen in the topic guide. In order to prevent the participants from colouring their responses or being overly aware of the recording device, an unobtrusive digital recorder was used (Yin, 2015). In addition, the audio-recorder ensured that vital information (linguistic and non-linguistic) is captured. It also prevented any interruptions (for example, by asking the participant to repeat his/her statement to note it down), thus slowing down the pace of the discussion (Yin, 2015). After each interview, the researcher reflected on the findings and the interview in order to interpret them. Finally, the recordings were transcribed within two weeks of the interviews to introduce any changes to the topic guide, and to avoid any issues related to forgetfulness or recall bias (Merriam & Tisdell, 2015).

4.76.2 Language of the interviews and the token of appreciation

Arabic and/or English were specified since these were the languages of the researcher, and no translators were hired. Although specifying languages as part of the inclusion criteria was considered a limiting factor in this research, these are the two most common languages used in Dubai.

As for the token of appreciation, the participants were offered a gift card (valued at 100 Dirhams, approximately £20), which was given to them in the form of an electronic gift card/voucher through www.yougotagift.com (see Figure 4.5). The ethics committees approved this approach.

Figure 4.5 Token of appreciation through www.yougotagift.com



4.7.3 Duration and location of the interviews

The GP interviews lasted 35 minutes (on average), while the patient interviews were between 45 and 60 minutes (on average). The GPs interviews were conducted in their offices at their respective clinics. As seen in Chapter Two, conducting interviews in a hospital setting was associated with shorter interviews. Yet, as mentioned earlier, the clinics facilitated the interviews by temporarily blocking the GPs schedule. Although the interview locations were established by the interviewees themselves, the fact that the GPs selected their offices helped maintain a natural setting (the location where the consultations take place), which heightened the richness and authenticity of the findings. Conversely, the patient interviews were conducted in various locations, including their workplace, work-friendly coffee shops or homes. In this case, conducting the interviews in these settings was thought to be advantageous since it is at a closer proximity to where their lived experience exist. Hence, enables reflecting on the complex interplay between the medical advice provided, and their experience with VDD within their S-E-C contexts. These locations also enabled conducting longer interviews in comparison to that of GPs. The patient interviews were generally conducted without major distractions, with some exceptions such as getting distracted by family members and children. In both cases (the GPs and patients), the chosen interview locations were inspected beforehand to ensure that the space met the following criteria: noise- and distraction-free, no physical barriers (high tables), confidential and comfortable (Parahoo, 2006).

4.7.4. Personal safety:

The personal safety process was only activated if the interview was conducted in patients' houses. The process was as follows: family members and the co-supervisor were informed about these interviews. The co-supervisor specifically had a copy of the interviews schedule in terms of time, date/ day and location. I texted the co-supervisor before the start of the interview and once finished. The co-supervisor is aware that it should not go beyond one hour, and if it did he would try to reach me. All interviews went on smoothly and were uneventful.

4.8 Reflexivity

In qualitative research, the researcher is the instrument for data collection and thus, his/her attributes influence the data (Guba & Lincoln, 1981; Merriam & Tisdell, 2015). In this regard, a major concern identified in the literature review was the lack of reflexivity. Since reflexivity is essential to all stages, I kept a journal to help the reflexive process and reflect on each interview within one hour. In this research, my status was central to the positionality, given my race (Arab), gender (female), social class (middle class), nationality (Emirati), background and profession (clinical pharmacists, academic and researcher) might have affected the findings. Consequently, journaling did not only help better understand and appreciate the subjective nature of the findings, but also understand how I might have affected the findings. This was then included in the reflexive TA. Reflexivity is further discussed in Chapter 6, discussion.

4.9 Data analysis

In order to answer the research questions, a qualitative analysis of the transcripts was conducted, based on Braun & Clarke (2019)'s six-step thematic analysis approach (see section 4.9.2). According to them, thematic analysis in general is a method for identifying, analysing and reporting patterns (themes) within data. However, it does more than organising, such as interpreting data (Boyatzis, 1998), which is important for moving away from reducing or simplifying findings, a weakness identified in some of the papers in the literature review. Moreover, the six steps of Braun and Clarke (2019) provide structure and guidance on how to conduct the analysis, unlike the other qualitative analysis techniques.

There are three clusters of thematic analysis which are: coding reliability TA, codebook TA, and reflexive TA (Braun & Clarke, 2021). Coding reliability depends on using a structured codebook by multiple independent coders, which is followed by calculating the inter-coder reliability to measure the accuracy or reliability of coding (Braun & Clarke, 2021). This was not found to be suitable for this thesis given that it is a very structured method, which requires the themes to be developed early, allowing less flexibility for introducing changes or allowing findings to emerge (Braun & Clarke, 2021). In other words, the themes are viewed as topic summaries and items that can be identified within data rather than conceptualised. Furthermore, there is one coder for this thesis 'myself', which means the inter-coder reliability calculation cannot be done. In addition, attempting to identify themes, and calculating the inter-coder reliability indicates a realist assumption, where there is a reality in the data that has to be accurately captured through codes and themes (Braun & Clarke, 2021). This is indeed conflicting with the philosophical stance of this thesis. Next is the codebook

TA, which, similar to coding reliability, uses a structured codebook, where themes are considered topic summaries (Braun & Clarke, 2021). However, it does not require calculating the inter-coder reliability (Braun & Clarke, 2021). This was also not found to be suitable as it prevents having a flexible and open approach to allow the researcher to get actively engaged with data (Braun & Clarke, 2021). In addition, similar to coding reliability, the codes and themes identification/ generation phases are underpinned by a realist assumption. This thesis instead adopted reflexive TA because it is theoretically flexible, allowing to use a range of theoretical and conceptual frameworks, which is the case in this thesis. Furthermore, the coding process is open, fluid, organic, and recursive, and can become more interpretive and conceptual across an analysis. Hence, move beyond the surface and explicit meaning to interrogate implicit meanings (Braun & Clarke, 2021). In other words, the codes undergo continuous refinements reflecting the researcher's deep engagement with the data, resulting in an evolving, situated, reflexive interpretation of them (Braun & Clarke, 2021). This is important because, unlike the other two approaches, the codes in reflexive TA are considered the building blocks for themes, and the themes are interconnected and contribute to the broader story (Braun & Clarke, 2021). Therefore, the codes in reflexive TA are conceptual tools in the developing analysis, which promote knowledge generation or construction, rather than the discovery approach seen in the first two, which have a realist perspective (Braun & Clarke, 2021). This aligns with the objectives and philosophical stance of this thesis. In addition, reflexive TA allows for identifying and analysing a broad range of experiences from a heterogeneous population. In particular, it allows comparing different data sets, while remaining theoretically flexible, as mentioned earlier. Thus, supporting both inductive and deductive research strategies similar to the ones used in this thesis (Braun & Clarke, 2019; Ibrahim, 2012). This enables getting immersed and going deeper at a conceptual level when it comes to the analysis (Braun & Clarke, 2019; Ibrahim, 2012). Furthermore, it is worth mentioning that during the data collection, the topic guide was amended, which is allowed in reflexive TA, unlike the other two methods that require remaining systematic with minimal changes (Braun & Clarke, 2019). Accordingly, given the aforementioned discussion, reflexive TA was found to be the most suitable for this thesis.

4.9.1 NVivo software

The thematic analysis was performed using NVivo 12 software (Macintosh version). In order to effectively use the software, I completed the Udemy course titled, ‘From Zero to NVivo 12’ (see the Appendix for the related certificate).

4.9.2 Analysis of the interviews (samples in the Appendix)

1. *Transcribing:*

Before beginning the analysis, the interviews, which were completely anonymised with participants assigned codes (GP1 and P1), were listened to and transcribed. As mentioned earlier, this step was done in a timely fashion to amend the topic guide (when necessary) and avoid recall bias. The transcribed interviews were revised three times to ensure accuracy.

2. *Familiarising with the data:*

In order to become familiar with the data and understand it, in addition to listening to the interviews three times, I re-read the transcripts at least three times, which was crucial for understanding the depth and breadth of the contents (Bird, 2005; Riessman, 1993). Active notetaking was also adopted to search for any meanings and patterns, rather than simply placing the spoken sounds on paper (Lapadat & Lindsay, 2016). Moreover, I kept a reflective journal to remain aware of my role as a researcher, its impact on the interview flow, and the type of data engendered.

3. *Generating initial codes:*

In this phase, an initial list of ideas was generated about the contents of the data and their relation to the research questions and aims. Subsequently, a list of broad codes was generated, which were refined into more specific codes on the second and third revisions of the coding list and transcripts. This coding approach was an inductive and deductive analysis using a line-by-line coding style. Open coding was also used and accordingly the codes were further modified throughout this process. In addition, memos and annotations were created in NVivo to reflect on the interviews and note any interesting points (for example, concerns about the recording). Overall, the final coding list was the product of a series of revisions (three times at least), that operated in an iterative mode, moving between the various phases of analysis. It is important to bear in mind that the iterative process involves continuous refinement, which means this process continues until the end of the analysis.

4. *Searching and reviewing the themes:*

After coding the text, the codes were used as building blocks to create the themes, where the codes were collated under general themes, and this was both data- and theory-driven. In this regard, a visual representation was used to help sort the codes into themes and envisage the relationship between them. This was useful for the revisions as well as for analysing and discussing the findings (see Figure 5.1 in Results chapter). For example, it was observed that some initial codes could be included in more than one main theme. Hence, some of the codes were omitted, while the others were either merged or broken down into separate themes. Another revision was done to confirm the codes' suitability and whether the codes within each theme appear to be coherent.

5. *Defining and naming the themes:*

This phase involved identifying the essence of the themes and determining what aspects of the data and thesis objectives each theme captures, and how the various themes are connected. This helped create a detailed analysis of each theme and its respective 'story' in light of the overall data and the research questions. Moreover, sub-themes were identified in this process. Examples of this are seen in Chapter 5, Results, which clearly shows that the themes were not based on the identified items but were conceptually driven and created.

6. *Interpretive analysis:*

This involved moving from descriptive to interpretive analysis, by providing a concise, logical, and interesting account of the data across themes (Braun & Clarke, 2006, 2019). This approach ensured that the analytic narratives went beyond describing the data to making an argument in relation to the research objectives. This phase also incorporated the contents of the reflective journal, as seen in Chapter 6, Discussion. During this phase, the themes were also amended.

4.10 Ceasing recruitment and the adequacy of data

The proposal, ethics approval and data collection phases were conducted before 2021, which preceded the publication of Braun and Clarke (2021). This new publication challenged the concept of data saturation, especially for reflexive TA, which had been defined as the point at which no new information, codes or themes can be yielded from the data (Lincoln and Guba, 1985). Braun and Clarke (2021) proposed instead that recruitment is ceased when researchers reach the point where the data collected is adequate to answer the research questions, and not based on information redundancy (Braun and Clarke, 2021). However, the authors state this should be balanced against what is pragmatic and acceptable to ethics committees and journal editors. Therefore, although deciding on the sample size in advance of data collection is not suitable for reflexive TA since it is a continuous process, stating a predicted sample size in advance of fieldwork is a requirement for securing ethical approval (Braun and Clarke, 2021). In the current study, the proposal and ethics application had stated that between 6–20 interviews for each group (GPs and patients) might be sufficient based on previous literature (Aljefree et al. 2017; Jang et al. 2013). The data analysis phase spanned over a year and a half, which fell before and after the publication of Braun and Clarke's (2021) new paper on saturation. Therefore, this new understanding was considered pragmatically during the data analysis phase, as explained in the following text.

To ensure collecting sufficient, thick and rich data that would help answer the research questions and achieve the research aims within the range specified in the proposal, information power was taken into account. This was done by carefully choosing the data collection method (semi-structured interviews), designing the topic guide based on SEM and lay knowledge, identifying characteristics of participants that would be information-rich cases as specified in the inclusion criteria, targeting both GPs and patients, recruiting participants purposefully with maximum variation to engender a heterogeneous population, and maintaining the natural setting (locations of interviews). In total 20 interviews per group were conducted, and this was due to two main reasons. Firstly, the COVID-19 pandemic started towards the end of data collection, and I was concerned that the imposed restrictions might prevent further interviews, hence, I proactively went with the upper limit in case I needed more data to answer the research questions and was unable to recruit any due to the restrictions. Secondly, the GPs' interviews were shorter than expected (an average of 35 minutes), so going with the upper limit was important to ensure that they elicited sufficient information to answer the research questions. During data analysis, by the 17th GP interview and 15th patient interview it was felt that the data represented a wide range of perspectives relating to the experiences of GPs and patients with VDD, and this included deep and thick reflections on the contextual experiences linked to the various levels of SEM. The data also represented a wide range of perspectives relating to the experiences of GPs and patients with vitamin D-medical consultations, and their perceptions regarding customisation. However, I decided to include in my analysis the full sample (20 in each group), as this was the only way by which I could verify whether or not I needed to further recruit any additional participants.

4.11 Rigour and quality

Since the researcher was the primary data collection tool, measures were taken to maintain the authenticity of the findings and avoid imposing my perspectives (Lincoln & Guba, 1985). In order to optimise rigour; reflexivity, audit trials, member checks, participants' verifications and maximum variation were utilised, as explained in Table 4.1. Maintaining a natural setting was also important to optimise rigour, as in the case of the interviews' locations. In addition, records were transcribed and interpreted within no more than two weeks to ensure the recollection of details regarding the interviews (Lincoln & Guba, 1985). Reflections on interviews were written immediately within one hour of the interview to avoid recalling bias as mentioned earlier. Moreover, two experienced academic supervisors were involved in the peer examination and audit trail to ensure that the participants are being properly represented.

Table 4.1. Rigour assessment and assurance techniques (Guba & Lincoln, 1981; Merriam & Tisdell, 2015)

Rigour assessment parameter	**Techniques used to optimise rigour**
1) Credibility (internal validity): Assurance that findings are congruent with reality and that the researchers have accurately presented the participants' perspectives.	• Reflexivity and audit trail: reflecting on how the researcher affected, and was affected by the research, and how all decisions were undertaken by keeping a journal. Reflecting on the interview took place immediately after the interview (within one hour). • Maximum variations: heterogeneous sample. • Member checks: participants were asked if the researcher can contact them to confirm some findings at later stages and all agreed. The researcher contacted five participants, three GPs and two patients she felt needed confirmation regarding her interpretations. • Thick descriptions were provided as seen in the Methodology and Results chapters. • Locations of interviews to maintain natural setting (clinics for GPs and houses, coffee shops, workplaces for patients). • Examine previous research as seen in the literature review chapter.

	• Competency of the researcher (took a course on how to use Nvivo, passed a course on qualitative data analysis and experienced supervisors extended their support).
2) Transferability (generalisability): Extrapolating the findings to a similar but non-identical setting.	• Thick and detailed descriptions: Methodology and Results chapters. • Maximum variations: heterogeneous sample. • Natural setting (locations of interviews).
3) Consistency or dependability (reliability): Assurances that all phases of research are consistent and integrated.	• Peer examination was performed through the academic supervisors. • Reflexivity and audit trail: reflecting on how the researcher affected, and was affected by the research, and how all decisions were undertaken by keeping a journal. Reflecting on the interview took place immediately after the interview (within one hour).
4) Confirmability: Assurance that the data presented vocalises the participants' perspectives.	• Reflexivity and audit trail: reflecting on how the researcher affected, and was affected by the research, and how all decisions were undertaken by keeping a journal. Reflecting on the interview took place immediately after the interview (within one hour).

4.12 Ethics

The Economic and Social Research Council Framework was used to guide the ethics in this thesis. As stated earlier, ethical approval was obtained from the DHA and LU (see the Appendix). Before interacting with the participants, signed consent forms were obtained after covering the contents of the information sheet, which included detailed instructions, the researcher’s contact information, the voluntary nature of participation, being audio recorded and clear instructions for data withdrawal (see the Appendix). The cut-off date after which they were not allowed to withdraw was two weeks from the date of conducting the interview or after the data had been anonymised and incorporated into the themes. This was included in the information sheet. Before getting enrolled in the study, all participants had the opportunity to ask questions.

Maintaining anonymity and confidentiality of the participants’ identities and information was essential, since qualitative research and recordings might unintentionally violate their privacy (Howe & Moses, 1999). Thus, the participants received individual codes upon registration, their personal identifiers were separated, and the datasets (soft and hard copies) were anonymised. Only the anonymised data were used in dissemination.

4. 12.1 Data storage, security, backup and accessibility

All of the data was stored in a secure location during the research and regularly backed up, following the U.K. Data Protection Act 1998 and 2018, and the General Data Protection Regulation (Data Protection Act, 1998; Data Protection Act, 2018). The anonymised data was only used for the specified purposes and it will be stored for 10 years at LU, after submitting the final report. In regard to the latter, LU Box was used to store an encrypted master copy, since it has a large capacity and it can be accessed off-campus. It also enables controlling with whom the data is shared, by requiring permission from the owner. Hence, it provides more robust security.

Regarding data security, LU's policy on categorising and protecting university information assets was used as a guide. Specifically, all hard copies were stored in a secured location with me till the end of the project. In addition, access on mobile devices was encrypted and password-protected, with no distribution of the data through email. Meanwhile, personal identifiers were stored separately in a secured locked cabinet, and will be shredded after completion of the research. The anonymised interview manuscripts were produced in a soft-copy format, encrypted and kept in one password-protected laptop. Any remaining hard copies were shredded and disposed. All of the audio-recordings were immediately transferred to an encrypted and password-protected laptop, and deleted from the recording device. The records will be kept until the completion and submission of this project, and then destroyed. Only the anonymised written manuscripts of the interviews will be kept for 10 years.

Finally, all of the data were only be accessible by the research team, while the personal identifiers were only be accessible by me in order to maintain the participants' confidentiality. In addition, the transcriptions of the interviews were solely made by me, thus optimising confidentiality.

4.13 Summary

For the purpose of this research, a qualitative explorative study (underpinned by relativism ontology and subjectivism epistemology) was adopted. Both GPs and patients were purposely recruited from two primary healthcare centres in Dubai, and interviewed using semi-structured interviews. These particular centres were chosen due to their geographical locations and the possibility of recruiting a heterogeneous sample. The data was then analysed using Braun and Clarke's (2019) reflexive thematic analysis, while ensuring that reflexivity was maintained and documented. This research was approved by the ethics committees at the DHA and LU, and took all measures to ensure maintaining confidentiality and anonymity of data.

Chapter Five

Findings

The objectives of this research were to determine how participants' (both GPs and patients) social, environmental and cultural context affects their vitamin D status, treatment and preventive options, and to reveal the extent to which lay knowledge is used by GPs and patients to contextualise the vitamin D-related advice during medical consultations. It also explores the perception of participants (GPs and patients) regarding the use of lay knowledge during consultations. Hence, this chapter presents the findings through the following four sections:

- Section 1: Demographics of the participants.
- Section 2: The effect of patients' social, environmental and cultural contexts on the acquisition of vitamin D deficiency, and its treatment and preventive options.
- Section 3: The current practice in terms of the use of lay knowledge to understand patients' social, environmental and cultural contexts during vitamin D-related medical consultations.
- Section 4: Perceptions of the participants regarding the use of lay knowledge to contextualise the vitamin D-related medical advice.

5.1 Section 1: Demographics

The 20 GPs (10 men and 10 women) in this research were Muslims from different age groups and nationalities, with experience ranging between 6 years to more than 30 years (residents or specialists) (see Table 5.1). They were educated in a number of different countries and were living in villas or apartments. The 20 patients (11 women and nine men) were aged between 20 and 67, from various backgrounds, professions (although mostly professional/skilled workers) and nationalities. They consisted of Muslims, Christians and Hindus living in villas or apartments (see Table 5.2).

Table 5.1. Demographics of the GPs

Gender	10 Females	10 Males	20 Total
Age			
Age (20 - 35)	3 (females only)		
Age (36 - 45)	8 (4 females and 4 males)		
Age (46 - 60)	9 (3 females and 6 males)		
Religion			
Religion	100% Muslim		
Years of experience			
6 - 10 years	3 (females only)		
11 - 20 years	8 (4 females and 4 males)		
21 - 30 years	7 (3 females and 4 males)		
>30 years	2 (males only)		
Title			
Resident	2 (females only)		
Specialist	18 (8 females and 10 males)		
Nationality			
UAE	3 (females only)		
Egypt	5 (4 females and 1 male)		
Sudan	5 (1 female and 4 males)		
Syria	4 (1 female and 3 males)		
India	2 (1 female and 1 male)		
Pakistan	1 (male only)		
Country of graduation			
UAE	3 (females only)		
Egypt	6 (4 females and 2 males)		
Sudan	1 (male only)		
Syria	3 (1 females and 2 males)		
India	2 (1 female and 1 male)		
Pakistan	1 (male only)		
Ireland	2 (males only)		
Hungary	1 (female only)		
Romania	1 (male only)		
Housing			
Villa	3 (females only)		
Apartment	17 (7 females and 10 males)		
Clinic			
AlBarsha	9 (5 females and 4 males)		
Nad AlHamar	11 (5 females and 6 males)		

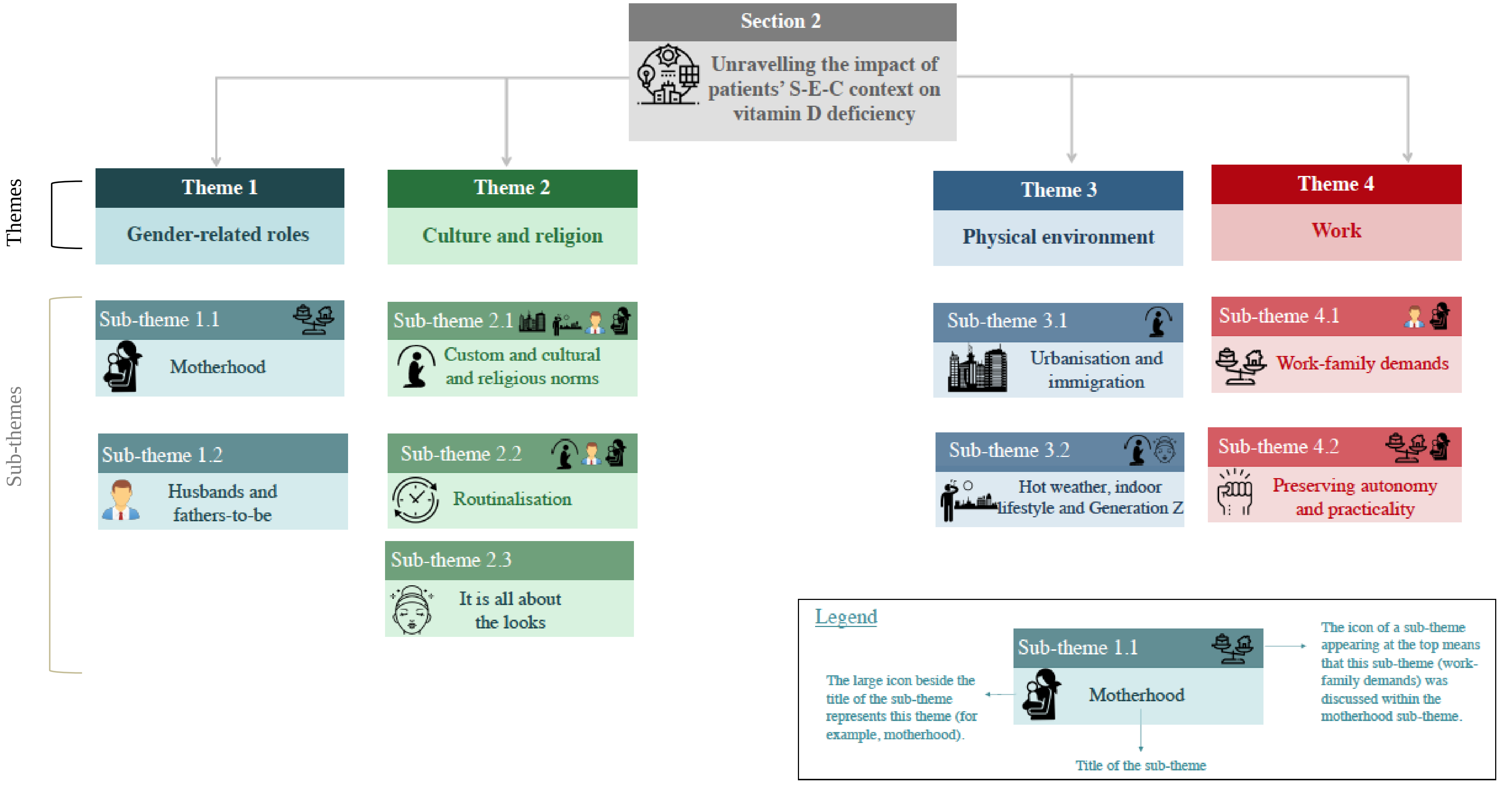
Table 5.2. Demographics of the patients

Gender	11 Females	9 Males	20 Total
Age			
Age (20 - 35)	8 (4 females and 4 males)		
Age (36 - 45)	9 (5 females and 4 males)		
Age (46–60)	2 (females only)		
Age (>60)	1 (male only)		
Religion			
Muslim	14 (7 females and 7 males)		
Christian	5 (2 females and 3 males)		
Hindu	1 (female only)		
Occupation (Indoor vs. outdoor) – all jobs are professional			
Outdoor			
Engineering	2 (males only)		
Technician	1 (female only)		
Indoor			
Administrative position (including managerial positions)	3 (females only)		
Personal trainer (fitness)	1 (male only)		
Teacher in a public school (Ministry of Education)	2 (females only)		
Own a restaurant, preparing healthy meals and working there	1 (male only)		
Healthcare (nurse)	1 (female only)		
Healthcare (medical representative)	1 (male only)		
Professional chief and blogger	1 (male only)		
Restaurateur	1 (male only)		
Outdoor and Indoor			
Property salesman	1 (male only)		
Interior designer	1 (female only)		
Not working			
Retired	4 (3 females and 1 male)		
Not retired (not working)	1 (female only)		
Nationality			
UAE	9 (6 females and 3 males)		
Cyprus	1 (male only)		
Turkey	1 (male only)		
Canada	2 (females only)		
Algeria	1 (male only)		
Lebanon	1 (male only)		
Iraq	1 (female only)		
Egypt	1 (male only)		
India	1 (female only)		
Philippines	2 (1 female and 1 male)		
Interview location			
House of the participant	6 (females only)		
Coffee shop	11 (3 females and 8 males)		
Workplace	3 (2 females and 1 male)		

5.2 Section 2: The effect of patients’ social, environmental and cultural contexts on the acquisition of vitamin D deficiency, and its treatment and prevention options

This section examines the experiences of the participants (both patients and GPs) concerning how their S-E-C contexts resulted in acquiring vitamin D deficiency, and how this context affected their adherence to its treatment and prevention. It is worth mentioning that GPs who were found to have vitamin D deficiency were also asked about their experience as patients with vitamin D deficiency. The themes as well as the interaction between the identified themes and sub-themes are presented in Figure 5.1 as explained in the legend.

Figure 5.1 S-E-C Contextual factors



5.2.1 Theme 1: Gender-related roles

Sub-theme 1.1: Motherhood

The various roles that women play repeatedly emerged in the dataset, one of which was being a mother. According to (Britten, 2008), motherhood is embedded in socially and culturally proscribed obligations, and maintaining them is essential. In the UAE, the society (Emiratis or immigrants) is structured in a way that mothers perform two to three key roles: as the family caregiver; as the person responsible for housework and in certain instances as a paid worker contributing to the family income. The women in the sample expressed that prioritising their children’s and family’s needs was paramount, and that everything else was secondary. Consequently, the health requirements of mothers were neglected in the quest to meet all of the needs at home. Some of the mothers mentioned that although they had vitamin supplements at home, they consistently forgot to take them, due to the aforementioned competing obligations. Interestingly, these findings were observed among all of the mothers, regardless of whether they were GPs or patients. The following are two examples from the interviews:

> *People prioritise many things over their health, especially mothers. For them, it is all about their kids, which makes them forget the important and essential things in life.* (P06, Female, UAE)

> *I do not remember because I am very busy. I have two kids and I live alone. My husband is working in Saudi Arabia, so he is not around. There is no time to think about or remember to take the pill. I feel like I have two jobs. Once I finish my duties at the clinic and go home, the second job starts as a mother where I cook, teach, etc.* (GP12, Female, Indian)

The mothers also elucidated that they sacrificed their own time, money, love, career and social lives for their families. In certain instances, such prioritisation also limited their own food options that could protect from vitamin D deficiency. For instance, one mother stated the following: *I do not cook salmon because my kids do not like it* (P05, Female, Iraq). In addition, caregiving and prioritising their families might result in losing their personal identity or autonomy due to the significant demand, and this is further discussed in sub-theme 4.2, page 135. Some mothers talked about the fact that they had to give up their social and professional lives to take care of their chronically unwell children. Although, both the GPs and patients talked about certain sacrifices, the patients were the ones who talked more about them:

> *Because of my child. I cannot leave her unintended. Although she is at the age of 12, she cannot do anything on her own, since she was diagnosed with mental retardation. So, I had to give up my job to be with her because I am just too scared that something might happen if she was left unattended.* (P20, Female, India)

Even though the participants mentioned that having to care for an ill child was associated with a negative experience, there were some positive aspects such as making the mother and child (who are both vitamin D-deficient) more compliant to taking the supplements (see Figure 5.1).

> *When I started giving my son the vitamin D for his skin condition, I started taking it as well. But as soon as he stopped, I started forgetting to take it.* (P08, Female, UAE)

Moreover, both the GPs and patients talked about their experience with pregnancy, in which they regarded their unborn child as a ‘super subject’, and referred to their bodies as being a mere vessel/incubator. In fact, they mentioned that mothers-to-be were expected to engage in activities to render the womb a more hospitable environment for the foetus. Hence, they took extra care and precautions, and adhered to treatment and preventive plans, mainly when pregnant or wanting to become pregnant. Their motivation (both GPs and patients) to follow treatment plans and medical advice was mainly due to their interest in their babies' well-being rather than their own, and also the expectations posed on them culturally regarding the foetus health. However, after delivery, the attention shifted away from the mothers towards the born child:

> *Yes! I mean I have to take care of my child.* (GP16, Female, Egypt)
>
> Researcher: *So, what is so different this time?* Participant: *I don't know, maybe because I am no longer pregnant.* (P18, Female, UAE)

Sub-theme 1.2: Husbands and fathers-to-be

As explained at depth in the introduction chapter, the UAE society places a high value on marriage, starting a family and raising children. In terms of gender-role, males focus more on their breadwinning role, as they are the main providers for their families. Therefore, it was observed that men did not discuss their parenthood or fatherhood to the same extent as women. Furthermore, mothers or females did not allude to their husbands' roles in caring for their children. An exception were those keen on starting a family, which mainly consisted of patient participants. They specifically mentioned that they were very attentive to their wives' health when they were either pregnant or wanted to get pregnant. Thus, the husbands ensured that their pregnant wives were taken care of and followed the appropriate regime to treat VDD. This also helped some husbands be more compliant during their wives' pregnancies, since reminding their wives to take their supplements meant they were likely to do the same. Husbands also exhibited adherence to treatment plans because they wanted to look after their health to help establish pregnancy based on their physicians' advice. However, remaining adherent to the supplements after delivery was questionable among some of the males participants. On the other hand, males also felt that when they present to the physician with their pregnant wives, their health concerns are minimised or receive less attention in comparison to that of their pregnant wives. For instance:

> *To be honest, as long as my wife is taking it during her pregnancy, I am taking it with her.* (P11, Male, Philippines)
>
> *Well, first of all, I feel that the main focus is on my wife. Although I am happy that she is getting a lot of care, I am also a patient. So, I definitely need some attention as well. I mean, I am sticking to the medication now because my wife is taking it and she is pregnant. Am I going to stick to it after my wife delivers?* (P11, Male, India)

Participants revealed that traditional gender roles still affect the way men and women manage work–family demands. Specifically, the participation of men in household tasks was generally low, and they expected to be served, which further aggregated the women's workloads. An exception to this was one participant who described how her brother's participation in housework and family care had a positive effect on his wife's health in terms of vitamin D deficiency. However, this brother greatly differed from her remaining brothers because he had to live on his own for a long period of time while studying abroad. Hence, became more independent, unlike the rest, who remained in a context that encourage the concept of being served.

> *The men I am talking about are Emiratis or Middle Eastern. They are used to being served, so they rarely do anything. But not all my brothers are like that. One of my brothers look after this own stuff and he do not have a maid. He also does the laundry on his own and depends on himself a lot. I always wondered why my brother is a bit different, and it is mainly because he studied abroad, unlike*

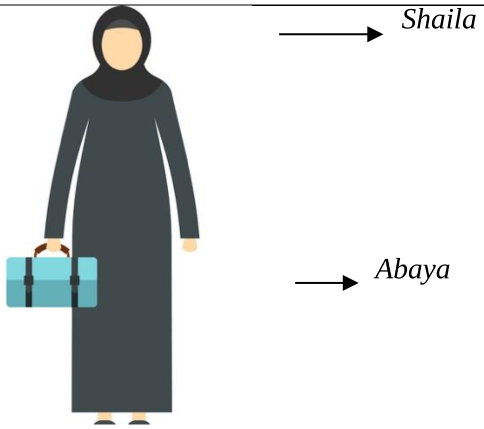
> *the other two, who are typical Arabs and feel that they have to be served. Also, since my brother is used to sharing all of the responsibilities with his wives, he gives her the opportunity to go out and spend time on different activities. As a result, his wife does not have a deficiency.* (P08, Female, UAE)

5.2.2 Theme 2: Culture and religion

Sub-theme 2.1: Custom and cultural and religious norms

Culture and religion were the two major contextual factors discussed heavily by both groups of participants in relation to vitamin D deficiency. In terms of custom, Arab or Muslim females wear conservative clothing and a head scarf when they are out, which is a religious and cultural obligation. Emirati females specifically wear a head scarf *(shaila)* and a maxi dress *(abaya)*, and in this case, only their hands and faces are exposed to the sun (Figure 5.2). Participants (GPs and patients) mentioned that the traditional religious custom is a major barrier hindering their exposure to sunlight, as they are fully covered when they are under the sun (see Figure 5.2). Interestingly, through their responses they mentioned that Emiratis only wear these customs in the UAE, but when they travel they do not have to and instead they wear less conservative clothing.

> *Based on my experience in the UAE, especially Emiratis, they do not get exposed to sunlight, and if they do, they do it while wearing conservative traditional clothing, which prevents sunlight from reaching the skin.* (GP9, Male, Syria)

Figure 5.2 Abaya and Shaila	***Figure 5.3 Kandora***
	

The Muslim women (GPs and patients) mentioned that in order to enable proper sun exposure, it would require having access to private spaces without the presence of men. However, this is not easily available, except in ladies clubs, ladies beaches or in their villas. Some of the patients mentioned that it is very stressful and difficult to have to go to the ladies club to get vitamin D through sunlight alongside all of their commitments and priorities in life including the ones that were discussed earlier. Others alluded to the limitations in availability of private spaces for sun exposure in absence of males even if they were living in their own private villas because of the drivers, gardeners or living with their in-laws.

> *Even though there are villas with private spaces, there are male drivers and gardeners around, making it is almost impossible to get sun exposure.* (P03, Female, UAE)
>
> *I am currently living with my in-laws, where I cannot get exposed in front of them. So, despite the fact that I am living in a villa, I still do not have a private space for sun exposure.* (GP3, Female, UAE)

Although it appears that the women were mainly affected by the traditional custom, some GPs observed that the traditional Emirati clothes of men (*kandora*) also limited proper sun exposure (see Figure 5.3). Though they could more easily be encouraged to make changes, men in UAE mainly wear Kandora, as this is considered to be an appropriate social appearance. The Kandora itself does not permit proper exposure (Figure 5.3). On the other hand, some of the participants from both sub-groups also talked about how men, in comparison to women, freely practice certain recreational activities outdoor, thus getting more sun exposure.

> *I find it easier to advise him not only because he is a man, but also because he can change the traditional clothing, and wear short sleeves and shorts.* (GP17, Male, Sudan)

> *We have parks and walking tracks everywhere, but we can only walk during the evening when people don't notice. People, I mean the guys including my husband's friends. Our society places a lot of pressure and restrictions on women and their lifestyles.* (P08, Female, UAE)

Sub-theme 2.2: Routinalisation

Previous research has shown that when a treatment or preventive plan corresponds with a regular activity, compliance is optimised, since there are minimal distractions (Koenig et al., 2013). In this regard, both the GPs and patients mentioned that certain religious practices were useful for increasing compliance by creating a routine or pattern. For instance, the weekly Friday prayers were found to be extremely useful for keeping some Muslim patients compliant with the intake of supplements. This weekly commitment could act as a trigger to remind individuals to take their medication. However, this was mainly useful for males since Friday prayers are primarily attended by men. Therefore, they can take the medication while getting ready for the prayers and going to the mosque. It was also useful for married women who helped their spouses get ready for the prayers, as seen in the following examples:

> *Since they have to go to Friday prayers, they now link the prayers to the intake of the supplement. I always link supplements to something that they do regularly. It sticks in their minds and the results are really positive.* (GP18, Male, India)

> *Every Friday, my husband has to go to the prayer, and he usually uses a specific Arabic perfume (oud), that smells really good. So, I usually put both beside one another, so when I go to get the oud, I also get the capsules, give him and my daughter, and I take one at the same time.* (P06, Female, UAE)

Sub-theme 2.3: It is all about the looks.

Through their responses, women talked about the importance of looks and appearance, and the fact that it is expected from them being a female to maintain a certain look. In other words, women are not only expected to be mothers who respond to their family's needs, but they are also expected to maintain their looks at all times in terms of their skin tone, looking pretty, and slowing ageing, even if this affects the treatment and preventive plans. Hence, the findings revealed that women (mainly patients) were more motivated by their concern for beauty than for health. Specifically, some of the participants had a prevailing desire for having fair skin, maintaining their youthful look and preventing ageing, all of which mitigated sun exposure. Similarly, it was more important for women to wear makeup to maintain a certain social appearance, even though it might have prevented sun exposure. On the other hand, some women also mentioned that because of their concerns with their skin tone, they wear gloves specifically when driving to protect their hands from getting pigmented or darker. This indeed further obstruct exposure to sunlight.

> W*e women are more concerned with skin, beauty and ageing.* (GP6, Female, UAE)

> *Well honestly, whether or not it affects me, I will never stop wearing them, I cannot go out without makeup.* (P1, Female, UAE)
> *I wear gloves while driving, since my hands are getting darker from the heat and the sun.* (P1, Female, UAE)

5.2.3 Theme 3: Physical environment

Sub-theme 3.1: Urbanisation and immigration

There is an inherently dynamic character in the relationship between the surrounding environment and behaviour. In this regard, both sub-groups acknowledged the impact of accommodations and surrounding environments on their vitamin D status and their adherence to treatment and preventive plans. The participants mentioned that people are less exposed to sunlight, due to living in apartments and confined spaces. *Vitamin D deficiency is the disease of vertical habitants. Most people who live in apartments suffer from this* (GP19, Male, Sudan). Patients mentioned that vitamin D deficiency was not an issue in the 1980s, when people were living in traditional houses (see Figure 5.4). Such houses provided the right environment for sun exposure, especially for women, by having inner private spaces exposed to sunlight, hence get exposed to sunlight while maintaining their cultural and religious obligations. For example:

> *Traditional houses had a hall in the middle, which was not covered. If you need to access anything, such as the bedroom, the bathroom or the kitchen, you need to pass by this sunny hall. It used to be very different, unlike now.* (P08, Female, UAE)

Figure 5.4 Traditional houses in the UAE

However, this is no longer the case, since the participants' S-E-C context and lifestyles have undergone dramatic changes due to immigration, urbanisation and an increase in the demand for living in apartments and living independently. The participants also complained of the lack of privacy in their backyards, mainly attributed to modernisation and changes in building style, where buildings became very clustered and close to each other. For instance:

> *Let me show you (she took me on a tour around her house). Look at the villas of my neighbours. They can oversee my house and the backyard. I cannot get out without wearing my shaila and something conservative.* (P08, Female, UAE)

On the other hand, some patients mentioned that living in an apartment (or a confined space) prompts people to spend more time outdoor or enjoy the facilities of their respective buildings (for example, the swimming pool): *Since immigrants mostly live in apartments, they probably spend more time outdoors* (P1, Female, UAE)

Sub-theme 3.2: Hot weather, indoor lifestyle and Generation Z

The hot weather in the UAE undeniably has an impact, prompting people to adopt an indoor lifestyle. In this regard, both sub-groups noted that in response to the heat, the infrastructure of cities, such as Dubai, has changed and is geared towards encouraging people to adopt an indoor lifestyle (for example, shopping malls, indoor swimming parks, etc.), as seen in the following response:

> *The sun is out all the time, but I live in a flat, use the lift, jump into my car and then go right into a building such as the clinic, supermarket, mall, etc. Back in India, everyone walks around. Even if you have a car, it is difficult to drive because of the large number of pedestrians. It is completely different here.* (GP12, Female, India)

In fact, both GPs and patients noted that the change due to immigration was another important reason for the lack of sun exposure due to adopting an indoor lifestyle after immigrating to the UAE. They also stated that being an immigrant, living away from their families and relatives and moving to a culture that is different to the one within which they were bought up and socialised had an impact. In relation to vitamin D deficiency, participants talked about how attending less social outdoor activities which was a regular habit in their home countries (barbequing) as well might have contributed to developing vitamin D deficiency and limited their exposure to sunlight.

> *When I was in the Philippines, I worked at a hospital and had to use public transportation (bus) and then walk for 10 to 12 minutes to get to work. I think that was sufficient for getting sun exposure on a daily basis. But, here, oh my god! The sun is too hot and the clinic where I work provides me with transportation, both to and from work. I start my shift at 7:30 and we finish around 5:00. I work in an ophthalmic clinic, so we barely have time to get sun exposure.* (P10, Female, Philippines)

As for their work environments, the participants talked about having indoor workspaces that do not encourage sun exposure: *My office does not face the window, so there is no way I can open the window and sit in the sun* (P5, Female, Iraq).

Moreover, entertainment methods have dramatically changed. Unlike previously, people now have and are more interested in technology such as watching movies/television shows and playing video games at the comfort of their cold indoor spaces. Hence, they do not spend much time outdoors. Furthermore, the infrastructure nowadays and availability of plenty of indoor alternatives encourages adopting such a behaviour as seen earlier. For instance:

> *My kids currently spend a lot of time in their rooms, and whenever I call them to come out, they do not necessarily come quickly, they are so addicted to watching movies/television shows on Netflix and playing video games.* (P6, Female, UAE)

And indeed, some women echoed this, where they talked about how the combination of hot weather and wearing the abaya was sometimes unbearable and made their experience cumbersome. For instance: *It is very very hot, and look at us! We are wearing these abayas, which makes the whole situation even worse! LAUGHS!! The heat is unbelievable!* (P03, Female, UAE).

5.2.4 Theme 4: Work

Sub-theme 4.1: Work–family demands

Other than the demands of family life, there are the demands of paid employment. Hence, in order to ensure compliance, treatment and preventive plans must be tailored around work–family demands. As women started taking on paid employment (which was traditionally reserved for men), their burden has tripled, thus hindering their compliance to supplements, sun exposure and treatment or preventive options. In this regard, females of both sub-groups mentioned the long working hours, the stress of reaching work on time, dropping their children off at school and helping them with their homework/studies, while simultaneously being pressed for time to look after their homes affected their compliance to treatment plans. Therefore, females nowadays need not to only succeed in their motherhood duties, but also in their paid job as this is now considered another important obligation for females.

> *I take my son to school and then go to my workplace. Once I am done, I go home, cook something for lunch, rest and then see what preparations I have to do.* (P05, Female, Iraq)

On the other hand, the male participants (GPs and patients) talked extensively about their jobs and work demands, in comparison to the other themes (for example, parenthood). One of the major concerns of males was their success at work which is a priority, even if this affects their vitamin D status, or hinders their ability to get exposed to sunlight or taking supplements. In fact, some males mentioned that despite their VDD, they do not have time to go to the clinic, or get exposure to sunlight and tend to forget taking the supplements sometimes in the quest to meet what is expected from them being the main providers and breadwinners. They stated that money is essential to succeed in their breadwinning role and providing all essentials for their families. This includes providing accommodation, securing educational opportunities for their children, access to healthcare, food, and all other essentials. Therefore, to males being able to secure all essentials for their families is the most important even if it affects their VDD. However, if any of their family members suffer from vitamin D deficiency, they immediately seek medical attention to get it resolved, since they consider themselves responsible for providing access to healthcare for their family members.

> *If they are living in a small area with no private space, then sun exposure for vitamin D deficiency is not a priority. Instead, they need food and drink, accomodation, education, access to hospitals and more. In other words, the priorities can vary.* (GP9, Male, Syria)

Sub-theme 4.2 *Preserving personal autonomy and the practicality of treatment plans*

In this context, personal autonomy refers to the patient's ability to have his/her life under their control, and based on their individual choices. According to their responses, the patients' participants preferred preserving their personal life and shaping it the way they wanted. To be more specific, they envisaged GPs' medical advise a threat to their autonomy, and their control over their daily lives and activities. For example, some retired participants talked about being able to spending time in the sun doing their favourite activities 'gardening' and having that privilege, freedom and willingness to do so after retirement, unlike when they were employed. Hence, their autonomy was maintained in this case while getting exposed to sunlight. For example:

> *Previously, when I was an entrepreneur, I used to spend a lot of time in the office overseeing my projects. But now, I spend more time outdoors, mainly gardening.* (P15, Male, UAE)

Conversely, former working mothers (now retired) felt that compliance to sun exposure and taking supplements are commitments, hindering their personal autonomy. In this regard, they wanted to have a more relaxing lifestyle free of commitments, especially after struggling to balance work and family commitments for such a long time. They also felt that because sun exposure means allocating or scheduling time for it and taking supplements means a lot of commitments in terms of going to the clinic to get tested, they sometimes felt reluctant to do so. For instance:

> *I just retired, so I want to sleep and then wake up peacefully to have my breakfast. Enough with commitments.* (P04, Female, UAE)

According to previous research, a treatment plan must be feasible, a part of daily life, with minimal disruptions, in order for people to adhere to its requirements (Britten, 2008). In terms of food choices, some patients discussed the impracticality of consuming food rich with vitamin D or fortified products, due to various reasons including: the inconvenience of preparing it, having to consume large quantities and the price tag of it ‘expensive’. Conversely, others thought that consuming certain types of vitamin D rich food is feasible since food choices are bound to their particular culture, personal preferences and the lived environment (for example Asians and seafood):

> *Yes, I mean cooking salmon is so messy!! LAUGHS!! I have to clean for three hours afterwards. I live in an apartment, so the whole place smells bad.* (GP16, Male, Egypt)

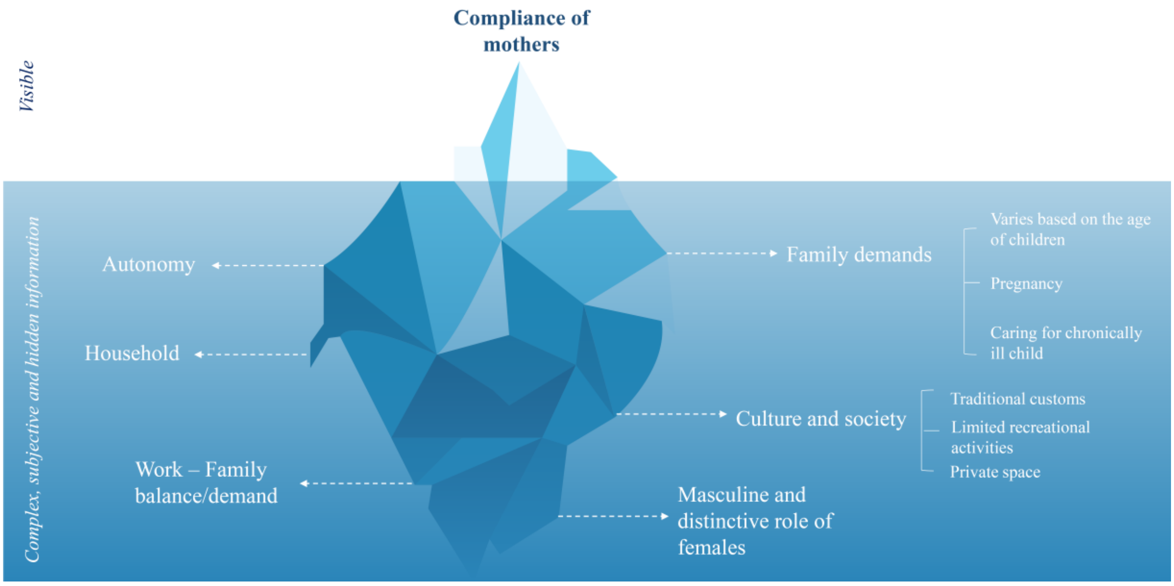
> *We, as a nation like, seafood. So, I do not have an issue with that.* (P10, Female, Philippines)
>
> *Fortified products are a bit more expensive, with limited benefits. They are a waste of money.* (GP1, Female, Egypt)

Meanwhile, in terms of supplements, patients mentioned that supplements were much more convenient, with minimal interruptions in their daily routines. For example, one participant specifically talked about the ease of taking supplements because he takes it with his daily protein shake for muscle building. *To be honest, I am taking it with my protein shakes, and other supplements, so I rarely miss out* (P13, Male, Lebanon). However, it is not as simple as having convenient options, where as seen in the previous examples and sections there are some other reasons that might result in forgetting to take the supplements including motherhood, wanting to preserve autonomy and more.

5.2.5 Summary of Section 2

The findings brought to light a number of themes including: gender-related roles, culture and religious related concerns, the physical environment, weather, urbanisation, immigration and work, and how these affected participants' experiences with VDD. The findings in this section also revealed that the participants, regardless of whether they are GPs or patients, are complex agents, and that the contextual factors identified are also complex, fluid, interactive, dynamic and unpredictable as seen in Figure 5.1 and the preceding examples. It should be noted that it was only possible to capture these findings because the participants were allowed to narrate their experiences and share their lay knowledge. It was also possible because obtaining lay knowledge was guided by the multi-layered SEM, which helped prompting participants to discuss and explore all layers. Therefore, unravel the holistic experiences, all possible contextual factors and the underlying meanings, beliefs, values and ideologies. Figure 5.5 shows an example regarding the compliance of mothers. In this case, a wide range of subjective contextual factors underpinned mothers’ experiences and compliance, yet each patient is expected to have her own unique collection of contextual factors, that is expected to bring about different circumstances. Moreover, as seen in the figure, some factors might be hidden or unpredictable, and cannot be unravelled without patients’ lay knowledge ‘tip of the iceberg’. This figure indeed helps us understand holistically and deeply how the S-E-C context affects mothers’ acquisition of vitamin D deficiency and its treatment and preventive options. Yet, this is not the only example that can be drawn from the findings, as there are more concerning fathers’ experiences, routinalisation, immigration and more as seen in Figure 5.1.

Figure 5.5 An example of mothers to elucidate the complexity, fluidity, subjectivity and interactivity of the context



5.3 Section 3: The current practice in terms of the use of lay knowledge to understand patients' social, environmental and cultural contexts during vitamin D-related medical consultations.

As seen in the preceding section, participants' S-E-C contexts play a significant role in the experiences of vitamin D-deficient patients and it was possible to capture this contextual information by obtaining participants' lay knowledge. Thus, this section explores the extent to which lay knowledge is obtained and utilised during vitamin D-related medical consultation to customise vitamin D-related medical advice. The themes in this section are as follow:

- Theme 1: Overall lack of obtaining lay knowledge and customisation

    Sub-theme 1.1: Tension between technical and lay knowledge

    Sub-theme 1.2: GPs acknowledging the usefulness of lay knowledge and customisation

    Sub-theme 1.3: The experiences of patients who are healthcare professionals.

- Theme 2: The premium version of lay knowledge

5. 3.1 Theme 1: Overall lack of obtaining lay knowledge and customisation

Sub-theme 1.1: Tension between technical and lay knowledge

The patients in this research expressed that their personal needs must be taken into account, instead of one-size-fits-all approach. The treatment and preventive options involve having to adopt certain practices such as compliance to supplements, sun exposure or ingestion of food containing vitamin D and these behaviours are closely tied to the S-E-C contexts of patients as seen in the previous section. In order for GPs to customise the medical advice, GPs must obtain patients' lay knowledge to capture their experiences with VDD within their specific S-E-C context. This means that there might be a shift or equalisation in power between patients and GPs. However, considering patients and GPs as equal partners can be challenging, due to the power imbalance in which physicians (based on their professional knowledge) are more privileged and granted a higher status in society. In this regard, there was an overall lack of customisation due to lack of obtaining lay knowledge, where both sub-groups in this research stated that most physicians adopt a paternalistic approach, and also use standardised techniques to obtain medical-related information from patients. Patients thought that the lack of customisation of medical advice could be because physicians do not have a two-way conversation with them, and that conversations do not go beyond asking a certain set of standarised medical questions. Physicians elucidated that the techniques used to obtain information focus primarily on obtaining information such as medical and medication histories, family history, allergies history, and other comorbidities. Yet, these techniques do not consider patients' S-E-C context or lay knowledge, which reduces the possibility of customisation. For example:

> *But as I said, it is one rule applied to all cases.* (P1, Female, UAE)
>
> *Well, not much, I mainly check if they have some comorbidities. Remember, we have the SOAP (Subjective Objective Assessment Plan). So, this is how we deal with patients.* (GP2, Female, Egypt)
>
> *The problem is we never have a dialogue with physicians, and I think this might be a major issue.* (P1, Female, UAE)

The tension between technical and lay knowledge, and the aforementioned power imbalance was clearly demonstrated in the dataset. The participants (GPs and patients) felt that physicians preferred using solely their technical knowledge, instead of complementing it with patients' lay knowledge, to gauge their treatment plans and medical advice. In fact, patients participants throught that their responses were less sensitive to the patients' S-E-C context, showed less empathy and lacked motivation, since they provided the same advice to everyone. Patient participants felt that GPs did not regard them as knowledgeable, placed them at a lower position, and that their knowledge had less value. Yet, physicians mentioned that patients usually trust physicians who exert power since it shows that physicians are confident of their skills. Furthermore, physicians mentioned that their practice was mainly as per the vitamin D deficiency medical guideline, which is indeed very standarised. Examples of such treatment are as follows:

> *Not all physicians believe in this style of treatment. Some are very technical and old school (LAUGHS)!* (GP5, Female, Syria)
>
> *They treat us similar to robots.* (P16, Male, UAE)
>
> *I do not believe that they think of us as knowledgeable people or at least people who are able to think and understand.* (P1, Female, UAE)

Consequently, even when the patients provided their feedback and wanted to share their experiences regarding the treatment, the majority of the physicians did not consider their views as essential. The patients even reported that the longevity of the relationship with their GPs became affected due to this, after which they had to search for another physician. As a result, the patients became more conservative when sharing their experiences and became passive receivers of information rather than being actively involved. The following examples highlight such situations:

> *I told him that it might not be possible, so he told me stick to the medication as much as you can.* (P3, Female, UAE)
>
> *Yes, I need solutions that suit me. When I am advised to do things that I cannot do, I eventually change my physician (LAUGHS)!!* (P1, Female, UAE)

> *Researcher: did you tell the GP about your experience? Participant: Well, since she will just repeat what she said earlier, and I know I will come across the same difficulties, let's just save the headache.* (P1, Female, UAE)

Since S-E-C contexts are subjective, complex, changing and interrelated, treatment plans should not be created in a vacuum. Hence, the researcher inquired about whether GPs assess the feasibility and appropriateness of their medical advice in relation to patients' contexts. In other words, the researcher explored whether GPs gave patients the chance to reflect on the plan they proposed in light of their S-E-C context. The vast majority of the participants reported that GPs do not usually ask about the feasibility of treatment and preventive plans, with the exception of choosing a regime. Not doing so made some of the participants perceive the medical advice as a command that must be followed, irrespective of the situation, which is also alluding to the power imbalance between patients and GPs. However, some GPs mentioned that the reason why they do not hold these feasibility related conversations with patients is because they want to give patients some degree of freedom, assuming that the situation will differ from day to another, and on certain days, they will be able to comply. The following are examples of such findings:

> *He told me to do it and that's all.* (P10, Female, Philippines)

> *So, I usually explain how to get proper sun exposure, but leave it up to the patients to decide whether they will actually do it.* (GP12, Female, India)
>
> *Honestly, every day is a different. One day you cannot, but another day you can. So, I leave it up to the patients.* (GP12, Female, India)

In their defence, some GPs mentioned that incorporating patients' experiences requires following up with the same physician, which is not always possible, since family medicine is practiced differently in the study location. Specifically, the healthcare centres in this research merely provide acute care services. As a result, there is no guarantee that patients will follow up with the same physician. In addition, since all healthcare providers are heavily dependent on a computerised system, when visiting multiple physicians, this system is incapable of recording the details of patients' experiences or their S-E-C contexts. Hence, lay knowledge is lost. Yet, some patients mentioned that their experiences can still be captured, despite visiting different physicians as patients can be simply asked to share their experiences.

> *Honestly, I will only do it if the patient comes back to me. Since this clinic functions as a 24-hour healthcare centre, I do not see the same patient, unless he/she requests me.* (GP12, Female, India)

In sum, this sub-theme revealed that the majority of the GPs follow a paternalistic approach in terms of gauging their treatment plans and medical advice. This unfortunately resulted in giving all patients similar treatment plans and advice. There was also a clear indication of a power imbalance between the patients and GPs, which only valued the technical knowledge and feedback from the latter.

Sub-theme 1.2: GPs acknowledging the usefulness of lay knowledge and customisation

Some of the GPs acknowledged the importance of lay knowledge and collaborating with their patients in order to create the best course of action. Where GPs recognised that there are some hidden factors that if not taken into account either now or in the future, it will hinder patients' compliance. However, this was mainly for other chronic condition. For example:

> *I currently have a patient with hypertension, and I was thinking of adding a diuretic to control her blood pressure. She refused my suggestion because of the shared apartment she was living in. She did not want to access the bathroom many times a night, she felt embarrassed about it.* (GP10, Male, Sudan)

In addition, few GPs mentioned that they ask about the feasibility of treatment and preventive plans all of the time, since they need to know which plan will suit the patient. Such feedback can also be incorporated in consultations with other patients. For instance:

> *I think it helps me understand whether my treatment plan will work. In fact, it helps me understand whether the ENTIRE plan will work. Supplements usually work when they are compliant, but what about other options such as sun exposure?* (GP6, Female, UAE)

In terms of customisation, sometimes also the GPs customised based on their understanding of patients' context, based on what they observe during the medical consultation or through their cultural competence. For example, a physician own her own decided to prescribe the weekly supplements instead of the daily ones to mothers who came to the clinic with their toddlers, assuming that mothers have competing pressures, hence weekly dose seemed more convenient. Furthermore, with veiled patients, the GPs preferred prescribing supplements, assuming that sun exposure might be difficult for them.

> *I remember visiting the clinic with my kids, the two young ones. Believing that it would make things easier for me, she suggested taking weekly supplements* (P18, Female, UAE).
>
> *But Arabs, ahh, it is a bit difficult, there are rules that have to be maintained in regard to culture and tradition.* (GP9, Male, Syria)

Meanwhile, they advocated for sun exposure amongst non-Muslims or patients who are not wearing conservative clothing, assuming that their exposure was easier. And in general, this is a clear indication that GPs were trying to customise based on the assumptions, as they were making decisions without asking the patients themselves. For example:

> *Since I am not covered or not Muslim, one cannot assume that I can get exposed to the sun. Actually, I have so many other commitments in life. I also have great respect for Islam. So, if I wear inappropriate clothing, then I feel like I am disrespecting the nation and the people here.* (P14, Female, Canada)

Yet, what is observed during the consultations or what is known through cultural competence might be an incomplete picture or just 'the tip of the iceberg' (see Figure 5.5). Hence, it can result in being unable to fully understand the patients' S-E-C context and providing less sensible advice to them. What seems obvious and logical from the physician's point of view, might not be entirely true for the patient. Therefore, in the examples below although it appears that weekly doses are more convenient, participant 13 thought otherwise:

> *It appears to me this way! Logically, one capsule per week is much easier to ingest and adhere to, in comparison to daily capsules.* (GP4, Male, Syria).

> *I chose the daily regimen because it is easier for me to remember to take it along my other fitness supplements and drinks.* (P13, Male, Lebanon)

The GPs also mentioned the importance of health education, which is usually embedded within the consultations. During health education physicians provides information related to the condition, all possible treatment options including pharmacological and non-pharmacological, which is useful. However, it was noticed that the information provided to the patients was standardised. In other words, although the patients were provided with health education, such information was not tailored to their own subjective experiences and S-E-C contexts. The rigid and standarised approach physicians adopted clearly impacted the way health education is provided to patients. In fact, patients mentioned specifically that vitamin D-related medical consultation is more of hearing the same thing again and again. For instance:

> *However, I am hearing the same things every time, after which I respond in the same way.* (P2, Male, Algeria)

> *I provide them with all of the options, after which they should choose the most suitable one. I try to direct them to use all of the possible techniques to get vitamin D, including those that can be performed at home.* (GP9, Male, Syria)

> *Honestly, no. I would give everyone a capsule and then provide them with health education, which will include information about sunlight and food.* (GP1, Female, Egypt)

Sub-theme 1.3: The experience of patients who are healthcare professionals

It is assumed that those with a health science background possess more information about diseases, treatment and preventive plans. It is also assumed that compliance to certain treatment plans are high among such individuals. However, one nurse participant reported that she did not want to reveal her identity because she felt embarrassed to share her lack of compliance with the physician. Also, nurses have a more submissive role, and are not used to arguing or having lengthy conversations with physicians, given their relative position in the healthcare hierarchy. For example:

> *Yes, and I felt really embarrassed when he discovered that I am a nurse who cannot manage to remember her medication.* (P10, Female, Philippines)

> *Maybe because I am a nurse, I am not used to arguing with physicians. Remember, there is hierarchy. Although I hate it, everyone acknowledges it.* (P10, Female, Philippines)

In another example, a pharmacist believed that physicians were intimidated by his presence, since he knows a lot about medications. This made his experience very uncomfortable, as his presence might have challenged the power of physicians: *Honestly, I am not sure, but sometimes I get the feeling that they do not feel very comfortable around me* (P19, Male, Egypt).

5.3.2 Theme 2: The premium version of lay knowledge

When GPs have vitamin D deficiency, they are considered to be patients. In this regard, physicians have a dual identity: clinicians and patients. Specifically, during the consultations, such physicians draw on both their technical knowledge (as a physician) and their lay knowledge (as a patient). In this research, both the GPs and patients mentioned that it was acceptable for physicians who are vitamin D-deficient to use their lay knowledge when treating patients. In fact, since it is coming from GPs, it received a higher value, and was accepted to complement GPs technical knowledge as opposed to patients' lay knowledge.

> *I usually tell them to take the dose just before the Friday prayers. In this case, the patients, especially the men, have provided positive feedback because they currently link the prayers with the intake of the supplement.* (GP18, Male, India)

> *He showed me an application (grabs her phone to show me) that sets reminders to take the supplements. Also, he gave me the pill box, and changed the supplements from daily to once a week.* (P05, Female, Iraq)

Again, this is based on the power imbalance between these sub-groups, in which GPs are always placed in a position of relative power. Such power is demonstrated in the following example:

> *See, there is something about these lab coats we wear. I mean, many healthcare professionals chose this profession to wear the lab coat. It gives you power by default. Sometimes, I pass by the supermarket after work, and believe me, this lab coat places me at the centre of attention. So, when I tell my patients about my technique with Friday prayers, most of the time, they follow. It is still working*. (GP18, Male, India)

Having GPs diagnosed with VDD also seems to have an effect in terms of comparing their own experiences to that of their patients. The vitamin D-deficient GPs in certain instances were able to relate to their own experiences with the lack of compliance when having consultations with their patients whom are not compliant. However, in other instances, the GPs who managed to successfully comply with the treatment or preventive plans could not rationalise why the patients did not, as shown in the following examples:

> *Yes, honestly, sometimes when patients tell me that they are not compliant, I relate to my own experience.* (GP9, Male, Syria)

> *I also wear a Hijab* (GP1, Female, Egypt).

> *I advise all of my Muslim patients to link the vitamin D supplement with Friday prayers. It has worked well for me. However, one time, there was a patient I advised in the same way who kept saying that he forgot. I could not understand why! I mean, I am doing it and it works well! Patients need to put more effort to help themselves out.* (GP18, Male, Muslim)

5.3.3 Summary of Section 3

This section mainly explored what occurs during vitamin D-related medical consultations. Based on the findings, there was a conflict between technical and lay knowledge, which was underpinned by the power imbalance, paternalistic approach and standardised techniques. Moreover, the lay knowledge of the patients was regarded as less valuable than that of vitamin D-deficient GPs, and in these circumstances, it was perceived as a premium version of lay knowledge.

5.4 Section 4: Perceptions of the participants regarding the use of lay knowledge to contextualise the vitamin D-related medical advice

In regard to the perceptions of the participants (GPs and patients) in this research, the majority of the patients believed that it is important to customise the medical advice based on the context and lay knowledge. For example, one patient referred to the pervasiveness of design thinking, the primary objective of which is to ensure that the clients' needs are met:

> *I completed a master's degree in design thinking, and when we work on anything that is going to be used by people, we need to specifically design something for them. Thus, as a patient, the advice should match my needs and my situation… So, why can't we use this approach when designing treatment plans?* (P2, Male, Algeria)

In addition, patients have important information about their experiences that cannot be explored unless the physician specifically asks about them. In other words, people have unique scenarios that need to be approached differently. The point is that our experience and our context is unique to us, therefore unless GPs ask about it, they cannot know, even if they assume they can. For example:

> *Let me give you an example about diabetes. I do not have diabetes, but I treat diabetic patients and give plenty of advice, either related to their medications, diet or lifestyle. However, I will never understand what they are going through unless I try it.* (GP6, Female, UAE)

> *I think that solutions or treatment plans should target these different reasons.* (P1, Female, UAE)

Moreover, allowing patients to collaborate made patients feel that their opinions were welcomed and valued, which contributed to optimising compliance and equalising the power relations. Although the core of the information may be the same in such situations, customisation might still be required, and the advice has to vary to ensure that participants maintain their autonomy, focus on what is relevant to them and recognise their responsibilities as patients to act on their vitamin D deficiency. For example:

> *We try as much as possible to customise, because it means that we are specifically targeting the individual based on his/her needs and situation. It also gives him/her a sense of responsibility.* (GP13, Female, Sudan)

Conversely, some of the participants questioned the usefulness of contextualising the medical advice as many people in the UAE live with vitamin D deficiency regardless of their S-E-C contexts that constrain their choices. In this regard, they seemed to regard supplements rather than lifestyle or social change as the most suitable approach. Culture and religion were two parameters that were seen as the most difficult to change, further suggesting that supplements are the best option. For instance:

> *It seems like everyone has the deficiency. Therefore, I cannot see how much the context would help, as it appears to me that even people from different contexts end up with the deficiency. (GP12, Female, India)*
>
> *Yes, but what can they do? It is related to the culture and religion, which are very sensitive topics. So, they give us supplements.* (P8, Female, UAE)

Finally, the GPs talked about the duration of the consultations, as an additional obstacle towards the customisation. Specifically, since the consultations are usually no more than 12 minutes in duration, some of the GPs stated that such limited time makes it difficult to consider obtaining lay knowledge to contextualise the vitamin D-related medical advice. This is an issue specifically for patients who come with multiple medical conditions that need to be addressed during the 12 minutes, which is the case with a vast majority of patients.

5.5 Summary

The chapter explored how contextual factors affected the participants' experiences with vitamin D deficiency. Often hidden among the participants, such factors were found to be complex, fluid and interactive. Moreover, each patient had a unique collection of these factors that could not be predicted without his/her lay knowledge. As for the findings regarding the vitamin D-related medical consultations, there was a conflict between technical and lay knowledge, which hindered the acquisition of lay knowledge and the exploration of patients' S-E-C contexts. In essence, this was underpinned by the power imbalance, paternalistic approach and the use of rigid standardised techniques when having conversations with patients. Furthermore, within the hierarchy, the lay knowledge of the patients was regarded as less valuable, with that of the physicians perceived as a premium version of lay knowledge. Overall, although the majority of the participants valued the use of lay knowledge to contextualise the medical advice, some questioned its usefulness given the high prevalence of VDD across all segments of the population in UAE.

Chapter Six

Discussion

This research explored how participants' social, environmental and cultural contexts affected their vitamin D status and the acquisition of treatment and preventive options. It also focused on what occurs during vitamin D-related medical consultations in terms of obtaining and using lay knowledge to contextualise the advice, and the perceptions regarding this approach. In this chapter, the findings are discussed in light of the existing literature, the researcher's experience and through the lens of the chosen theoretical and conceptual frameworks.

The chapter starts by shedding light on vitamin D quantitative and qualitative literature, it then moves on to discuss the contributions related to the process of obtaining and understanding lay knowledge, and the contributions related to civic intelligence. After that, it discusses the current practice in terms of obtaining, understanding and utilising lay knowledge to complement technical knowledge during vitamin D-related medical consultation. Then it goes on to discuss what undergirds the current practice and the perceptions attached to it. Finally, the reflexivity is discussed, and a set of recommendations are put forward.

Before proceeding, it is worth mentioning the difference between the person's unique context and the wider S-E-C context. The person's unique context is defined in this thesis as the specific context of a person that arises due to the interaction and combination of specific and unique factors arising from the wider S-E-C context. While, the wider S-E-C context is defined in this thesis as the social, culture and environment contexts and factors common among a specific population or group of people.

6.1 A snapshot of the quantitative and qualitative vitamin D literature:

Quantitative vitamin D deficiency studies represent a significant portion of the literature. Hence, it is important to shed light on it in terms of its focus and relation to the current thesis. Most quantitative studies have focused on measuring participants' knowledge, awareness, attitude, practice, and behaviour towards vitamin D deficiency. Specifically, studies have found that the levels of knowledge and awareness were generally low to moderate regarding vitamin D deficiency, the importance of vitamin D, the consequences of VDD, vitamin D sources and factors affecting vitamin D levels, the daily dose of vitamin D and time required to be spent in sunlight for cutaneous vitamin D production (Al Bathi et al., 2012; Alamoudi et al., 2019; Anwar et al., 2019; Arora et al., 2016; Bani-issa et al., 2017; Boland et al., 2015; Eid Al Agha & Alorabi, 2016; Ho-Pham & Nguyen, 2012; Ibrahim et al., 2019; Salmanpour et al., 2016; Tariq et al., 2020; Vu et al., 2010; Walker et al., 2014; Zareef & Jackson, 2021). Furthermore, the attitude, practice, and behaviour of participants were generally negative towards sun exposure, dietary consumption of vitamin D (food or supplements), testing for vitamin D deficiency and following up post-treatment course completion (Anwar et al., 2019; Boland et al., 2015; Eid Al Agha & Alorabi, 2016; Habib et al., 2021; Ho-Pham & Nguyen, 2012; Ibrahim et al., 2019; Jamil et al., 2019; Zareef & Jackson, 2021; Zhou et al., 2016). Accordingly, the recommendations in the vast majority of studies were to raise knowledge and awareness through health promotion campaigns and educational interventions, which are expected to render the attitudes, practices and behaviours more positive towards treating and preventing vitamin D deficiency as per the social-psychological models.

On the other hand, the qualitative literature and chapter 2 confirmed that vitamin D deficiency and its treatment and preventive options are closely tied to people's behaviour. The behaviour of people is a product of an interaction between the person and the wide S-E-C context (Kelly & Barker, 2016). To understand the behaviour affecting vitamin D status; an exploration of patients' experiences is required, and the quantitative evidence, despite its importance, did not enable exploring experiences in depth and breadth. Although the relationship between patients' behaviour, S-E-C context and vitamin D deficiency was the focus of qualitative studies in the literature review, it was observed that the experiences of participants were simplified and reduced. This prevented capturing fully and holistically the experiences, and did not maintain the subjective, complex, dynamic, interactional, intersectional and multi-layered characteristics of their contexts. In addition, the qualitative studies found that participants were not generally lacking knowledge regarding vitamin D, but the impact of the contextual element was more significant. Given that qualitative studies focused on the connection between vitamin D deficiency and S-E-C contexts of patients, their recommendations also emphasised having more health promotion campaigns, but tailored ones to address the subjectivity of the contexts.

In a nutshell, the quantitative and qualitative vitamin D literature provided crucial information about the knowledge, awareness, attitude, perception, behaviour, practice, and experiences of participants related to vitamin D deficiency. However, a recent systematic review and a meta-analysis which looked into the prevalence of VDD between 2000 and 2022 in 81 countries, and among approximately 8 million participants, found that 63.6% were deficient, and 76.6% were insufficient (Cui et al., 2023). This is a reminder that the prevalence remains high despite all the efforts, including the tailored health promotion campaigns. This thesis aims to build on and contribute to the existing knowledge by using a different approach stemming mainly from the identified shortcomings and gaps seen in the literature. This will be further discussed in the successive sections related to the process of obtaining and understanding lay knowledge, civic intelligence, and the current practice related to vitamin D-medical consultations.

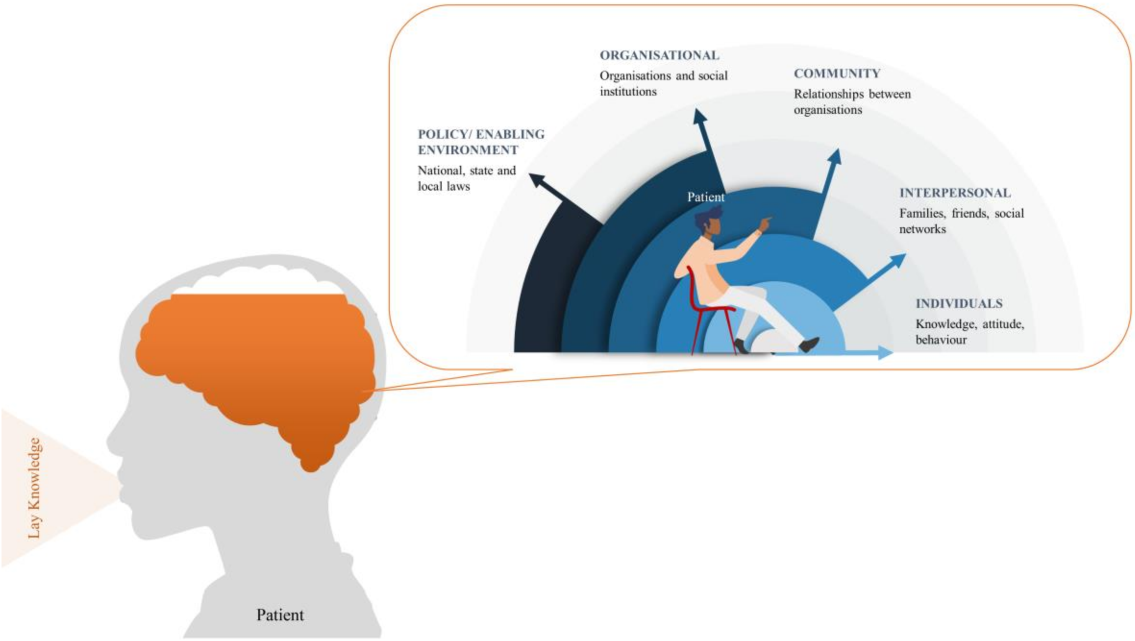
6.2 Contributions related to the process of obtaining and understanding lay knowledge:

As mentioned earlier, vitamin D is affected by the patient's social context, and vitamin D-medical consultations provide ample opportunity to deliver customised and contextually suitable medical advice. Hence, GPs need to make efforts to collaborate with patients during the process of obtaining and understanding their lay knowledge, to provide customised and accessible vitamin D-related medical advice. One of the aims of this research was to explore how participants' S-E-C contexts affected their vitamin D status, and their experience with the treatment and preventive options. Although this is not the first study to explore it, it is the first to explore it differently using the merits of lay knowledge embedded within the SEM. This was done to address a number of concerns that emerged from literature including capturing and presenting partial experiences, reducing and generalising these experiences and contextual factors, and not maintaining the complexity, subjectivity, and interactional nature of the social contexts. This also allowed me 'the researcher' to experience the process of obtaining and understanding lay knowledge, thus, gain more insights about it. It also enabled comparisons between my experience while obtaining lay knowledge from participants and the current practice concerning vitamin D-medical consultations. The following sections (6.2.1 to 6.2.3) show how the adaptation of these two models paved the way to unravel new knowledge, and develop new understanding related to the process of obtaining and understanding participants' lay knowledge. This is indeed important as the quality of lay knowledge will ultimately determine the quality of the customised medical advice.

6.2.1 Going beyond the common and predictable factors in relation to VDD

One of the concerns that emerged from the qualitative literature was related to capturing an incomplete picture or experience. Hence, in an attempt to address this, merits of lay knowledge and SEM were used together for the first time to capture participants' lived experiences of VDD within their S-E-C contexts. This has resulted in identifying some new, less apparent factors and conversations that were never captured, or seen in the literature before, such as the experience of fathers-to-be, newly married couples living with in-laws, person's autonomy, the traditional custom of Emirati males, routinisation and linking treatment plans to Friday prayers and more. To further explain this, the literature review and also the initial discussion with stakeholders revealed clearly that some factors (the common ones) that impeded the prevention and treatment of VDD could be identified without having to draw on patients' lay knowledge. Yet, the literature in Chapter 2 also showed that the type, depth and breadth of information obtained from participants could vary due to various reasons (see Meta-Methods – Chapter 2). For example, in the literature, it was found that the type of information shared via lay knowledge is affected by the location of the interview and recruitment (surrounding context), current status (married, single, immigrant, mother and more), time of day, types of questions asked, and mind-set (Aljefree et al., 2017; Bonevski et al., 2013; Brand et al., 2008; Christie & Mason, 2011; Durvasula et al., 2010; Jang et al., 2013; Kotta et al., 2015; Pirrone et al., 2013). In other words, conversations might be affected by these factors and tailored towards these current influences, which might also be transient, temporary or only visible at that time (for example, coming to the clinic and having to wear shaila and abaya). Accordingly, the lay knowledge passed on by patients or participants might be redundant, have deficiencies or be partial and not reflect the actual holistic or complete experience and social contexts. The same concern is expected to arise during patient–physician interaction. Therefore, to increase chances of capturing the whole picture, it was felt that patients needed to be reminded of their whole S-E-C and personal contexts. This can be done by cognitively taking them back into thinking about their social systems and contexts when inquiring about their experience and lay knowledge (Figure 6.1). To be more specific, due to using the merits of both lay knowledge and SEM, participants shared their experiences in relation to the various layers of SEM, and accordingly, their whole social system, which led to unravelling new outcomes. This approach brought to light the value of combining lay knowledge and SEM in addressing the challenges identified above related to obtaining holistic lay knowledge and experience.

Figure 6.1 Patient sharing experience/ lay knowledge guided by SEM

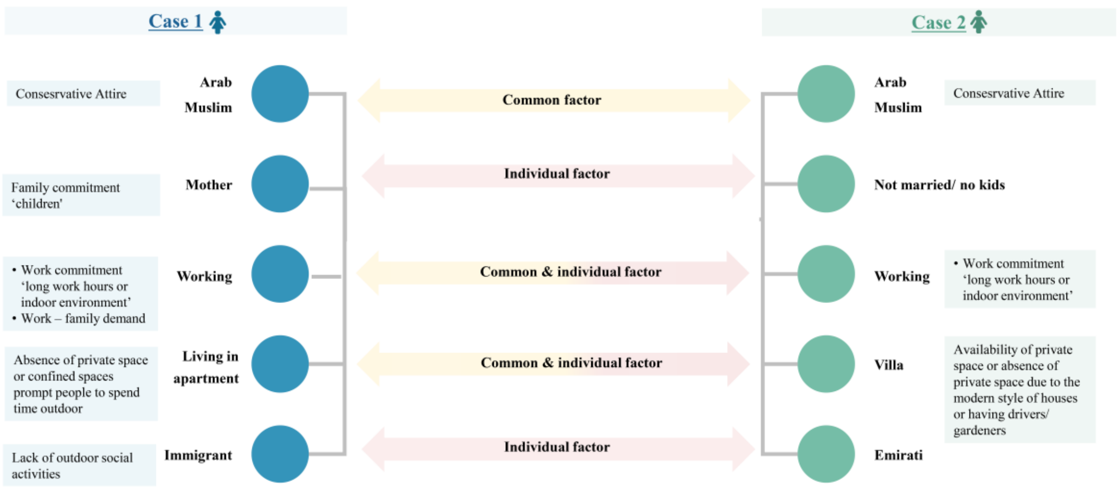


6.2.2 Moving away from generalisation

The literature review also found that there was a tendency to generalise experiences, which resulted in not acknowledging the subjectivity, diversity and uniqueness of people's experiences and contexts within the population (termed person’s unique context). This also resulted in reducing the complex social contexts and experiences into factors, segments or independent variables. The research undertaken for this thesis aimed not to just capture a wide range of experiences, but also to move away from generalisation and reducing or simplifying findings. Therefore, SEM alongside lay knowledge was used for the first time to maintain the subjective, complex and intersectional dynamic nature of patients’ experiences with vitamin

D deficiency, and their unique personal contexts. To further explain this, the literature review identified that most studies on VDD sought to use their findings to design customised or tailored health promotion campaigns that suit and address a specific population. To do that, contextual factors were identified from the experiences shared by participants. Then these populations from which participants were recruited were labelled with a certain set of commonly identified contextual factors that might have affected their experience, and which need to be considered when designing health promotion campaigns. Despite the usefulness of this approach in designing tailored health promotion campaigns, it has resulted in the reduction of experiences, which is expected to impact the quality of the customised vitamin D-medical advice. In comparison to this, using both lay knowledge and SEM enabled capturing data, which illuminates that each patient presents as the tip of their own unique complex 'iceberg', his/her personal context proving to be unpredictable with some hidden subjective and complex information that are mainly coming from the S-E-C context. Hence, exploring and capturing the hidden parts of the 'ice berg' is important to enable a fuller picture of patients' lived experience. Figure 6.2 presents an example of two Arab participants (GP 12 and P1). These two cases had some common contextual factors, such as their race 'Arab', religion and being a working female, and other individual factors, including marital status and being an immigrant or a local. However, Figure 6.2 shows that although there are common factors, these interacted with each other differently and were underpinned by another set of contextual factors such as work and accommodations, which brought about different outcomes, circumstances or personal contexts. For instance, employment in Case 2 (Figure 6.2) was not complicated by work–family demands, unlike in Case 1. The absence of a private space in Case 1 resulted from living in an apartment as an immigrant, unlike in Case 2, which was due to the presence of drivers/gardeners or that the houses in the neighbourhood were clustered, allowing the neighbours to see into the backyard. Therefore, obtaining lay knowledge with the aid of SEM helped participants not just to reflect on these different circumstances, but also to show and maintain the fullness, complexity and interactional nature of participants' experiences, their unique personal contexts as well as the wider S-E-C contexts and social and cultural factors.

Figure 6.2 Case 1 vs. Case 2



Further on the interactional nature of context, using SEM when obtaining lay knowledge helped also shed light for the first time on the impact on one person's context caused by changes in the context of surrounding people. Hence, any changes in the contexts of people surrounding participants might indirectly affect their context and, consequently, their experience with VDD 'the domino effect'. For example, participants who were fathers-to-be mentioned that they expected their experience during their wives' pregnancy to be different than after delivery in terms of compliance with their supplement treatment. Another example is the experience of an immigrant wife and mother who came to the UAE with her husband, and then her husband after a while had to immigrate to a neighbouring country for a better work opportunity. The change in her husband's context changed her context from considering herself a mother, and wife who share responsibilities and is supported by her husband to feeling and acting like a single mother. This indicates that the contexts of individuals are interconnected, and any changes in the personal context of one person will affect the contexts of others surroundings this person.

6.2.3 Capturing deeper meanings

The ultimate aim of capturing experiences and contextual information is to ensure that the provided advice is sensible and suitable. While inquiring about participants' S-E-C context, their experiences and their lay knowledge, using SEM specifically made the deeper meanings attached to participants' experiences more visible for the first time. This is crucial as capturing these realities, and the meanings that underpin are important in making sense of people's capacity to sustain prevention and treatment practices. Also, this allowed approaching patients as experts in their own experiences and capacities, and showed them respect and interest, which encouraged sharing otherwise hidden meanings that impacted their practices. The section below demonstrates this through examples related to my own experience, and the findings of this thesis.

Reflecting on my own experience with VDD, I was not compliant with the treatment despite being a clinical pharmacist and fully aware of the consequences. Yet, my lack of compliance was not only due to wearing conservative clothing or not having a private space. It was actually due to my busy schedule having to juggle and balance between a number of responsibilities (studying, working, conducting research and having an administrative assignment at an academic institution). My lack of compliance was mainly because my extremely busy lifestyle makes me armour-plate my time, prone to reject anything that will prolong my to-do list, or make my full plate overflow, even if it was as simple as remembering to take a pill. I would describe my day as such: each day is planned ahead, each hour is counted, and there are checkpoints throughout the day that help me remain productive and accomplish the tasks pertaining to the roles I have and responsibilities I am assigned to.

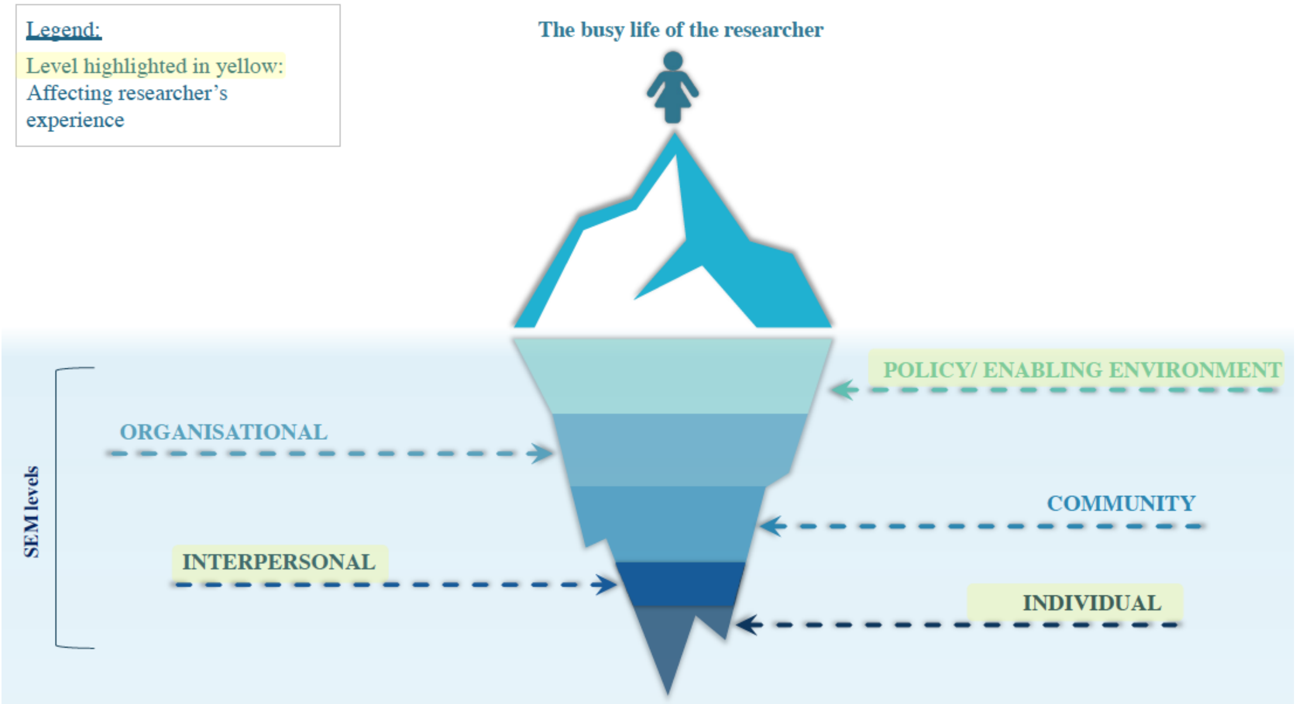
With regards to the findings of this thesis, for example, males appeared to lack interest in complying with vitamin D deficiency treatment and preventive options. However, this was only at face value, but at a deeper level, men through their responses alluded that their breadwinning role was the priority, hence, they did not recognise VDD as equally important. Men felt that being able to provide accommodation for their families, education for their children, and access to healthcare and food were their most important roles. Therefore, they did not consider getting an accommodation with a private space (to support access to sunlight) as important as providing all essentials to their families (home, education, food, health). In fact, they were less keen on having to look after their own VDD or adopt any behaviour (for example, sun exposure or attending clinic appointments) if they felt it was going to hinder their ability to succeed in their breadwinning role or affect their performance or interfere with their jobs. They specifically considered it a threat towards their primary role. Hence, it was not a lack of interest, but the capacity to manage their treatment and prevention practices in the face of competing priorities. In a similar way, some mothers who had given up work and who were not compliant with prevention and treatment alluded to how becoming a mother made them lose their sense of autonomy, especially when their children were young or ill. So, when there was an opportunity to regain their autonomy (for example, children are grown-up), they were keener on getting back to their former lives, and considered any vitamin D-related medical intervention a threat to that. Indeed, capturing these realities and the meanings are crucial to providing customised medical advice that is not only based on contextual information and experiences, but also on people's capacities.

6.2.4 Understanding lay knowledge through patients’ eyes and the SEM

Understanding lay knowledge and experiences of patients is essential to achieve optimum results, since each story and experience of a patient is complex, subjective, changing, has a dynamic interactional nature and should be understood as such. In other words, a proper understanding of patients' lay knowledge and experiences is equally important to the process of obtaining lay knowledge. This is indeed the first study to focus on this aspect, and used SEM to complement the lay knowledge not only while capturing the experience, but also during the process of understanding it. This was done to address a drawback identified in the literature, which was related to how findings were understood, handled, and subsequently presented in a reduced manner. In fact, using SEM helps to present patients and their experiences as a whole person, and it emphasises the interdependence and interaction of individual, social, and contextual factors, and the various levels of SEM (Golden & Earp, 2012; Stokols, 1996). This is also important for GPs whom are involved in the process of providing a customised advice, where, patients' lay knowledge has to be properly understood by GPs and through the eyes of patients to be able to optimise customisation. This is further demonstrated in the successive section through my own experience, and also the findings of this thesis.

Based on my own experience with vitamin D deficiency, my busy life was the main reason behind my lack of compliance, although my conservative attire, hot weather, and lack of a private space for sun exposure would have been the apparent ones in my case. However, using the SEM helped me better understand my own situation by unpacking the experience through the various layers of the model (Figure 6.3). To illustrate, my busy lifestyle at the individual level of SEM is mainly related to the value I place on my professional life, occupation, success, and knowledge, which made me get involved in plenty of activities or duties. At an interpersonal level, I was brought up in a family where both my parents and my siblings are very successful in their professional lives, hence their expectations and the expectations of my peers or colleagues and friends played a role. Also, because of the efforts of the country and government to give opportunities and encourage females to secure managerial positions, this enabling environment encouraged me to further invest in my career. Therefore, I realised that SEM is needed to complement the lay knowledge not only to capture experience, but also during the process of understanding it.

Figure 6.3 Using SEM to understand what underpins the busy life of the researcher.



In relation to this thesis, the value of utilising the multiple levels of SEM in understanding patients' lay knowledge and experience was also demonstrated. Following are only two out of many examples that emerged in the data set. Motherhood and the roles of women and men that have affected the experiences of patients with VDD were innervated by values and beliefs stemming from four levels of SEM: the individual, interpersonal, community and organisational levels. To illustrate, at the individual level, becoming a mother limited vitamin

D acquisition through sunlight or supplements as it involved a shift in priorities, such that family comes first. At the same time, motherhood and all of its related duties are also socially, culturally and religiously defined and driven (Culture of United Arab Emirate, 2020; Hofstede, 2001; United Arab Emirates Country Profile, 2018). Therefore, it is also influenced by the interpersonal and community levels. Similarly, the high rank and authority local cultural norms award to mothers within their families, and the responsibility this gives to operate the household and act as a leader demonstrates a social/cultural influence, which is coming from the organizational level (Culture of United Arab Emirate, 2020; United Arab Emirates Country Profile, 2018). Along similar lines, becoming pregnant meant that these mothers-to-be had to look after themselves to ensure that their foetus is healthy. Yet, participants mentioned that the attention is shifted towards the newborn child immediately after delivery. This is happening due to the influences that are coming from individual, interpersonal and community levels.

Another example was the lack of the ability to get more sunlight exposure due to the women’s conservative and traditional clothing, and the lack of private spaces in the absence of men. So, despite their desire to maintain good health evidenced by their decision to visit the clinic, adhering to cultural and religious obligations was more important to participants. For example, some newly married women talked about living with their in-laws, which hindered their ability to get exposed to sunlight. This is mainly due to the culture of extended families in UAE, which comes from organisational, community, and interpersonal SEM levels. Meanwhile, others talked about how the availability of drivers/gardeners in every Emirati household further complicated their sun exposure experience. In fact, it is normal to have drivers/gardeners, since vast majority of Emiratis belong to the middle social class, therefore they can afford having them. Also, because they live in extended families, these are some of the requirements needed to operate such a huge household. Therefore, this is an indication that the lack of sun exposure by women having such a context is influenced and undergirded by organisational, community and interpersonal levels.

6.3 Contribution related to achieving civic intelligence:

6.3.1 Advocating for civic intelligence during vitamin D-medical consultations

Civic intelligence is defined as the knowledge or intelligence that results from bringing together public lay knowledge, and that of experts in the field 'technical knowledge' (Elliott & Williams, 2008). According to Schuler (2001), it mainly aims to address public- or civic-related issues. Policymakers more commonly use the term civic intelligence in the field of politics, and mainly when the opinion of citizens is crucial for taking a certain decision (Steele, 2015).

Although civic intelligence is more commonly used in politics, it was discussed by Elliott & Williams (2008), in relation to assessing the impact of a new housing project on the health of residents. Local people's lay knowledge, opinions and experiences were considered alongside those of professionals while conducting a health impact assessment of the housing project. This combination of lay and professional expertise helped heighten understanding of the health impact by developing technical and situational understanding and awareness, which allowed complex questions that emerged from and related to citizens' lived contexts to be answered. Consequently, this resulted in producing a more reliable, valid and effective science linked to a richer conception of knowledge, and able to inform social action (Elliott & Williams, 2008).

In relation to the current thesis, this is the first study to discuss the adaptation of civic intelligence during vitamin D-related medical consultations. In various sections of this thesis, there was a clear demonstration that lay knowledge is crucial because of its value in applying patients' understanding to problems or health conditions affecting their own life-situations. It is knowledge in the social context, which is a more integrative and synthetic approach to knowledge, in contrast to the reductive and analytic approaches of most scientific research or knowledge (Brown, 1992; Popay & Williams, 1996). This was demonstrated in this thesis, where participants did not only share a set of contextual factors, their experiences and opinions but also shed light on the dynamics of the impact of their S-E-C contexts on their vitamin D deficiency. Furthermore, the interpretation of participants' quotes revealed an important hidden truth about the specific social context in which these concerns were voiced. This confirms that lay knowledge is more integrative and synthetic, which was found to be very similar to the rationale underpinning the paper of Elliott & Williams (2008). Yet, despite the value of lay knowledge in the context of VDD, technical knowledge should not be de-valued, and in fact, it is equally important and needed for a proper and sensible regime. The difference in this thesis in comparison to Elliott & Williams (2008), is that civic intelligence is promoted and discussed in the context of vitamin D-medical consultations. Where, GPs who own technical knowledge need to collaborate with patients to include their lay knowledge, and consequently produce a medical advice through civic intelligence that is suitable for patients' personal and social contexts. Yet, it is important to recognise that it is not simply advocating the placing of the subjective opinions alongside scientific evidence, but rather getting engaged with lay people who attend to matters of concern relating to their health and their knowledge. This was specifically discussed in the previous section concerning obtaining and understanding lay knowledge, which ultimately should be combined with technical knowledge to achieve civic intelligence.

6.3.2 Researcher's attempts to achieve civic intelligence

Through my conversations with patients, and after obtaining their lay knowledge as discussed earlier, I tried to use civic intelligence when providing vitamin D-related medical advice to participants. This was also done for the first time in the context of vitamin D deficiency. As a clinical pharmacist, I am very much acquainted with VDD's medical guidelines. Hence, after obtaining and understanding participants' lay knowledge, I tried to provide customised advice and see how participants reacted to it. Some participants whom I visited in their homes talked about the lack of private spaces to get exposed to sunlight. I advised them to open the window during the time when the sun rays enter the living room, and get exposed to the sun for 20 minutes from the comfort of their home and sofa, while maintaining privacy. Participants were amased and surprised that this could be possible, and were keen on and excited to try it. Another example is the females who were very concerned about their beauty, did not want to get exposed to sunlight, and tended to forget taking the supplements. I advised them to place the supplements beside their night skincare serums, so it gets introduced to their daily routine. Therefore, in these two examples I used my vitamin D technical knowledge, and my understanding of patients' context to provide tailored advice.

A summary:

The earlier discussion brought to light that to achieve civic intelligence, there is a need to capture lay knowledge, and the process of capturing, and understanding lay knowledge was further enhanced by the application of the SEM. Using both helped to go beyond the apparent contextual factors, recognise that patients are agents and that they have their own personal contexts, which are complex, subjective and interactional. In addition, using SEM alongside lay knowledge and approaching participants as experts helped capture the deeper meanings attached to their experiences, which further flourished understanding. This enabled me to implement civic intelligence with participants.

Furthermore, from this discussion and exercise, I learned that experiences are innervated by a complex interplay of beliefs, values and ideologies relating to various intersecting levels of SEM. These beliefs, values and ideologies could be very similar across people who share similarities in their contexts (for example, extended families, culture, and religion). Consequently, these can be generalised to a degree unlike individual experiences and unique personal contexts. Hence, these common beliefs, values and ideologies are the ones that can be used when creating strategic and tailored health promotion campaigns and for policy-making, as seen later in the recommendation section. Yet, there has to be room left for the unique personal experiences and contexts when creating health promotion campaigns.

6.4 Contributions related to the current practice during vitamin D-related medical consultation:

Based on the findings thus far, it is clear that treatment and preventive options must be tailored to patients' lives and contexts as well as their underlying social, religious, cultural and environmental norms and values (Dobrow, 2009; Dobrow et al., 2006; Leplege et al., 2007; McCance et al., 2011; Romana, 2006; Tomaselli et al., 2020; Tudor et al., 2004; Van Royen et al., 2010). Despite the fact that vitamin D-related medical consultations are suitable moments to provide customised advice, no previous studies have explored what occurs during these consultations in terms of obtaining lay knowledge to implement civic intelligence (Aljefree et al., 2017; Bonevski et al., 2013; Brand et al., 2008; Christie & Mason, 2011; Durvasula et al., 2010; Jang et al., 2013; Kotta et al., 2015; Pirrone et al., 2013). This is the first study to explore the current practice during vitamin D-related medical consultations. This is important to develop an understanding of what underpins the current practice as a baseline, and use this information to render the consultations more suitable for customisation and the implementation of civic intelligence. Furthermore, this is the first study to capture the perspectives of both GPs and patients, which enables differences and commonalities to be seen in relation to the two parties involved in the medical consultation. Therefore, this enables not only answering what questions, but also the how and why questions in relation to the medical consultation. The following sub-sections include a discussion related to GPs' paternalistic approach, their realist view of reality and the partial lay knowledge, civic intelligence and finally the 'premium' version of lay knowledge. Furthermore, within the sections below, there is also a discussion about the perception of both parties, their beliefs and values regarding the utilisation of lay knowledge and experience to customise vitamin D-related medical advice. This is important, where as seen earlier, in the literature review, and during the discussions with stakeholders, participants' practices and behaviours were underpinned by perceptions, beliefs and values. Furthermore, exploring perceptions thought to be crucial, as perception and behaviour are interconnected, and have an important influence on acceptability and consequently, on behavioural change (Colmenares-Quintero et al., 2020; Ferguson & Bargh, 2004; Otara, 2011).

6.4.1 The paternalistic approach

The tension between lay and technical knowledge as well as the hierarchy between physicians and patients appeared to have a major impact on such consultations rendering them paternalistic, with authority and power embodied within the GP. Although this hierarchy and the conflict between technical and lay knowledge are not new (Joseph-Williams et al., 2014; Kinsella, 2002; Lindström & Karlsson, 2016; Popay & Williams, 1996), this study captured it for the first time in the context of vitamin D deficiency. The tension had implications on vitamin D- consultations as further discussed below, which are also described for the first time in the context of vitamin D.

Evidence-based approach or practice is defined as providing care that integrates clinical expertise, evidence from literature and patient or caregiver perspectives (Sackett, 1997; Sackett et alimil., 1996). However, in this study, both GPs and patients confirmed that in the majority of cases, the patient or caregiver perspective was excluded. In fact, the majority of medical consultations and decisions relating to prevention and treatment were mainly based on laboratory values, vitamin D-related medical guidelines, and the use of standardised tools such as SOAP to obtain patient information, none of which consider patients' experiences or provided opportunities for customisation of advice. Findings unraveled that GPs in certain instances, did not establish conversations with their patients, dismissed their feedback, placed them in passive/submissive positions, and made them feel that they were less knowledgeable. This lack of collaboration and patient engagement has affected the nature of the relationship between the patients and GPs, rendering it more unidirectional in which the patients mainly became passive receivers of information. A similar response was seen in Taber et al. (2015): *Doctors often make you feel like you're stupid*. Haw et al. (2018) and Van Teijlingen & Hundley (2002), found that participants who felt that their lay knowledge was de-valued felt frustrated and confused. This dissatisfaction has been shown to result in lack of compliance, missing subsequent appointments and halting the relationship between physicians and their patients (Williams, 1994), which is similar to what was found in this thesis. In addition, due to GPs' preferences to adopt a paternalistic approach, participants mentioned that even health education which should be customised, was instead generalised and standardised. Hence, the same content of vitamin D-related health education was provided to all patients. This also could stem from the findings of quantitative literature and social-psychological models, which emphasised heightening knowledge and awareness to alter behaviour. However, having one schematic model for educating patients might affect their ability to focus on the important and relevant aspects (Nardi et al., 2007; Stokols, 1996).

On the other hand, customisation or patient collaboration is not always favourable as physicians exerting power during the consultation indicates that physicians are confident and feel knowledgeable, and consequently, patients seek their attention and trust their decisions

(Beisecker, 1990; Bending, 2015). The same observation was noted by participants of this thesis. Hence, despite the fact that consultations are suitable moments for implementing civic intelligence, a number of barriers mainly stemming from the culture of medicine, the hierarchy between technical and lay knowledge and preferences towards the paternalistic approach obscured the implementation of civic intelligence and obtaining lay knowledge.

6.4.2 The partial lay knowledge

Healthcare professionals are trained to incorporate their realist view of society or reality in their practice, where they base their decisions on what they observe or can measure (Akobeng, 2005; Cohen & Hersh, 2004). The realist view in this context refers to the philosophic realism which is the view that entities exist independently of being perceived, and can be seen or measured (Merriam & Tisdell, 2015; Schwandt, 2000). Despite the fact that this is not a new concept, this study contributed to the literature by exploring how the realist view of physicians and the tendency to generalise affected the conduction of vitamin D-medical consultations, and customisation of medical advice. Based on the findings of this study not all GPs overlooked patients' experiences. In fact, some customised their advice and treatment, but this was according to what they observed during the consultations or what they knew about the social system. Yet, given that patients' contexts are unique, with hidden information and meanings that cannot be predicted, conclusions should not be drawn based on assumptions and/or observations without exploring the lived experiences of patients. This was further complicated by the cultural competence displayed by some GPs. Cultural competence in healthcare is defined as the providing care to people with different values and beliefs culturally, socially, religiously and more (Becoming a Culturally Competent Health Care Organization, 2013; Brach & Fraser, 2002). However, being culturally competent does not necessarily mean that physicians can simply customise treatment plans based on what they know about the culture and society. In other words, GPs exhibited a tendency to generalise experiences and contextual factors based on the assumption that all people within a specific population deal with the same contextual factors or go through the same experience, which is not the case as discussed earlier. This takes us back to the earlier discussion related to how important it is to obtain a holistic lay knowledge and experience, and avoid generalisation. That is due to the difference between assuming that someone knows the experience and social context and capturing and understanding it fully. Therefore, what appears to be reasonable might not necessarily result in creating a suitable treatment plan, since personal context is unique to that specific patient, and there are hidden information and deep meaning within patients' experiences. An example to demonstrate this is the case of the Canadian woman patient (P14), who although could easily sunbath, she refuses to do so just to respect the culture of the country she is living within.

The discussion above contributes to the understanding that the current practice is not just underpinned by the paternalistic approach, but also by GPs' realist view of reality, and their tendency to generalise. This made them fall into the trap of using a partial lay knowledge and experience, and gauging their decisions based on assumptions and generalised perceptions they made. In fact, this was echoed by Springett et al. (2007), who note that separating contexts and managing diseases and lifestyle behaviours in isolation can prevent explorations of how these contextual factors interrelate, potentially leading to a failure in dealing with the 'real' issues that people face.

6.4.3 GPs' use of civic intelligence

Despite that the vast majority of experiences captured in this thesis are mainly not showing any adaptation of civic intelligence, there are few GPs who adopted it in the right way but for a different medical condition. It was important to capture this as it helps assess the plausibility of adopting civic intelligence in the context of the study location 'healthcare centers'. For instance, GP (GP10) gave an example of his hypertensive patient who refused to take a diuretic, despite it is a first-line agent against hypertension. Upon further questioning by the GP, she mentioned that she cannot access the bathroom many times at night. The physician did not stop at that point, but in fact went on to further understand her situation, and he came to know that she is living in a shared apartment and feels embarrassed to access the bathroom multiple times at night. Hence, this did not only help the physician to change the diuretic, but also avoid any other option that could trigger the same concern. In this example, the patient was empowered to communicate, which have led to sharing her specific and unique experience with using the medication in the context of shared housing, and the meanings attached to her experience. A similar observation was seen in this thesis when I approached participants as experts, which enabled them to speak freely and deeply about their S-E-C contexts, and their experiences. In fact, as per Haskard Zolnierek & DiMatteo (2009), and Stewart (1995), caring, respecting, and empowering communicative physician-patient context is shown to improve patient satisfaction and adherence through patients' involvement and participation in their care.

6.4.4 Perception of both parties about adopting civic intelligence

As seen earlier, participants' perception was captured in the quantitative literature, but it was mainly focused towards a certain behaviour (for example, exposure to sun). This thesis, however, explored for the first time the perception of patients and GPs towards the adaptation of civic intelligence during vitamin D-medical consultations. The perception of both GPs and patients towards this approach was in majority of times positive, because they regarded themselves as experts in what works best for them, and believed that such customisation will help heighten their adherence to the suggested plan or regime. This reflects the work of Britten (2008), and Entwistle et al. (2010), who found that when patients are actively involved in decision-making about their healthcare, they show better health outcomes. In addition, for some GPs this approach enabled patients to shoulder part of their health responsibility, helping preserve their autonomy and render the treatment plan more appealing, thus increasing their compliance.

On the contrary, a very small number of participants in this thesis who were mainly patients questioned the effectiveness of using lay knowledge and contextual information to customise VDD treatment and preventive plans. That is mainly because the prevalence is very high in UAE, and these participants thought that the vast majority of people have the deficiency irrespective of their context or experience. Such an opposing or negative perception was captured for the first time in vitamin D literature. This was an eye-opener and a useful insight for the recommendations section, where health promotion campaigns should not only target what needs to be done as seen in the literature, but also addresses this perspective.

Furthermore, as physicians are heavily involved in the process of obtaining and understanding lay knowledge and experience to achieve civic intelligence; their feedback is of prime importance. GPs were concerned about the feasibility of this practice, particularly given that the consultation does not last more than 12 minutes and in the majority of times, patients have other comorbidities that need to be addressed during the same consultation. Therefore, GPs felt that they have to prioritise and spend more time on chronic diseases such as hypertension and diabetes. Hence, although some GPs valued this approach, the feasibility remains to be a challenge. This was a useful feedback regarding the structure and length of consultation, which, as seen in the recommendations section, helped put forward recommendations and suggestions to enable conducting this activity.

6.4.5 The premium version of lay knowledge

The findings of this thesis revealed a new hierarchy for the first time, which is a hierarchy in lay knowledge itself. It was observed that when GPs have vitamin D deficiency and become patients, they utilise their lay knowledge to complement the technical knowledge during the consultation. In other instances, they transfer their lay knowledge to patients in a form of technical knowledge. In fact, just because GPs are considered the experts in the field and hold higher power in that specific patient–physician context, their lay knowledge received higher ranking compared to that of patients, and patients were willing to accept it. This indicates that the hierarchy in the lay knowledge itself is based on the source of it, if GPs are producing it, then it is premium and equivalent to technical knowledge, while if patients are producing it, it is considered to be of less value.

The outcome of combining technical knowledge with GPs’ lay knowledge was also captured for the first time. In certain instances, it was found to be advantageous due to sharing techniques stemming from GPs’ experience with VDD to help their patients become more adherent (linking supplement intake to Friday prayers timing or using mobile devices as reminders). Furthermore, if GPs were not compliant, they were criticising less, which created a comfortable environment for their patients to freely admit and discuss their lack of compliance. However, it is important to remember that physician’s lay knowledge might not necessarily suit the patient, since each person has his/her own unique context and consequently experience. Therefore, some vitamin D-deficient GPs were unable to understand why the techniques that worked well for them, still are not working for their patients (for example, mobile phone reminders). Hence, in summary, when GPs had vitamin D deficiency, they used their lay knowledge either to provide the techniques they have used to help heighten their patients' compliance, or to understand patients’ struggles or to compare their compliance to that of their patients.

<u>A summary:</u>

In general, most GPs in this study did not acknowledge the value of lay knowledge, did not envisage patients as experts and in most of the time preferred to go solely with their technical knowledge. That is mainly because the current vitamin D-related medical consultations are underpinned by the tension between technical and lay knowledge, and hierarchy between patients and physician. Although the tension and hierarchy are not new, this study unravels it for the first time in the context of vitamin D. It also suggests that to advocate for utilising lay knowledge during vitamin D-related medical consultations, it is important to target this tension and the value of patients' lay knowledge and their expertise. In other words, if this to be implemented and to be successful, physicians should acknowledge the value of using patients' lay knowledge to complement their technical knowledge, combining to what this thesis describes as 'civic intelligence'. On the other hand, although some GPs tried to customise, they customised using the partial 'observed' lay knowledge, which might not be entirely suitable for patients.

The current study also helped capture another hierarchy for the first time, which is within lay knowledge itself. It is basically, when lay knowledge is coming from GPs, then it is accorded greater credibility and importance than the lay knowledge of patients. GPs who were also vitamin D patients complemented their technical knowledge with their own lay knowledge. Although this was useful in certain instances, it was unsuitable for other patients, since GPs experiences and contexts differ from that of patients.

6.5 Reflexivity

Reflexivity is important, given the role of the researcher in qualitative research, and its implications on the research and the data collected. Being a female researcher had its own influence, especially in the UAE, where gender is important (Culture of United Arab Emirate, 2020; United Arab Emirates Country Profile, 2018). In this thesis, the women participants were more relaxed and disclosed more information about certain topics such as motherhood because they felt it was relevant, and that I can relate to since I am a female. However, the men did not discuss their domestic issues or activities in-depth, and were reserved in front of me, and wanted to primarily talk about their breadwinning role. In terms of recruitment, recruiting males in general was more difficult than recruiting females. Yet, recruiting male patients proved to be more difficult than recruiting male GPs. This could be attributed to the cultural and religious restraints, where it is unacceptable for a woman to sit and chat with a man she is not acquainted with (Culture of United Arab Emirate, 2020; United Arab Emirates Country Profile, 2018). However, for the GPs, it was not an issue, since it occurred in the clinic, and seeking medical attention from a male physician by a female patient is considered acceptable (Culture of United Arab Emirate, 2020; United Arab Emirates Country Profile, 2018). Interestingly, vast majority of males both GPs and patients did not maintain eye contact with me, which confirms that certain boundaries pertaining to the interaction of opposing gender has to be maintained.

Furthermore, my age (30s) influenced the way how participants communicated and interacted with me. In certain instances, I felt that I was dealt with as a junior fellow especially when I was interviewing participants who are older than me. This made some of the participants feel that they have a higher authority or power due to their seniority (age). In other instances, I felt that some of the ‘senior’ participants when they answered the questions, they answered in a way that this is the correct and ultimate approach, which should not be questioned or further discussed.

Since I am a healthcare professional (a clinical pharmacist) with an academic post, this affected the way how both GPs and patients interacted with me. Some GPs felt intimidated by my presence, felt as if they were being assessed, and in certain instances, tried to verify the accuracy of their answers, although all assurances were provided that this was not my intension. This was found to be very similar to the experience of the pharmacist participant in this thesis, who felt that his presence might have challenged GPs' authority and power. On the other hand, patients participants had a different experience, and valued my expertise and profession as being both an academic and a clinical pharmacist. When patients participants were given my business card, in majority of times, they were more relaxed, welcomed the idea of conducting an interview and sometimes even invited me to their households.

Finally, being an Emirati, Muslim and coming from a middle social class also seemed to have an effect. In this regard, some Emiratis saw me as an insider, who could easily understand and relate to the aspects they were discussing, thus supporting the interviews (for example living with their in-laws). Yet, it is important to also understand that Emiratis themselves differ. For example, Emirati females dress differently, where some are more conservative than others are. Therefore, when I (wearing headscarf) interviewed the ones who were not wearing a headscarf, they talked less about it. On the other hand, with the expatriates, because they are immigrants being interviewed by an Emirati, they did not want to criticise the weather or lifestyles or the negative impact of having to immigrate to UAE or discuss their religious practices. Yet, as they considered me an outsider, they wanted to further enlighten me about the differences between their home countries and the UAE, and how the immigration have changed their lifestyle, while trying to be less negative about it.

6.6 Recommendations

Based on the findings of this research the following recommendations can be made:

6.6.1 Recommendations related to obtaining lay knowledge during the short consultations:

- Using a check-list by GPs that is undergirded by the various levels of SEM to obtain patients' lay knowledge holistically and accurately. Also, given the current structure and length of consultation (12 minutes), the check-list will help render the consultation and conversation more purposeful, hence a better utilisation of the consultation time.

- Providing an accumulative calculated duration for consultation, which should be calculated based on the condition/s. For example, if a patient is coming for vitamin D deficiency, the allocated time for the consultation might be approximately 10 minutes (this is a theoretical example). However, if the patient is suffering from vitamin D deficiency, hypertension or diabetes, then the consultation duration will increase based on all the conditions. The decision related to the minutes allocated for each condition should be based on the average time spent with patients having these conditions. Such information can be obtained from the hospital or the clinic registry. This way even the duration of the consultation is customised based on the case or situation.

6.6.2 Recommendations related to achieving civic intelligence

- The organisational level in healthcare, medical curriculums, internship programmes and medical or treatment guidelines should promote adopting civic intelligence, and collaboration between patients and physicians. This should entail conducting training and professional development sessions to educate, train and encourage GPs on how to implement civic intelligence.
- In terms of health promotion campaigns, patients need not only to be informed about VDD (seen in section 6.6.3 below), but also about how their lay knowledge might heighten the chance of success to provide a tailored advice. Therefore, the health promotion campaigns should encourage them to share their experiences and lay knowledge, and meet physicians halfway. In addition, the health promotion campaigns should educate patients on their role in rendering the treatment successful, where their compliance to one or more of the options available is essential to succeed.

- Developing VDD patients groups to harness the collective experience of patients, therefore gives them greater power and leverage.

6.6.3 Recommendations related to methods used to develop population-wide and individualised strategic health promotion campaigns

- Developing a series of strategic health promotion campaigns that address the common or shared ideologies, values and beliefs among a population, according to the various levels of SEM. In addition, the promotion campaigns should be designed to empower patients to take an active role in resolving their VDD according to their own unique personal contexts. To illustrate, the promotion campaigns and messages should acknowledge the common contextual barriers (for example, wearing conservative attire), yet it should try to put forward solutions for it (for example, opening the window and letting the sun rays in), and encourage participants in the promotion campaigns to think of suitable solutions. This way although the health promotion campaigns are targeting common factors, it is also shedding light on the variations in individuals' own contexts and experiences, by encouraging patients to take an active role in findings the suitable techniques to improve or prevent their VDD. By doing so, these promotion campaigns will also acknowledge the heterogeneity of the population in Dubai and hence, address all segments of the population. For instance, for some patients going to the beach would be feasible, for others opening the window to allow the sun rays and accordingly achieve exposure is more preferred. These approaches are different from the existing VDD health promotion campaigns, which mainly aim to disseminate information and raise awareness.

6.6.4 Recommendations related to conducting research

- The combination of lay knowledge and SEM should be envisaged as a school of thought, and should be used to explore the experiences of patients who suffer from chronic conditions. That is due to the fact that experience and behaviour are expected to be affected by the unique S-E-C contexts of patients in the same manner as VDD. In fact, I used merits of both lay knowledge and SEM when researching people's perceptions concerning the deceased organ donation programme in UAE (AlHajri et al., 2021). The outcome was that people’s perception was affected by a wide range of contextual factors, which were underpinned by common and/or personal ideologies coming from various levels of SEM. Accordingly, it was concluded that such findings should be part of the promotion campaigns to heighten the acceptability of this program amongst the public. Another example is obesity, where a systematic review that used the socio-ecological model to synthesise studies found that the discussion related to addressing obesity and overweight is always at the individual level, despite acknowledging the impact of the remaining levels (Melius, 2015). This is similar to the concerns observed vitamin D literature. Hence, using both frameworks should not be limited to vitamin D deficiency, but rather should inform conceptually a wide range of conditions that are affected by behaviour, and require a behavioural change, which means almost all medical conditions.

6.7 Limitations

The findings of this study have to be seen in light of some limitations. The researcher’s role in qualitative research is crucial, therefore, it is worth discussing the primary researcher’s expertise and specialty. I am originally a clinical pharmacist, who was mainly and only conducting quantitative studies. During the course of my studies, I started exploring qualitative methodology, and used it for my thesis. Despite being a novice at first, I attended

180 credit hours of courses in various areas related to research. Furthermore, throughout the research phase, two academics who are experts in qualitative methodologies closely supervised me and provided guidance. In addition, I am Arab, Emirati female and Muslim, and these characteristics, as discussed earlier, have influenced the study. Given the heterogeneity of the population, in certain instances, my characteristics matched the population I was interviewing. But, in other instances, my characteristics were not matching those of participants, and I was considered an outsider. This might have been a source of bias, where the depth and breadth of data obtained in these two scenarios might vary. Having a male expatriate (non-Emirati) researcher or interviewer would have been an added value in addressing the gender and cultural barriers. Yet, it was not possible to do it differently for practicality and feasibility reasons, the lack of funds, and that I am a PhD student who needs to get engaged in the process, do the actual work and collect the data used in the thesis. Furthermore, the lack of funds also did not allow me to recruit translators to help translate the 40 interviews and alleviate my fatigue and stress.

Regarding the methodology, some limitations are also worth discussing. GPs were mainly Muslims, and although the researcher attempted to recruit non-Muslims, it was extremely difficult to find non-Muslim GPs, unlike other specialities. Hence, any finding that alluded to non-Muslim GPs was based only on patients' experiences. Another important point is the length of the recruitment process, which could have been shortened by conducting it through electronic platforms such as social media or LinkedIn. Yet, this was the preference of the gatekeepers at Dubai Health Authority (study location). In addition, GPs interviews were shorter than that of patients', and also were shorter than expected. The main reason for this is the location of the interview (GPs offices), where it is expected that it would be longer if it occurred in different locations such as the clinic coffee shop or canteen or outside the working place. However, maintaining a natural setting was also crucial in making this decision, and therefore, I decided to increase the number of interviews to compensate for this. Although the participants came from various professions, all of them were highly skilled. Unfortunately, the data did not include the experiences of blue-collar workers, which is also expected to bring about different outcomes, and will also be useful in designing health promotion campaign that targets all segments of the population. The different circumstances expected to arise from blue-collar workers' experience include: living in hostels or shared housing and bedrooms, having long working hours, lower wages and basic insurance plans that preclude vitamin D laboratory tests and supplements. Including the blue-collar workers would have been possible if an additional researcher who speaks their languages was part of the research team, since I can only speak Arabic and English.

6.8 Summary

As seen in the Results and Discussion chapters, individuals and their lived experiences within their S-E-C contexts are too intricate to deal with it lightly. The use of a combination of lay knowledge and SEM to capture and understand experiences during the medical consultation is crucial to unravel the holistic experience, deep meanings, ideologies, values and beliefs. Moreover, although customisation of vitamin D-related medical advice is important, this is complicated by preferences to the paternalistic approach, the conflict between technical and lay knowledge, the hierarchy between GPs and patients, GPs realist view of reality and the current structure and duration of the consultation. Civic intelligence offers a way forward, and to do so, some work needs to be done to heighten the acceptability of this approach, mainly through promotion campaigns and training sessions, using suitable checklists and by tailoring the length of consultation according to the patient's case.

Chapter Seven

Conclusion

In general, the prevalence of vitamin D deficiency remains high, despite the ongoing efforts, which indicates that this phenomenon might require a different and new approach. The subjective and complex social, environmental and cultural contexts of patients are major players in affecting their behaviour and consequently, their vitamin D status. Hence, customisation of the health advice and treatment according to patients' S-E-C context is necessary.

The first research question aimed to explore the experience of patients who were vitamin D deficient within their social context. Although this is not the first study to focus on experiences related to VDD, it is indeed the first to use the merits of both lay knowledge and SEM while obtaining the experience or lay knowledge in the context of vitamin D deficiency. While obtaining participants' lay knowledge, some key characteristics related to patients' experience and lay knowledge surfaced, for example, patients, their experiences and S-E-C contexts are unique, subjective, complex, unpredictable, and should be maintained as such. Therefore, obtaining and understanding lay knowledge must be properly conducted to ensure that experience is holistic, thus enhancing the customisation of medical advice. Another important finding was that the shared lay knowledge might be partial, mainly because the depth and breadth of information provided through it is affected by multiple factors, as discussed earlier. In addition, experiences are underpinned by meanings, which are equally important to develop a deep understanding. Using SEM alongside lay knowledge helped to go beyond the common and predictable contextual factors to unravel new ones, maintain the complexity of experiences, move away from generalising one person's experience to the whole population, and unleash the deeper meanings attached to participants' experiences. Along the same line, using SEM helped understand experiences as they appear, as well as the values, beliefs, and ideologies that underpin their experiences. Hence, the answer to the first research question not only confirmed that S-E-C context is a major player in VDD, but also highlighted that obtaining and understanding lay knowledge needs to be done diligently.

Studies in the literature advocated for tailored health promotion campaigns, yet it is worth noting that VDD gets first diagnosed in the physician's office. Hence, customisation of vitamin D-related medical advice must be done based on lay knowledge and technical knowledge, referred to as 'civic intelligence' (Elliott & Williams, 2008). I tried to achieve civic intelligence by combining my technical knowledge and the participants' lay knowledge, which was done for the first time in the context of vitamin D deficiency. It helped me experience implementing civic intelligence with patient participants in this thesis to observe their acceptability of this approach. Also, it allowed me to try to compare my experience with implementing it with the current practice related to vitamin D-medical consultations as seen in the discussion chapter.

The second and third research questions were more focused on vitamin D-medical consultations, given the ample opportunity it provide to pass on customised medical advice. It was observed that the literature did not explore what occurs during vitamin D-medical consultations. This baseline information is important to help understand the status quo and put forward strategic and suitable recommendations for implementing civic intelligence. Therefore, this was considered to be an important addition to the body of knowledge. The current practice related to vitamin D-medical consultations was mainly geared by the paternalistic approach that focused on technical knowledge, and precluded the lay knowledge and experiences of patients. It is also underpinned by the realist view of reality that GPs have and adopt during their practice. In addition, the findings captured for the first time a hierarchy within lay knowledge itself, where lay knowledge is considered premium if it comes from experts in the field. The current perception of both GPs and patients regarding the use of lay knowledge during vitamin D-related medical consultations was between being negative and positive. Physicians specifically talked about how the current structure and duration of medical consultations might not be feasible and hinder the ability to spend time customising vitamin D-related medical advice.

The findings of this thesis, and the knowledge gathered have helped put forward a number of recommendations starting with recommendations related to obtaining lay knowledge and achieving civic intelligence during medical consultations. That is because the thesis findings provided baseline information related to vitamin D-medical consultations, and the perception of the two parties involved in it (GPs and patients). It is also important to bear in mind that this study is not devaluing the importance of health promotion campaigns, and accordingly it puts forward recommendations for developing population-wide and individualised strategic health promotion campaigns. The difference in this thesis though is that it shows the difference between the personal context and experience, and the common or shared ideologies, values and beliefs of a population. The recommendations emphasise targeting common ideologies, values and beliefs during the promotion campaigns, but equally emphasise empowering patients to work around the obstacles they face in their daily lives. Finally, given that using a combination of lay knowledge and SEM helped unravel valuable information, this thesis also recommends using this combination when exploring the experiences of patients with chronic conditions that are affected heavily by the behaviour. In other words, this thesis also provided recommendations related to research targeting the experiences of patients suffering from a wide range of conditions.

8. References:

Abdelgadir, E., Rashid, F., Basheir, A., AlAwadi, F., AlSuwidi, H., & Eltinay, A. (2016). Vitamin D Deficiency, the Volume of the Problem in the United Arab Emirates. A Cohort from the Middle East. *Symbiosis*. https://symbiosisonlinepublishing.com/endocrinology-diabetes/endocrinology-diabetes44.pdf

Adams, J. S., Clemens, T. L., Parrish, J. A., & Holick, M. F. (1982). Vitamin-D synthesis and metabolism after ultraviolet irradiation of normal and vitamin-D-deficient subjects. *The New England Journal of Medicine*, *306*(12), 722–725. https://doi.org/10.1056/NEJM198203253061206

Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In J. Kuhl & J. Beckmann (Eds.), *Action Control: From Cognition to Behavior* (pp. 11–39). Springer. https://doi.org/10.1007/978-3-642-69746-3_2

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I., & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior*. Prentice-Hall.

Akobeng, A. K. (2005). Principles of evidence based medicine. *Archives of Disease in Childhood*, *90*(8), 837–840. https://doi.org/10.1136/adc.2005.071761

Al Anouti, F., Thomas, J., Abdel-Wareth, L., Rajah, J., Grant, W. B., & Haq, A. (2011). Vitamin D deficiency and sun avoidance among university students at Abu Dhabi, United Arab Emirates. *Dermato-Endocrinology*, *3*(4), 235–239. https://doi.org/10.4161/derm.3.4.16881

Al Bathi, B. A., Al Zayed, K. E., Qenai, M. A., Makboul, G., & El-Shazly, M. K. (2012). Knowledge, attitude and practice of patients attending primary care centers toward vitamin D in Kuwait. *Alexandria Journal of Medicine*, *48*(3), 277–282. https://doi.org/10.1016/j.ajme.2012.02.003

Al Zarooni, A. A. R., Al Marzouqi, F. I., Al Darmaki, S. H., Prinsloo, E. A. M., & Nagelkerke, N. (2019). Prevalence of vitamin D deficiency and associated comorbidities among Abu Dhabi Emirates population. *BMC Research Notes*, *12*(1), 503. https://doi.org/10.1186/s13104-019-4536-1

Alamoudi, L. H., Almuteeri, R. Z., Al-Otaibi, M. E., Alshaer, D. A., Fatani, S. K., Alghamdi, M. M., & Safdar, O. Y. (2019). Awareness of Vitamin D Deficiency among the General Population in Jeddah, Saudi Arabia. *Journal of Nutrition and Metabolism*, *2019*, 4138187. https://doi.org/10.1155/2019/4138187

Al-Anouti, F., Abdel-Wareth, L., Rajah, J., Haq, A., Devkaran, S., Thomas, J., & Al-Ameri, S. (2013). *Sun avoidance among indoor employees leading to vitamin D deficiency and depression in the United Arab Emirates*. https://globalscienceresearchjournals.org/gjmms/314922013647

Aljefree, N., Lee, P., & Ahmed, F. (2017). Exploring Knowledge and Attitudes about Vitamin D among Adults in Saudi Arabia: A Qualitative Study. *Healthcare (Basel, Switzerland)*, *5*(4). https://doi.org/10.3390/healthcare5040076

Aljefree, N. M., Lee, P., & Ahmed, F. (2017). Knowledge and attitudes about vitamin D, and behaviors related to vitamin D in adults with and without coronary heart disease in Saudi Arabia. *BMC Public Health*, *17*(1), 266. https://doi.org/10.1186/s12889-017-4183-1

Allison, K. R. (1991). Theoretical issues concerning the relationship between perceived control and preventive health behaviour. *Health Education Research*, *6*(2), 141–151. https://doi.org/10.1093/her/6.2.141

Al-Mogbel, E. S. (2012). Vitamin D status among Adult Saudi Females visiting Primary Health Care Clinics. *International Journal of Health Sciences*, *6*(2), 116–126.

Altaher, N. (2016, May 15). *UAE one of world's highest in Vitamin D deficiency*. GulfNews. http://gulfnews.com/news/uae/health/uae-one-of-world-s-highest-in-vitamin-d-deficiency-1.1831384

American Academy of Dermatology and AAD Association. (2009). *Position Statement on VITAMIN D*. American Academy of Dermatology and AAD Association. https://www.aad.org/Forms/Policies/Uploads/PS/PS-Vitamin%20D.pdf

Anglin, R. E. S., Samaan, Z., Walter, S. D., & McDonald, S. D. (2013). Vitamin D deficiency and depression in adults: Systematic review and meta-analysis. *The British Journal of Psychiatry*, *202*(2), 100–107. https://doi.org/10.1192/bjp.bp.111.106666

Ansmann, L., & Pfaff, H. (2017). Providers and Patients Caught Between Standardization and Individualization: Individualized Standardization as a Solution. *International Journal of Health Policy and Management*, *7*(4), 349–352. https://doi.org/10.15171/ijhpm.2017.95

Anwar, M., El-Dahiyat, F., Jairoun, A., Raed, R., Butt, I., Abdel-Majid, W., & Abdelgadir, H. (2019). The sunshine under our skin: Public knowledge and practices about vitamin D deficiency in Al Ain, United Arab Emirates. *Archives of Osteoporosis*, *14*(1), 111. https://doi.org/10.1007/s11657-019-0671-5

Arora, H., Dixit, V., & Srivastava, N. (2016). EVALUATION OF KNOWLEDGE, PRACTICES OF VITAMIN D AND ATTITUDE TOWARDS SUNLIGHT AMONG INDIAN STUDENTS. *Asian Journal of Pharmaceutical and Clinical Research*, 308–313.

Austin, Z., & Sutton, J. (2014). Qualitative Research: Getting Started. *The Canadian Journal of Hospital Pharmacy*, *67*(6), 436–440.

Autier, P., & Gandini, S. (2007). Vitamin D supplementation and total mortality: A meta-analysis of randomized controlled trials. *Archives of Internal Medicine*, *167*(16), 1730–1737. https://doi.org/10.1001/archinte.167.16.1730

Aveyard, H., Payne, S., & Preston, N. (2016). *A Postgraduate'S Guide To Doing A Literature Review In Health And Social Care* (1 edition). Open University Press.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory* (pp. xiii, 617). Prentice-Hall, Inc.

Bandura, A. (1989). Regulation of cognitive processes through perceived self-efficacy. *Developmental Psychology*, *25*(5), 729–735. https://doi.org/10.1037/0012-1649.25.5.729

Bandura, A. (1994). Social cognitive theory of mass communication. In *Media effects: Advances in theory and research* (pp. 61–90). Lawrence Erlbaum Associates, Inc.

Bandura, A. (1997). *Self-efficacy: The exercise of control* (Vol. ix). W H Freeman/Times Books/ Henry Holt & Co.

Bandura, A. (2001). Social Cognitive Theory: An Agentic Perspective. *Annual Review of Psychology*, *52*(1), 1–26. https://doi.org/10.1146/annurev.psych.52.1.1

Bandura, A. (2004). Health Promotion by Social Cognitive Means. *Health Education & Behavior, 31*(2), 143–164. https://doi.org/10.1177/1090198104263660

Bani-issa, W., Eldeirawi, K., Harfil, S., & Fakhry, R. (2017). Vitamin D Deficiency and Its Determinants in Adults: A Sample from Community-Based Settings in the United Arab Emirates. *International Journal of Endocrinology*, *2017*, e3906306. https://doi.org/10.1155/2017/3906306

Banning, J. (2003). *Ecological triangulation: An approach for qualitative meta-synthesis*. US Department of Education. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.152.5185&rep=rep1&type=pdf

Barnett-Page, E., & Thomas, J. (2009). Methods for the synthesis of qualitative research: A critical review. *BMC Medical Research Methodology, 9*(1), 59. https://doi.org/10.1186/1471-2288-9-59

Batieha, A., Khader, Y., Jaddou, H., Hyassat, D., Batieha, Z., Khateeb, M., Belbisi, A., & Ajlouni, K. (2011). Vitamin D status in Jordan: Dress style and gender discrepancies. *Annals of Nutrition & Metabolism*, *58*(1), 10–18. https://doi.org/10.1159/000323097

Baumeister, F., Heatherton, T. F., Baumeister, R. F., & Heatherton, T. F. (1996). *TARGET ARTICLE Self-Regulation Failure: An Overview*.

Becker, H. (1998). *Tricks of the Trade: How to Think about Your Research While You're Doing It* (1 edition). University Of Chicago Press.

Becker, M. (1974). The Health Belief Model and Sick Role Behavior*: *Health Education Monographs*. https://doi.org/10.1177/109019817400200407

Becoming a Culturally Competent Health Care Organization. (2013). https://www.aha.org/ahahret-guides/2013-06-18-becoming-culturally-competent-health-care-organization

Beisecker, A. E. (1990). Patient Power in Doctor-Patient Communication: What Do We Know? *Health Communication, 2*(2), 105–122. https://doi.org/10.1207/s15327027hc0202_4

Bending, Z. J. (2015). Reconceptualising the doctor-patient relationship: Recognising the role of trust in contemporary health care. *Journal of Bioethical Inquiry*, *12*(2), 189–202. https://doi.org/10.1007/s11673-014-9570-z

Berger, P. L., & Luckmann, T. (2011). *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*. Open Road Media.

BetterYou. (2019). *Raising awareness of vitamin D deficiency—VDA Campaign 2019*. BetterYou. https://betteryou.com/raising-awareness-vitamin-d-deficiency

Bezuglov, E., Tikhonova, A., Zueva, A., Khaitin, V., Waśkiewicz, Z., Gerasimuk, D., Żebrowska, A., Rosemann, T., Nikolaidis, P., & Knechtle, B. (2019). Prevalence and Treatment of Vitamin D Deficiency in Young Male Russian Soccer Players in Winter. *Nutrients*, *11*(10), Article 10. https://doi.org/10.3390/nu11102405

Bird, C. (2005). How I Stopped Dreading and Learned. *Qualitative Inquiry*, *11*(2). https://doi.org/10.1177/1077800404273413

Boland, S., Irwin, J. D., & Johnson, A. M. (2015). A survey of university students’ vitamin D-related knowledge. *Journal of Nutrition Education and Behavior*, *47*(1), 99–103. https://doi.org/10.1016/j.jneb.2014.08.013

Bonevski, B., Bryant, J., Lambert, S., Brozek, I., & Rock, V. (2013). The ABC of vitamin D: A qualitative study of the knowledge and attitudes regarding vitamin D deficiency amongst selected population groups. *Nutrients*, *5*(3), 915–927. https://doi.org/10.3390/nu5030915

Booth, A., Sutton, A., & Papaioannou, D. (2016). *Systematic Approaches to a Successful Literature Review* (2 edition). SAGE Publications Ltd.

Boyatzis, R. E. (1998). *Transforming Qualitative Information: Thematic Analysis and Code Development* (1 edition). SAGE Publications, Inc.

Brach, C., & Fraser, I. (2002). Reducing Disparities through Culturally Competent Health Care: An Analysis of the Business Case. *Quality Management in Health Care*, *10*(4), 15–28.

Brand, C. A., Abi, H. Y., Couch, D. E., Vindigni, A., & Wark, J. D. (2008). Vitamin D deficiency: A study of community beliefs among dark skinned and veiled people. *International Journal of Rheumatic Diseases*, *11*(1), 15–23. https://doi.org/10.1111/j.1756-185X.2008.00323.x

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. http://dx.doi.org.ezproxy.hct.ac.ae/10.1191/1478088706qp063oa

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, *11*(4), 589–597. https://doi.org/10.1080/2159676X.2019.1628806

Braun, V., & Clarke, V. (2021). To saturate or not to saturate? Questioning data saturation as a useful concept for thematic analysis and sample-size rationales. *Qualitative*

Research in Sport, Exercise and Health, *13*(2), 201–216. https://doi.org/10.1080/2159676X.2019.1704846

Britten, N. (2008). *Medicines and Society: Patients, Professionals and the Dominance of Pharmaceuticals*. Macmillan Education UK.

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist*, *32*(7), 513–531. https://doi.org/10.1037/0003-066X.32.7.513

Brown, P. (1992). Popular Epidemiology and Toxic Waste Contamination: Lay and Professional Ways of Knowing. *Journal of Health and Social Behavior*, *33*(3), 267–281. https://doi.org/10.2307/2137356

Bryman, A. (2012). *Social Research Methods, 4th Edition* (4th edition). Oxford University Press.

Bureau, O. (2018). *MyMedicineBox launches nationwide Vitamin-D deficiency awareness campaign*. @businessline. https://www.thehindubusinessline.com/news/mymedicinebox-launches-nationwide-vitamind-deficiency-awareness-campaign/article10033178.ece

Burke, N. J., Joseph, G., Pasick, R. J., & Barker, J. C. (2009). Theorizing social context: Rethinking behavioral theory. *Health Education & Behavior: The Official Publication of the Society for Public Health Education*, *36*(5 Suppl), 55S-70S. https://doi.org/10.1177/1090198109335338

Carson, D., Gilmore, A., Perry, C., & Gronhaug, K. (2001). *Qualitative Marketing Research*. SAGE.

Charmaz, K. (2006). *Constructing Grounded Theory: A Practical Guide through Qualitative Analysis*. SAGE.

Chaudhary, S. B. (2017, October 15). *90% of UAE population Vitamin D deficient, says DHA official*. GulfNews. https://gulfnews.com/news/uae/society/90-of-uae-population-vitamin-d-deficient-says-dha-official-1.2113556

Christie, F. T. E., & Mason, L. (2011). Knowledge, attitude and practice regarding vitamin D deficiency among female students in Saudi Arabia: A qualitative exploration. *International Journal of Rheumatic Diseases*, *14*(3), e22-29. https://doi.org/10.1111/j.1756-185X.2011.01624.x

Cohen, A., & Hersh, W. (2004). Criticisms of Evidence–Based Medicine. *Cardiovascular Medicine*, *8*, 197–198.

Colmenares-Quintero, R. F., Benavides-Castillo, J. M., Rojas, N., & Stansfield, K. E. (2020). Community perceptions, beliefs and acceptability of renewable energies projects: A systematic mapping study. *Cogent Psychology*, *7*(1), 1715534. https://doi.org/10.1080/23311908.2020.1715534

Cooke, A., Smith, D., & Booth, A. (2012). Beyond PICO: The SPIDER tool for qualitative evidence synthesis. *Qualitative Health Research*, *22*(10), 1435–1443. https://doi.org/10.1177/1049732312452938

Creswell, J. W. (2012). Five Qualitative Approaches to Inquiry. In *Qualitative Inquiry and Research Design: Choosing Among Five Approaches* (3 edition, pp. 69–110). SAGE Publications, Inc.

Creswell, J. W. (2013). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 4th Edition* (4th edition). SAGE Publications, Inc.

Crotty, M. (1998). *The Foundations of Social Research | SAGE Publications Ltd*. https://uk.sagepub.com/en-gb/mst/the-foundations-of-social-research/book207972

Crowe, M. (2015, December 8). Crowe Critical Appraisal Tool (v1.4). *Conchra*. https://conchra.com.au/2015/12/08/crowe-critical-appraisal-tool-v1-4/

Crowe, M., Inder, M., & Porter, R. (2015). Conducting qualitative research in mental health: Thematic and content analyses. *The Australian and New Zealand Journal of Psychiatry*, *49*(7), 616–623. https://doi.org/10.1177/0004867415582053

Crowe, M., & Sheppard, L. (2011). A general critical appraisal tool: An evaluation of construct validity. *International Journal of Nursing Studies*, *48*(12), 1505–1516. https://doi.org/10.1016/j.ijnurstu.2011.06.004

Cui, A., Zhang, T., Xiao, P., Fan, Z., Wang, H., & Zhuang, Y. (2023). Global and regional prevalence of vitamin D deficiency in population-based studies from 2000 to 2022: A pooled analysis of 7.9 million participants. *Frontiers in Nutrition*, *10*, 1070808. https://doi.org/10.3389/fnut.2023.1070808

Culture of United Arab Emirate. (2020). *Culture of United Arab Emirates—History, people, women, beliefs, food, customs, family, social, dress*. https://www.everyculture.com/To-Z/United-Arab-Emirates.html

Data Protection Act. (1998). Stationery Office Books.

Data protection act. (2018). GOV.UK. https://www.gov.uk/data-protection

Daynurseries. (2012). *Doctors launch campaign to tackle vitamin D deficiency in children*. https://www.daynurseries.co.uk/news/article.cfm/id/1558554/royal-college-of-paediatrics-and-child-health-launch-campaign-to-tackle-vitamin-d-deficiency

Denzin, N. K. (1989). *Interpretive biography* (p. 95). Sage Publications, Inc.

Devereaux, P. J., Manns, B. J., Ghali, W. A., Quan, H., & Guyatt, G. H. (2002). The reporting of methodological factors in randomized controlled trials and the association with a journal policy to promote adherence to the Consolidated Standards of Reporting Trials (CONSORT) checklist. *Controlled Clinical Trials*, *23*(4), 380–388.

Dixon-Woods, M., Cavers, D., Agarwal, S., Annandale, E., Arthur, A., Harvey, J., Hsu, R., Katbamna, S., Olsen, R., Smith, L., Riley, R., & Sutton, A. J. (2006). Conducting a critical interpretive synthesis of the literature on access to healthcare by vulnerable groups. *BMC Medical Research Methodology*, *6*, 35. https://doi.org/10.1186/1471-2288-6-35

Dobrow, M. (2009). Caring for people with chronic conditions: A health system perspective. *International Journal of Integrated Care*, *9*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2663709/

Dobrow, M. J., Goel, V., Lemieux-Charles, L., & Black, N. A. (2006). The impact of context on evidence utilization: A framework for expert groups developing health policy recommendations. *Social Science & Medicine (1982)*, *63*(7), 1811–1824. https://doi.org/10.1016/j.socscimed.2006.04.020

Doherty, M., & Thompson, H. (2014). Enhancing person-centred care through the development of a therapeutic relationship. *British Journal of Community Nursing*, *19*(10), 502–507. https://doi.org/10.12968/bjcn.2014.19.10.502

Dubai Annual Health Statistical Report. (2015). Dubai Health Authority. https://www.dha.gov.ae/DHAOpenData/Annual%20Statistical%20Books/DHADoc768681140-28-07-2016.pdf

Dubai Municipality. (2016). *Dubai land sectors*. https://www.dm.gov.ae/wps/portal/home

Duncan, C., Jones, K., & Moon, G. (1996). Health-related behaviour in context: A multilevel modelling approach. *Social Science & Medicine (1982)*, *42*(6), 817–830.

Durvasula, S., Kok, C., Sambrook, P. N., Cumming, R. G., Lord, S. R., March, L. M., Mason, R. S., Seibel, M. J., Simpson, J. M., & Cameron, I. D. (2010). Sunlight and health: Attitudes of older people living in intermediate care facilities in southern Australia. *Archives of Gerontology and Geriatrics*, *51*(3), e94-99. https://doi.org/10.1016/j.archger.2010.01.008

Dworkin, S. L. (2012). Sample Size Policy for Qualitative Studies Using In-Depth Interviews. *Archives of Sexual Behavior*, *41*(6), 1319–1320. https://doi.org/10.1007/s10508-012-0016-6

Eid Al Agha, A., & Alorabi, S. H. (2016). Awareness of Vitamin D and its Deficiency in Jeddah Population, Saudi Arabia. *Journal of Community & Public Health Nursing*, *2*(2). https://doi.org/10.4172/2471-9846.1000120

Elamin, M. B., Abu Elnour, N. O., Elamin, K. B., Fatourechi, M. M., Alkatib, A. A., Almandoz, J. P., Liu, H., Lane, M. A., Mullan, R. J., Hazem, A., Erwin, P. J., Hensrud, D. D., Murad, M. H., & Montori, V. M. (2011). Vitamin D and cardiovascular outcomes: A systematic review and meta-analysis. *The Journal of Clinical Endocrinology and Metabolism*, *96*(7), 1931–1942. https://doi.org/10.1210/jc.2011-0398

Elliott, E., & Williams, G. (2008). Developing a Public Sociology: From Lay Knowledge to Civic Intelligence in Health Impact Assessment. *Journal of Applied Social Science*, *2*(2), 14–28. https://doi.org/10.1177/193672440800200203

Entwistle, V. A., Carter, S. M., Cribb, A., & McCaffery, K. (2010). Supporting Patient Autonomy: The Importance of Clinician-patient Relationships. *Journal of General Internal Medicine*, *25*(7), 741–745. https://doi.org/10.1007/s11606-010-1292-2

Epstein, R. M., & Street, R. L. (2011). The Values and Value of Patient-Centered Care. *Annals of Family Medicine*, *9*(2), 100–103. https://doi.org/10.1370/afm.1239

Evans, R. J., & Plows, A. J. (2007). Listening Without Prejudice? Re-Discovering the Value of the Disinterested Citizen. *Social Studies of Science*, *37*(6), 827–854. https://doi.org/Evans, Robert John <http://orca.cf.ac.uk/view/cardiffauthors/A070811H.html> and Plows, Alexandra Jane 2007. Listening Without Prejudice? Re-Discovering the Value of the Disinterested Citizen. Social Studies of Science 37 (6) , pp. 827-854. 10.1177/0306312707076602 <http://dx.doi.org/10.1177/0306312707076602>

Ferguson, M. J., & Bargh, J. A. (2004). How social perception can automatically influence behavior. *Trends in Cognitive Sciences*, *8*(1), 33–39. https://doi.org/10.1016/j.tics.2003.11.004

France, E. F., Cunningham, M., Ring, N., Uny, I., Duncan, E. A. S., Jepson, R. G., Maxwell, M., Roberts, R. J., Turley, R. L., Booth, A., Britten, N., Flemming, K., Gallagher, I., Garside, R., Hannes, K., Lewin, S., Noblit, G. W., Pope, C., Thomas, J., … Noyes, J. (2019). Improving reporting of meta-ethnography: The eMERGe reporting guidance. *BMC Medical Research Methodology*, *19*(1), 25. https://doi.org/10.1186/s12874-018-0600-0

France, E. F., Ring, N., Noyes, J., Maxwell, M., Jepson, R., Duncan, E., Turley, R., Jones, D., & Uny, I. (2015). Protocol-developing meta-ethnography reporting guidelines (eMERGe). *BMC Medical Research Methodology*, *15*(1), 103. https://doi.org/10.1186/s12874-015-0068-0

France, E. F., Uny, I., Ring, N., Turley, R. L., Maxwell, M., Duncan, E. A. S., Jepson, R. G., Roberts, R. J., & Noyes, J. (2019). A methodological systematic review of meta-ethnography conduct to articulate the complex analytical phases. *BMC Medical Research Methodology*, *19*(1), 35. https://doi.org/10.1186/s12874-019-0670-7

Fraser, D. R., & Kodicek, E. (1970). Unique Biosynthesis by Kidney of a Biologically Active Vitamin D Metabolite. *Nature*, *228*(5273), 764–766. https://doi.org/10.1038/228764a0

Frohlich, K. L., Corin, E., & Potvin, L. (2001). A theoretical proposal for the relationship between context and disease. *Sociology of Health & Illness*, *23*(6), 776–797. https://doi.org/10.1111/1467-9566.00275

Glanz, K., Rimer, B. K., & Viswanath, K. (Eds.). (2008). *Health Behavior and Health Education: Theory, Research, and Practice* (4 edition). Jossey-Bass.

Glaser, B. G., & Strauss, A. L. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Aldine de Gruyter.

Glasgow, S., & Schrecker, T. (2015). The double burden of neoliberalism? Noncommunicable disease policies and the global political economy of risk. *Health & Place*, *34*, 279–286. https://doi.org/10.1016/j.healthplace.2015.06.005

Golden, S. D., & Earp, J. A. L. (2012). Social ecological approaches to individuals and their contexts: Twenty years of health education & behavior health promotion interventions. *Health Education & Behavior: The Official Publication of the Society* *for Public Health Education*, *39*(3), 364–372. https://doi.org/10.1177/1090198111418634

Gough, D., Oliver, S., & Thomas, J. (Eds.). (2012). *An Introduction to Systematic Reviews* (1 edition). SAGE Publications Ltd.

Grant, W. B., Lahore, H., McDonnell, S. L., Baggerly, C. A., French, C. B., Aliano, J. L., & Bhattoa, H. P. (2020). Evidence that Vitamin D Supplementation Could Reduce Risk of Influenza and COVID-19 Infections and Deaths. *Nutrients*, *12*(4), Article 4. https://doi.org/10.3390/nu12040988

Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., Kyriakidou, O., & Peacock, R. (2005). Storylines of research in diffusion of innovation: A meta-narrative approach to systematic review. *Social Science & Medicine*, *61*(2), 417–430. https://doi.org/10.1016/j.socscimed.2004.12.001

Guba, E. G., & Lincoln, Y. S. (1981). *Effective evaluation: Improving the usefulness of evaluation results through responsive and naturalistic approaches* (Vol. xxv). Jossey-Bass.

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln, *Handbook of Qualitative Research* (pp. 105–117). SAGE Publications, Inc.

Guba, E. G., & Lincoln, Y. S. (2000). Epistemological and Methodological Bases of Naturalistic Inquiry. In D. L. Stufflebeam, G. F. Madaus, & T. Kellaghan (Eds.), *Evaluation Models* (pp. 363–381). Springer Netherlands. https://doi.org/10.1007/0-306-47559-6_19

GulfNews. (2019). *UAE school highlights vitamin D deficiency*. https://gulfnews.com/uae/health/uae-school-highlights-vitamin-d-deficiency-1.2164568

Habib, S. S., Alhalabi, H. B., Alharbi, K. S., Alghamdi, O. S., Alghamdi, A. I., Ajarem, M. A., & Alqarni, M. A. (2021). Knowledge attitude and practices of university students to Vitamin D and Vitamin D supplements during times of low sun exposure and post lockdown. *European Review for Medical and Pharmacological Sciences*, *25*(23), 7297–7305. https://doi.org/10.26355/eurrev_202112_27423

Hamilton, K., Cleary, C., White, K. M., & Hawkes, A. L. (2016). Keeping kids sun safe: Exploring parents' beliefs about their young child's sun-protective behaviours. *Psycho-Oncology*, *25*(2), 158–163. https://doi.org/10.1002/pon.3888

Hannes, K., & Macaitis, K. (2012). A move to more systematic and transparent approaches in qualitative evidence synthesis: Update on a review of published papers. *Qualitative Research*, *12*(4), 402–442. https://doi.org/10.1177/1468794111432992

Haskard Zolnierek, K. B., & DiMatteo, M. R. (2009). Physician Communication and Patient Adherence to Treatment: A Meta-analysis. *Medical Care*, *47*(8), 826–834. https://doi.org/10.1097/MLR.0b013e31819a5acc

Haw, J., Cunningham, S., & O'Doherty, K. C. (2018). Epistemic tensions between people living with asthma and healthcare professionals in clinical encounters. *Social Science & Medicine (1982)*, *208*, 34–40. https://doi.org/10.1016/j.socscimed.2018.04.054

Hilger, J., Friedel, A., Herr, R., Rausch, T., Roos, F., Wahl, D. A., Pierroz, D. D., Weber, P., & Hoffmann, K. (2014). A systematic review of vitamin D status in populations worldwide. *British Journal of Nutrition*, *111*(1), 23–45. https://doi.org/10.1017/S0007114513001840

Hofstede, G. (2001). *Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations Across Nations*. SAGE Publications.

Holbrook, A. M., Pereira, J. A., Labiris, R., McDonald, H., Douketis, J. D., Crowther, M., & Wells, P. S. (2005). Systematic Overview of Warfarin and Its Drug and Food Interactions. *Archives of Internal Medicine*, *165*(10), 1095–1106. https://doi.org/10.1001/archinte.165.10.1095

Holick, M. F. (2007). Vitamin D deficiency. *The New England Journal of Medicine*, *357*(3), 266–281. https://doi.org/10.1056/NEJMra070553

Holick, M. F., MacLaughlin, J. A., Clark, M. B., Holick, S. A., Potts, J. T., Anderson, R. R., Blank, I. H., Parrish, J. A., & Elias, P. (1980). Photosynthesis of previtamin D3 in human skin and the physiologic consequences. *Science (New York, N.Y.)*, *210*(4466), 203–205.

Hoon Lim, J. (2011). Qualitative Methods in Adult Development and Learning: Theoretical Traditions, Current Practices, and Emerging Horizons. In C. Hoare (Ed.), *The Oxford Handbook of Reciprocal Adult Development and Learning* (p. 0). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199736300.013.0020

Ho-Pham, L., & Nguyen, M. (2012). Survey on Knowledge and Attitudes on Vitamin D and Sunlight Exposure in an Urban Population in Vietnam. *Journal of the ASEAN Federation of Endocrine Societies*, *27*(2), Article 2.

Howe, K. R., & Moses, M. S. (1999). Ethics in Educational Research. *Review of Research in Education*, *24*, 21–59. https://doi.org/10.2307/1167266

Ibrahim, M. (2012). Thematic Analysis: A critical review of its process and evaluation. *West East Journal of Social Sciences*, *1*(1), 9.

Ibrahim, O. M., Al-Tameemi, N. K., & Dawoud, D. (2019). KNOWLEDGE AND PERCEPTIONS OF VITAMIN D DEFICIENCY AMONG THE UNITED ARAB EMIRATES POPULATION. *Asian Journal of Pharmaceutical and Clinical Research*, 183–186. https://doi.org/10.22159/ajpcr.2019.v12i18.33988

Irwin, A. (1995). *Citizen Science: A Study of People, Expertise and Sustainable Development*. Psychology Press.

Jamil, N. A., Shahudin, N. N., Abdul Aziz, N. S., Jia Qi, C., Wan Aminuddin, W. A. A., Mat Ludin, A. F., Chin, K.-Y., Abd Manaf, Z., & Mat Daud, N. (2019). Knowledge, Attitude and Practice Related to Vitamin D and Its Relationship with Vitamin D Status among Malay Female Office Workers. *International Journal of Environmental Research and Public Health*, *16*(23), 4735. https://doi.org/10.3390/ijerph16234735

Jang, H., Kuen Koo, F., Ke Candidate, L., Clemson, L., Cant, R., Fraser, D. R., Seibel, M. J., Tseng, H. W., Mpofu, E., Mason, R. S., & Brock, K. (2013). Culture and Sun Exposure in Immigrant East Asian Women Living in Australia. *Women & Health*, *53*(5), 504–518. https://doi.org/10.1080/03630242.2013.806386

Janssen, N. B. a. T., Oort, F. J., Fockens, P., Willems, D. L., de Haes, H. C. J. M., & Smets, E. M. A. (2009). Under what conditions do patients want to be informed about their risk of a complication? A vignette study. *Journal of Medical Ethics*, *35*(5), 276–282. https://doi.org/10.1136/jme.2008.025031

Joseph-Williams, N., Edwards, A., & Elwyn, G. (2014). Power imbalance prevents shared decision making. *BMJ*, *348*. https://doi.org/10.1136/bmj.g3178

Kahlke, R. M. (2014). Generic Qualitative Approaches: Pitfalls and Benefits of Methodological Mixology. *International Journal of Qualitative Methods*, *13*(1), 37–52. https://doi.org/10.1177/160940691401300119

Kamudoni, P., Poole, C., & Davies, S. J. (2016). An estimate of the economic burden of vitamin D deficiency in pregnant women in the United Kingdom. *Gynecological Endocrinology*, *32*(8), 592–597. https://doi.org/10.3109/09513590.2016.1160374

Kelly, M. P., & Barker, M. (2016). Why is changing health-related behaviour so difficult? *Public Health*, *136*, 109–116. https://doi.org/10.1016/j.puhe.2016.03.030

Kinsella, W. J. (2002). Problematizing the distinction between expert and lay knowledge. *New Jersey Journal of Communication*, *10*(2), 191–207. https://doi.org/10.1080/15456870209367428

Koch, T. (1996). Implementation of a hermeneutic inquiry in nursing: Philosophy, rigour and representation. *Journal of Advanced Nursing*, *24*(1), 174–184. https://doi.org/10.1046/j.1365-2648.1996.17224.x

Koenig, L. J., Lyles, C., & Smith, D. K. (2013). Adherence to antiretroviral medications for HIV pre-exposure prophylaxis: Lessons learned from trials and treatment studies. *American Journal of Preventive Medicine*, *44*(1 Suppl 2), S91-98. https://doi.org/10.1016/j.amepre.2012.09.047

Kotta, S., Gadhvi, D., Jakeways, N., Saeed, M., Sohanpal, R., Hull, S., Famakin, O., Martineau, A., & Griffiths, C. (2015). “Test me and treat me”—attitudes to vitamin D deficiency and supplementation: A qualitative study. *BMJ Open*, *5*(7), e007401. https://doi.org/10.1136/bmjopen-2014-007401

Krause, W. (2008). Civil Society and Rentierism? Challenges to the UAE Woman. In W. Krause (Ed.), *Women in Civil Society: The State, Islamism, and Networks in the UAE* (pp. 27–46). Palgrave Macmillan US. https://doi.org/10.1057/9780230615755_2

Krug, E. G., Mercy, J. A., Dahlberg, L. L., & Zwi, A. B. (2002). The world report on violence and health. *Lancet (London, England), 360*(9339), 1083–1088. https://doi.org/10.1016/S0140-6736(02)11133-0

Krumeich, A., Weijts, W., Reddy, P., & Meijer-Weitz, A. (2001). The benefits of anthropological approaches for health promotion research and practice. *Health Education Research*, *16*(2), 121–130. https://doi.org/10.1093/her/16.2.121

Kuhn, T. (1970). *The Structure of Scientific Revolutions* (2 edition). University of Chicago Press.

Kuipers, M. A. G., Jongeneel-Grimen, B., Droomers, M., Wingen, M., Stronks, K., & Kunst, A. E. (2013). Why residents of Dutch deprived neighbourhoods are less likely to be heavy drinkers: The role of individual and contextual characteristics. *Journal of Epidemiology and Community Health*, *67*(7), 587–594. https://doi.org/10.1136/jech-2012-201242

Laird, E. A., McCance, T., McCormack, B., & Gribben, B. (2015). Patients’ experiences of in-hospital care when nursing staff were engaged in a practice development programme to promote person-centredness: A narrative analysis study. *International Journal of Nursing Studies*, *52*(9), 1454–1462. https://doi.org/10.1016/j.ijnurstu.2015.05.002

Laleye, L. C., Kerkadi, A. H., Wasesa, A. A., Rao, M. V., & Aboubacar, A. (2011). Assessment of vitamin D and vitamin A intake by female students at the United Arab Emirates University based on self-reported dietary and selected fortified food consumption. *International Journal of Food Sciences and Nutrition*, *62*(4), 370–376. https://doi.org/10.3109/09637486.2010.533159

Laleye, L. C., Wasesa, A. A. H., & Rao, M. V. (2009). A study on vitamin D and vitamin A in milk and edible oils available in the United Arab Emirates. *International Journal of Food Sciences and Nutrition*, *60*(sup5), 1–9. https://doi.org/10.1080/09637480802054094

Lapadat, J. C., & Lindsay, A. C. (2016). Transcription in Research and Practice: From Standardization of Technique to Interpretive Positionings: *Qualitative Inquiry*. https://doi.org/10.1177/107780049900500104

Leplege, A., Gzil, F., Cammelli, M., Lefeve, C., Pachoud, B., & Ville, I. (2007). Person-centredness: Conceptual and historical perspectives. *Disability and Rehabilitation*, *29*(20–21), 1555–1565. https://doi.org/10.1080/09638280701618661

Lim, H. W., Gilchrest, B. A., Cooper, K. D., Bischoff-Ferrari, H. A., Rigel, D. S., Cyr, W. H., Miller, S., DeLeo, V. A., Lee, T. K., Demko, C. A., Weinstock, M. A., Young, A., Edwards, L. S., Johnson, T. M., & Stone, S. P. (2005). Sunlight, tanning booths, and vitamin D. *Journal of the American Academy of Dermatology*, *52*(5), 868–876. https://doi.org/10.1016/j.jaad.2005.03.015

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry* (1st edition). SAGE Publications.

Lind, S. (2015). *Government experts want everyone to take vitamin D supplements*. Pulse Today. http://www.pulsetoday.co.uk/news/clinical-news/government-experts-want-everyone-to-take-vitamin-d-supplements/20010670.article

Lindström, J., & Karlsson, S. (2016). Tensions in the epistemic domain and claims of no-knowledge: A study of Swedish medical interaction. *Journal of Pragmatics*, *106*, 129–147. https://doi.org/10.1016/j.pragma.2016.07.003

Lucas, P. J., Baird, J., Arai, L., Law, C., & Roberts, H. M. (2007). Worked examples of alternative methods for the synthesis of qualitative and quantitative research in systematic reviews. *BMC Medical Research Methodology*, *7*, 4. https://doi.org/10.1186/1471-2288-7-4

Ma, Y., Zhang, P., Wang, F., Yang, J., Liu, Z., & Qin, H. (2011). Association Between Vitamin D and Risk of Colorectal Cancer: A Systematic Review of Prospective Studies. *Journal of Clinical Oncology*, *29*(28), 3775–3782. https://doi.org/10.1200/JCO.2011.35.7566

Malacova, E., Cheang, P. (Rachel), Dunlop, E., Sherriff, J. L., Lucas, R. M., Daly, R. M., Nowson, C. A., & Black, L. J. (2019). Prevalence and predictors of vitamin D deficiency in a nationally representative sample of adults participating in the 2011–2013 Australian Health Survey. *British Journal of Nutrition*, *121*(8), 894–904. https://doi.org/10.1017/S0007114519000151

Martineau, A. R., Jolliffe, D. A., Hooper, R. L., Greenberg, L., Aloia, J. F., Bergman, P., Dubnov-Raz, G., Esposito, S., Ganmaa, D., Ginde, A. A., Goodall, E. C., Grant, C. C., Griffiths, C. J., Janssens, W., Laaksi, I., Manaseki-Holland, S., Mauger, D., Murdoch, D. R., Neale, R., … Camargo, C. A. (2017). Vitamin D supplementation to prevent acute respiratory tract infections: Systematic review and meta-analysis of individual participant data. *BMJ*, *356*. https://doi.org/10.1136/bmj.i6583

Mason, M. (2010). Sample Size and Saturation in PhD Studies Using Qualitative Interviews. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, *11*(3). https://doi.org/10.17169/fqs-11.3.1428

Maxwell, J. A. (2013). *Qualitative Research Design: An Interactive Approach* (3 edition). SAGE Publications, Inc.

McCance, T., McCormack, B., & Dewing, J. (2011). An exploration of person-centredness in practice. *Online Journal of Issues in Nursing*, *16*(2), 1.

McCartney, D. M., & Byrne, D. G. (2020). Optimisation of Vitamin D Status for Enhanced Immuno-protection Against Covid-19. *Irish Medical Journal*, 4.

McDonagh, M., Peterson, K., Raina, P., Chang, S., & Shekelle, P. (2013). *Avoiding Bias in Selecting Studies*. Agency for Healthcare Research and Quality (US). https://www.ncbi.nlm.nih.gov/books/NBK126701/

McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education Quarterly*, *15*(4), 351–377.

McMillan, J., & Anderson, L. (1997). Knowledge and Power in the Clinical Setting. *Bioethics*, *11*(3–4), 265–270. https://doi.org/10.1111/1467-8519.00065

Melius, J. (2015). Exploring social workers’ use of the socioecological model as an intervention and research framework for treating overweight or obese clients. *Social Work*, *60*(1), 55–63. https://doi.org/10.1093/sw/swu048

Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative Research: A Guide to Design and Implementation* (4 edition). Jossey-Bass.

Mertens, D. (2014). An introduction to research. In *Research and Evaluation in Education and Psychology: Integrating Diversity With Quantitative, Qualitative, and Mixed Methods* (4 edition, pp. 1–45). SAGE Publications, Inc.

Merzon, E., Tworowski, D., Gorohovski, A., Vinker, S., Cohen, A. G., Green, I., & Frenkel-Morgenstern, M. (2020). Low plasma 25(OH) vitamin D level is associated with increased risk of COVID-19 infection: An Israeli population-based study. *The FEBS Journal*, *287*(17), 3693–3702. https://doi.org/10.1111/febs.15495

Methley, A. M., Campbell, S., Chew-Graham, C., McNally, R., & Cheraghi-Sohi, S. (2014). PICO, PICOS and SPIDER: A comparison study of specificity and sensitivity in three search tools for qualitative systematic reviews. *BMC Health Services Research*, *14*(1), 579. https://doi.org/10.1186/s12913-014-0579-0

Minichiello, V., Browne, J., & Kendig, H. (2000). Perceptions and consequences of ageism: Views of older people. *Ageing & Society*, *20*(3), 253–278.

Mitri, J., Muraru, M. D., & Pittas, A. G. (2011). Vitamin D and type 2 diabetes: A systematic review. *European Journal of Clinical Nutrition*, *65*(9), 1005–1015. https://doi.org/10.1038/ejcn.2011.118

Mogire, R. M., Mutua, A., Kimita, W., Kamau, A., Bejon, P., Pettifor, J. M., Adeyemo, A., Williams, T. N., & Atkinson, S. H. (2020). Prevalence of vitamin D deficiency in Africa: A systematic review and meta-analysis. *The Lancet Global Health*, *8*(1), e134–e142. https://doi.org/10.1016/S2214-109X(19)30457-7

Moher, D. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *Annals of Internal Medicine*, *151*(4), 264. https://doi.org/10.7326/0003-4819-151-4-200908180-00135

Molla, A. M., Al Badawi, M., Hammoud, M. S., Molla, A. M., Shukkur, M., Thalib, L., & Eliwa, M. S. (2005). Vitamin D status of mothers and their neonates in Kuwait. *Pediatrics International: Official Journal of the Japan Pediatric Society*, *47*(6), 649–652. https://doi.org/10.1111/j.1442-200x.2005.02141.x

Morse, J. M., & Field, P. A. (1995). *Qualitative Research Methods for Health Professionals*. SAGE Publications.

MR, el-S., & NU, A.-G. (1996). Vitamin D deficiency in veiled Kuwaiti women. *European Journal of Clinical Nutrition*, *50*(5), 315–318.

Muhairi, S. J., Mehairi, A. E., Khouri, A. A., Naqbi, M. M., Maskari, F. A., Kaabi, J. A., Dhaheri, A. S. A., Nagelkerke, N., & Shah, S. M. (2013). Vitamin D deficiency among healthy adolescents in Al Ain, United Arab Emirates. *BMC Public Health*, *13*, 33. https://doi.org/10.1186/1471-2458-13-33

Murad, M. H., Elamin, K. B., Abu Elnour, N. O., Elamin, M. B., Alkatib, A. A., Fatourechi, M. M., Almandoz, J. P., Mullan, R. J., Lane, M. A., Liu, H., Erwin, P. J., Hensrud, D. D., & Montori, V. M. (2011). The Effect of Vitamin D on Falls: A Systematic Review and Meta-Analysis. *The Journal of Clinical Endocrinology & Metabolism*, *96*(10), 2997–3006. https://doi.org/10.1210/jc.2011-1193

Mutch, C. (2005). *Doing Educational Research: A Practitioner's Guide to Getting Started*. NZCER Press.

Nardi, R., Scanelli, G., Corrao, S., Iori, I., Mathieu, G., & Cataldi Amatrian, R. (2007). Co-morbidity does not reflect complexity in internal medicine patients. *European Journal of Internal Medicine*, *18*(5), 359–368. https://doi.org/10.1016/j.ejim.2007.05.002

NICE. (2016). *A social marketing campaign for early years practitioners to increase awareness of the importance of vitamin D and healthy start supplements* [SharedLearningArticle]. National Institutefor Health and Care Excellence; NICE. https://www.nice.org.uk/sharedlearning/a-social-marketing-campaign-and-training-to-early-years-practitioners-to-increase-awareness-of-the-importance-of-vitamin-d-and-healthy-start-supplements

Nimri, L. F. (2018). Vitamin D status of female UAE college students and associated risk factors. *Journal of Public Health*, *40*(3), e284–e290. https://doi.org/10.1093/pubmed/fdy009

Nnoaham, K. E., & Clarke, A. (2008). Low serum vitamin D levels and tuberculosis: A systematic review and meta-analysis. *International Journal of Epidemiology*, *37*(1), 113–119. https://doi.org/10.1093/ije/dym247

Noblit, G. W., & Hare, R. D. (1988). *Meta-Ethnography: Synthesizing Qualitative Studies*. SAGE.

nutraingredients-usa.com. (2016). *New consumer campaign encourages vitamin D testing to identify deficiency, advance research*. Nutraingredients-Usa.Com. https://www.nutraingredients-usa.com/Article/2016/02/03/Campaign-encourages-vitamin-D-testing-to-advance-research

Osteoporosis Australia. (2014). *Vitamin D: Medical Guide*. Osteoporosis Australia. https://www.osteoporosis.org.au/sites/default/files/files/oa_medical_vitd_2nd_ed.pdf

Otara, A. (2011). Perception: A Guide for Managers and Leaders. *Journal of Management and Strategy*, *2*(3), p21. https://doi.org/10.5430/jms.v2n3p21

Palacios, C., & Gonzalez, L. (2014). Is vitamin D deficiency a major global public health problem? *The Journal of Steroid Biochemistry and Molecular Biology*, *144PA*, 138–145. https://doi.org/10.1016/j.jsbmb.2013.11.003

Parahoo, K. (2006). *Nursing Research: Principles, Process and Issues* (2nd edition). Palgrave Macmillan.

Parker, J., Hashmi, O., Dutton, D., Mavrodaris, A., Stranges, S., Kandala, N.-B., Clarke, A., & Franco, O. H. (2010). Levels of vitamin D and cardiometabolic disorders:

Systematic review and meta-analysis. *Maturitas*, *65*(3), 225–236. https://doi.org/10.1016/j.maturitas.2009.12.013

Paterson, B. L., Thorne, S. E., Canam, C., & Jillings, C. (2001). *Meta-Study of Qualitative Health Research: A Practical Guide to Meta-Analysis and Meta-Synthesis*. SAGE.

Patton, J. H. (1985). A Context for Communication. *Journal of Pastoral Care*, *39*(4), 289–292. https://doi.org/10.1177/002234098503900401

Pawson, R. (1989). *A Measure for Measures a Manifesto for Empirical Sociology*.

Percy, W., Kostere, K., & Kostere, S. (2015). Generic Qualitative Research in Psychology. *The Qualitative Report*. https://doi.org/10.46743/2160-3715/2015.2097

Pirrone, A., Capetola, T., Riggs, E., & Renzaho, A. (2013). Vitamin D deficiency awareness among African migrant women residing in high-rise public housing in Melbourne, Australia: A qualitative study. *Asia Pacific Journal of Clinical Nutrition*, *22*(2), 292–299.

Pittas, A. G. (2010). Systematic Review: Vitamin D and Cardiometabolic Outcomes. *Annals of Internal Medicine*, *152*(5), 307. https://doi.org/10.7326/0003-4819-152-5-201003020-00009

Poole, C. D., Smith, J., & Davies, J. S. (2015). Cost-effectiveness and budget impact of Empirical vitamin D therapy on unintentional falls in older adults in the UK. *BMJ Open*, *5*(9), e007910. https://doi.org/10.1136/bmjopen-2015-007910

Popay, J., & Williams, G. (1996). Public health research and lay knowledge. *Social Science & Medicine*, *42*(5), 759–768. https://doi.org/10.1016/0277-9536(95)00341-X

Popay, J., & Williams, G. (1998). Qualitative research and evidence-based healthcare. *Journal of the Royal Society of Medicine*, *91*(Suppl 35), 32–37.

Popay, J., & Williams, G. (2006). Lay knowledge and the privilege of experience. In D. Kelleher, J. Gabe, & G. Williams (Eds.), *Challenging medicine.* (pp. 122–145). Routledge. http://eprints.lancs.ac.uk/8355/

Pope, C., Ziebland, S., & Mays, N. (2000). Analysing qualitative data. *BMJ : British Medical Journal*, *320*(7227), 114–116.

Price, C. (2014). *NICE calls for national campaign to promote daily vitamin D supplements*. Pulse Today. http://www.pulsetoday.co.uk/clinical/clinical-specialties/musculoskeletal/nice-calls-for-national-campaign-to-promote-daily-vitamin-d-supplements/20006686.article

Prior, L. (2003). Belief, knowledge and expertise: The emergence of the lay expert in medical sociology. *Sociology of Health & Illness*, *25*, 41–57.

Prochaska, J. O., DiClemente, C. C., & Norcross, J. C. (1992). In Search of the Structure of Change. In Y. Klar, J. D. Fisher, J. M. Chinsky, & A. Nadler (Eds.), *Self Change: Social Psychological and Clinical Perspectives* (pp. 87–114). Springer. https://doi.org/10.1007/978-1-4612-2922-3_5

Punch, K. F., & Punch, K. (1998). *Introduction to Social Research: Quantitative and Qualitative Approaches*. SAGE Publications.

Punter, C. (2016, January 26). *A Canadian Government Ad Campaign Told Everyone They "Need the D."* Vice. https://www.vice.com/en_us/article/9bgv73/yukon-rethinks-its-we-all-need-the-d-public-health-ad

Rhodes, J. M., Subramanian, S., Laird, E., & Kenny, R. A. (2020). Editorial: Low population mortality from COVID-19 in countries south of latitude 35 degrees North supports vitamin D as a factor determining severity. *Alimentary Pharmacology & Therapeutics*, *51*(12), 1434–1437. https://doi.org/10.1111/apt.15777

Riessman, C. K. (1993). *Narrative analysis* (pp. vii, 79). Sage Publications, Inc.

Ritzer, G. (1990). Metatheorizing in Sociology. *Sociological Forum*, *5*(1), 3–15.

Ritzer, G. (1992). The Legitimation and Institutionalization of Metatheorizing in Sociology. *Sociological Perspectives*, *35*(3), 543–550. https://doi.org/10.2307/1389336

Robertson, S. (2007). *Understanding Men and Health: Masculinities, Identity and Well-being: Masculinity, Identity and Well-being* (1 edition). Open University Press.

Romana, H.-W. (2006). Is Evidence-Based Medicine Patient-Centered and Is Patient-Centered Care Evidence-Based? *Health Services Research*, *41*(1), 1–8. https://doi.org/10.1111/j.1475-6773.2006.00504.x

Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social learning theory and the Health Belief Model. *Health Education Quarterly*, *15*(2), 175–183.

Sackett, D. L. (1997). Evidence-based medicine. *Seminars in Perinatology*, *21*(1), 3–5. https://doi.org/10.1016/S0146-0005(97)80013-4

Sackett, D. L., Rosenberg, W. M., Gray, J. A., Haynes, R. B., & Richardson, W. S. (1996). Evidence based medicine: What it is and what it isn’t. *BMJ : British Medical Journal*, *312*(7023), 71–72.

Sadler, G. R., Lee, H.-C., Lim, R. S.-H., & Fullerton, J. (2010). Research Article: Recruitment of hard-to-reach population subgroups via adaptations of the snowball sampling strategy. *Nursing & Health Sciences*, *12*(3), 369–374. https://doi.org/10.1111/j.1442-2018.2010.00541.x

Salmanpour, V. A., Ibrahim, H. S., Salameh, A. G., Yahya, A. M., & Debal, B. K. (2016). Vitamin D deficiency: Knowledge and practices among the adult population in Sharjah, United Arab Emirates. *Archives of Osteoporosis*, *11*, 15. https://doi.org/10.1007/s11657-016-0269-0

Schuler, D. (2001). Cultivating Society's Civic InTELligence: Patterns for a New "World Brain." *Information, Communication & Society*, *4*(2), 157–181. https://doi.org/10.1080/13691180122844

Schwandt, T., A. (2000). "Three epistemological stances for qualitative inquiry: Interpretivism, hermeneutics and social constructivism" IN: Handbook of qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *The handbook of qualitative research* (pp. 189–213). SAGE. http://www.library.mmu.ac.uk/secure/index.php?cat_file=&filename=y_220a0001_schwandt_three.pdf

Scotland, J. (2012). Exploring the Philosophical Underpinnings of Research: Relating Ontology and Epistemology to the Methodology and Methods of the Scientific, Interpretive, and Critical Research Paradigms. *English Language Teaching*, *5*(9), 9.

Short, S. E., & Mollborn, S. (2015). Social Determinants and Health Behaviors: Conceptual Frames and Empirical Advances. *Current Opinion in Psychology*, *5*, 78–84. https://doi.org/10.1016/j.copsyc.2015.05.002

Sinclair, C., & Foley, P. (2009). Skin cancer prevention in Australia. *British Journal of Dermatology*, *161*, 116–123. https://doi.org/10.1111/j.1365-2133.2009.09459.x

Singer, M., & Weeks, M. R. (1996). Preventing AIDS in Communities of Color: Anthropology and Social Prevention. *Human Organization*, *55*(4), 488–492. JSTOR.

Skull, S. A., Ngeow, J. Y. Y., Biggs, B. A., Street, A., & Ebeling, P. R. (2003). Vitamin D deficiency is common and unrecognized among recently arrived adult immigrants from The Horn of Africa. *Internal Medicine Journal*, *33*(1–2), 47–51.

Springett, P. J., Owens, C., & Callaghan, J. (2007). The challenge of combining ‘lay’ knowledge with ‘evidence-based’ practice in health promotion: Fag Ends Smoking Cessation Service. *Critical Public Health*, *17*(3), 243–256. https://doi.org/10.1080/09581590701225854

Stainton-Rogers, W. (1993). From psychometric scales to cultural perspectives. In *Health and Wellbeing: A Reader* (pp. 34–43). Macmillan.

Stake, R. E. (2005). Qualitative Case Studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research (3rd ed.)* (pp. 443–466). Sage Publications Ltd.

Stewart, M. A. (1995). Effective physician-patient communication and health outcomes: A review. *CMAJ: Canadian Medical Association Journal = Journal de l’Association Medicale Canadienne*, *152*(9), 1423–1433.

Stokols, D. (1996). Translating social ecological theory into guidelines for community health promotion. *American Journal of Health Promotion: AJHP*, *10*(4), 282–298. https://doi.org/10.4278/0890-1171-10.4.282

Taber, J. M., Leyva, B., & Persoskie, A. (2015). Why do People Avoid Medical Care? A Qualitative Study Using National Data. *Journal of General Internal Medicine*, *30*(3), 290–297. https://doi.org/10.1007/s11606-014-3089-1

Tariq, A., Khan, S. R., & Basharat, A. (2020). Assessment of knowledge, attitudes and practice towards Vitamin D among university students in Pakistan. *BMC Public Health*, *20*(1), 355. https://doi.org/10.1186/s12889-020-8453-y

Teixeira, P., Santos, A. C., Casalta-Lopes, J., Almeida, M., Loureiro, J., Ermida, V., Caldas, J., & Fontes-Ribeiro, C. (2019). Prevalence of vitamin D deficiency amongst soccer athletes and effects of 8 weeks supplementation. *The Journal of Sports Medicine and Physical Fitness*, *59*(4), 693–699. https://doi.org/10.23736/S0022-4707.18.08551-1

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, *8*(1), 45. https://doi.org/10.1186/1471-2288-8-45

Thorne, S., Paterson, B., Acorn, S., Canam, C., Joachim, G., & Jillings, C. (2002). Chronic illness experience: Insights from a metastudy. *Qualitative Health Research, 12*(4), 437–452. https://doi.org/10.1177/104973202129120007

Tomaselli, G., Buttigieg, S. C., Rosano, A., Cassar, M., & Grima, G. (2020). Person-Centered Care From a Relational Ethics Perspective for the Delivery of High Quality and Safe Healthcare: A Scoping Review. *Frontiers in Public Health*, *8,* 44. https://doi.org/10.3389/fpubh.2020.00044

Tudor, L. E., Keemar, K., Tudor, K., Valentine, J., & Worrall, M. (2004). *The Person-Centred Approach: A Contemporary Introduction*. Macmillan International Higher Education.

United Arab Emirates Country Profile. (2018). Employment Conditions Abroad International. https://www.birmingham.ac.uk/Documents/staff/hr/Country-Profile-United-Arab-Emirates.pdf van de Vijver, F. J. R. (2007). Cultural and Gender Differences in Gender-Role Beliefs, Sharing Household Task and Child-Care Responsibilities, and Well-Being Among Immigrants and Majority Members in The Netherlands. *Sex Roles*, *57*(11), 813–824. https://doi.org/10.1007/s11199-007-9316-z

Van Royen, P., Beyer, M., Chevallier, P., Eilat-Tsanani, S., Lionis, C., Peremans, L., Petek, D., Rurik, I., Soler, J. K., Stoffers, H. E. J. H., Topsever, P., Ungan, M., & Hummers-Pradier, E. (2010). The research agenda for general practice/family medicine and primary health care in Europe. Part 3. Results: Person centred care, comprehensive and holistic approach. *The European Journal of General Practice*, *16*(2), 113–119. https://doi.org/10.3109/13814788.2010.481018

van Teijlingen, E., & Hundley, V. (2002). The importance of pilot studies. *Nursing Standard (Royal College of Nursing (Great Britain): 1987)*, *16*(40), 33–36. https://doi.org/10.7748/ns2002.06.16.40.33.c3214

von Hurst, P. R., Stonehouse, W., & Coad, J. (2010). Vitamin D status and attitudes towards sun exposure in South Asian women living in Auckland, New Zealand. *Public Health Nutrition*, *13*(4), 531–536. https://doi.org/10.1017/S1368980009990838

Vu, L. H., Pols, J. C. van der, Whiteman, D. C., Kimlin, M. G., & Neale, R. E. (2010). Knowledge and Attitudes about Vitamin D and Impact on Sun Protection Practices among Urban Office Workers in Brisbane, Australia. *Cancer Epidemiology Biomarkers & Prevention*, *19*(7), 1784–1789. https://doi.org/10.1158/1055-9965.EPI-10-0127

Walker, N., Love, T. D., Baker, D. F., Healey, P. B., Haszard, J., Edwards, A. S., & Black, K. E. (2014). Knowledge and attitudes to vitamin D and sun exposure in elite New

Zealand athletes: A cross-sectional study. *Journal of the International Society of Sports Nutrition*, *11*, 47. https://doi.org/10.1186/s12970-014-0047-6

Webb, A. R., Kline, L., & Holick, M. F. (1988). Influence of season and latitude on the cutaneous synthesis of vitamin D3: Exposure to winter sunlight in Boston and Edmonton will not promote vitamin D3 synthesis in human skin. *The Journal of Clinical Endocrinology and Metabolism*, *67*(2), 373–378. https://doi.org/10.1210/jcem-67-2-373

Wijsman-Grootendorst, A., & van Dam, R. M. (2005). [The attitude of Dutch women of Turkish ancestry towards measures for the prevention and treatment of vitamin D deficiency; the results of focus group interviews]. *Nederlands Tijdschrift Voor Geneeskunde*, *149*(17), 932–936.

Williams, B. (1994). Patient satisfaction: A valid concept? *Social Science & Medicine*, *38*(4), 509–516. https://doi.org/10.1016/0277-9536(94)90247-X

Williams, S. J. (1995). Theorising class, health and lifestyles: Can Bourdieu help us? *Sociology of Health & Illness*, *17*(5), 577–604. https://doi.org/10.1111/1467-9566.ep10932093

www.ETHealthworld.com. (2014). *Kolkata witnesses a campaign on Vitamin D awareness—ET HealthWorld*. ETHealthworld.Com. http://health.economictimes.indiatimes.com/news/industry/kolkata-witnesses-a-campaign-on-vitamin-d-awareness/45677977

Wyke, S. (1992). Explaining Health and Illness. An Exploration of Diversity (Book). *Sociology of Health & Illness*, *14*(3), 427–428. https://doi.org/10.1111/1467-9566.ep11357527

Xie, Z., Xia, W., Zhang, Z., Wu, W., Lu, C., Tao, S., Wu, L., Gu, J., Chandler, J., Peter, S., Yuan, H., Wu, T., & Liao, E. (2019). Prevalence of Vitamin D Inadequacy Among Chinese Postmenopausal Women: A Nationwide, Multicenter, Cross-Sectional Study. *Frontiers in Endocrinology*, *9*. https://doi.org/10.3389/fendo.2018.00782

Yin, R. (2015). *Qualitative Research from Start to Finish, Second Edition* (2 edition). The Guilford Press.

Zareef, T. A., & Jackson, R. T. (2021). Knowledge and attitudes about vitamin D and sunlight exposure in premenopausal women living in Jeddah, and their relationship with serum vitamin D levels. *Journal of Health, Population, and Nutrition*, *40*(1), 38. https://doi.org/10.1186/s41043-021-00263-w

Zhao, S. (1991). Metatheory, Metamethod, Meta-Data-Analysis: What, Why, and How? *Sociological Perspectives*, *34*(3), 377–390. https://doi.org/10.2307/1389517

Zhou, M., Zhuang, W., Yuan, Y., Li, Z., & Cai, Y. (2016). Investigation on vitamin D knowledge, attitude and practice of university students in Nanjing, China. *Public Health Nutrition*, *19*(1), 78–82. https://doi.org/10.1017/S1368980015000373

Zullo, S. (2007). Evidence-Based Healthcare Design: Use of Color, Light, and Gardens at Choices Recovery Services Choices Longitudinal Study. *Long Beach*.

9. Appendix

9.1 CCAT for quality assessment

The CCAT form contains eight categories, and 22 sub-items, where each item has multiple item descriptors (❑) to enable marking them as present/absent/not applicable and scoring them (Crowe, 2015). Each category receives its own score on a 6-point scale from 0–5, where the lowest is 0, and the highest is 5 (Crowe, 2015). The quality assessment tool is posted below (Crowe, 2015).

Crowe Critical Appraisal Tool (CCAT) Form (v1.4)

Reference

Reviewer

This form must be used in conjunction with the CCAT User Guide (v1.4); otherwise validity and reliability may be severely compromised.

Citation

Year

Research design (add if not listed)

☐ Not research		Article | Editorial | Report | Opinion | Guideline | Pamphlet | …
☐ Historical		…
☐ Qualitative		Narrative | Phenomenology | Ethnography | Grounded theory | Narrative case study | …
☐ Descriptive, Exploratory, Observational		A. Cross-sectional | Longitudinal | Retrospective | Prospective | Correlational | Predictive | … B. Cohort | Case-control | Survey | Developmental | Normative | Case study | …
Experimental	☐ True experiment	Pre-test/post-test control group | Solomon four-group | Post-test only control group | Randomised two-factor | Placebo controlled trial | …
	☐ Quasi-experiment	Post-test only | Non-equivalent control group | Counter balanced *(cross-over)* | Multiple time series | Separate sample pre-test post-test [no Control] [Control] | …
	☐ Single system	One-shot experimental *(case study)* | Simple time series | One group pre-test/post-test | Interactive | Multiple baseline | Within subjects *(Equivalent time, repeated measures, multiple treatment)* | …
☐ Mixed Methods		Action research | Sequential | Concurrent | Transformative | …
☐ Synthesis		Systematic review | Critical review | Thematic synthesis | Meta-ethnography | Narrative synthesis | …
☐ Other		…

Variables and analysis

Intervention(s), Treatment(s), Exposure(s)	Outcome(s), Output(s), Predictor(s), Measure(s)	Data analysis method(s)

Sampling

Total size		Group 1		Group 2		Group 3		Group 4		Control	
Population, sample, setting											

Data collection (add if not listed)

Audit/Review	a) Primary | Secondary | … b) Authoritative | Partisan | Antagonist | … c) Literature | Systematic | …	Interview	a) Formal | Informal | … b) Structured | Semi-structured | Unstructured | … c) One-on-one | Group | Multiple | Self-administered | …
Observation	a) Participant | Non-participant | … b) Structured | Semi-structured | Unstructured | … c) Covert | Candid | …	Testing	a) Standardised | Norm-ref | Criterion-ref | Ipsative | … b) Objective | Subjective | … c) One-on-one | Group | Self-administered | …

Scores

Preliminaries		Design		Data Collection		Results		Total [/40]	
Introduction		Sampling		Ethical Matters		Discussion		Total [%]	

General notes

Appraise research on the merits of the research design used, not against other research designs.

Category Item	Item descriptors [☑ Present; ☒ Absent; ■ Not applicable]	Description [Important information for each item]	Score [0–5]
1. Preliminaries			
Title	1. Includes study aims ☐ and design ☐		
Abstract (assess last)	1. Key information ☐ 2. Balanced ☐ and informative ☐		
Text (assess last)	1. Sufficient detail others could reproduce ☐ 2. Clear/concise writing ☐, table(s) ☐, diagram(s) ☐, figure(s) ☐		
		Preliminaries [/5]	
2. Introduction			
Background	1. Summary of current knowledge ☐ 2. Specific problem(s) addressed ☐ and reason(s) for addressing ☐		
Objective	1. Primary objective(s), hypothesis(es), or aim(s) ☐ 2. Secondary question(s) ☐		
	Is it worth continuing?	**Introduction [/5]**	
3. Design			
Research design	1. Research design(s) chosen ☐ and why ☐ 2. Suitability of research design(s) ☐		
Intervention, Treatment, Exposure	1. Intervention(s)/treatment(s)/exposure(s) chosen ☐ and why ☐ 2. Precise details of the intervention(s)/treatment(s)/exposure(s) ☐ for each group ☐ 3. Intervention(s)/treatment(s)/exposure(s) valid ☐ and reliable ☐		
Outcome, Output, Predictor, Measure	1. Outcome(s)/output(s)/predictor(s)/measure(s) chosen ☐ and why ☐ 2. Clearly define outcome(s)/output(s)/predictor(s)/measure(s) ☐ 3. Outcome(s)/output(s)/predictor(s)/measure(s) valid ☐ and reliable ☐		
Bias, etc	1. Potential bias ☐, confounding variables ☐, effect modifiers ☐, interactions ☐ 2. Sequence generation ☐, group allocation ☐, group balance ☐, and by whom ☐ 3. Equivalent treatment of participants/cases/groups ☐		
	Is it worth continuing?	**Design [/5]**	
4. Sampling			
Sampling method	1. Sampling method(s) chosen ☐ and why ☐ 2. Suitability of sampling method ☐		
Sample size	1. Sample size ☐, how chosen ☐, and why ☐ 2. Suitability of sample size ☐		
Sampling protocol	1. Target/actual/sample population(s): description ☐ and suitability ☐ 2. Participants/cases/groups: inclusion ☐ and exclusion ☐ criteria 3. Recruitment of participants/cases/groups ☐		
	Is it worth continuing?	**Sampling [/5]**	
5. Data collection			
Collection method	1. Collection method(s) chosen ☐ and why ☐ 2. Suitability of collection method(s) ☐		
Collection protocol	1. Include date(s) ☐, location(s) ☐, setting(s) ☐, personnel ☐, materials ☐, processes ☐ 2. Method(s) to ensure/enhance quality of measurement/instrumentation ☐ 3. Manage non-participation ☐, withdrawal ☐, incomplete/lost data ☐		
	Is it worth continuing?	**Data collection [/5]**	
6. Ethical matters			
Participant ethics	1. Informed consent ☐, equity ☐ 2. Privacy ☐, confidentiality/anonymity ☐		
Researcher ethics	1. Ethical approval ☐, funding ☐, conflict(s) of interest ☐ 2. Subjectivities ☐, relationship(s) with participants/cases ☐		
	Is it worth continuing?	**Ethical matters [/5]**	
7. Results			
Analysis, Integration, Interpretation method	1. A.I.I. method(s) for primary outcome(s)/output(s)/predictor(s) chosen ☐ and why ☐ 2. Additional A.I.I. methods (e.g. subgroup analysis) chosen ☐ and why ☐ 3. Suitability of analysis/integration/interpretation method(s) ☐		
Essential analysis	1. Flow of participants/cases/groups through each stage of research ☐ 2. Demographic and other characteristics of participants/cases/groups ☐ 3. Analyse raw data ☐, response rate ☐, non-participation/withdrawal/incomplete/lost data ☐		
Outcome, Output, Predictor analysis	1. Summary of results ☐ and precision ☐ for each outcome/output/predictor/measure 2. Consideration of benefits/harms ☐, unexpected results ☐, problems/failures ☐ 3. Description of outlying data (e.g. diverse cases, adverse effects, minor themes) ☐		
		Results [/5]	
8. Discussion			
Interpretation	1. Interpretation of results in the context of current evidence ☐ and objectives ☐ 2. Draw inferences consistent with the strength of the data ☐ 3. Consideration of alternative explanations for observed results ☐ 4. Account for bias ☐, confounding/effect modifiers/interactions/imprecision ☐		
Generalisation	1. Consideration of overall practical usefulness of the study ☐ 2. Description of generalisability (external validity) of the study ☐		
Concluding remarks	1. Highlight study's particular strengths ☐ 2. Suggest steps that may improve future results (e.g. limitations) ☐ 3. Suggest further studies ☐		
		Discussion [/5]	
9. Total			
Total score	1. Add all scores for categories 1–8		
		Total [/40]	

9.2 CCAT for data extraction (Crowe, 2015)

Table 7: Data extraction sheet - CCAT

	Data Extraction	Comments for quality assessment
Preliminaries		
Title		
Abstract		
Text		
Introduction		
Background		
Objectives		
Design		
Research Design		
Variable and analysis		
Intervention(s), treatment(s), exposure(s)		
Outcomes, outputs, predictors, measures		
Analysis Methods		
Bias		
Sampling		
Sampling		
Data collection		
Data collection methods		
Ethical matters		
Ethical considerations		
Results		
Results of the study		
Discussion		
Discussion section of the study		
Generalization		
Conclusion		

9.3 Literature review primary studies characteristics Literature Review

Table 2.3. Primary studies characteristics

Reference	**Objective**	**Theory**	**Population**	**Location**	**Methodology/ Methods**	**Data collection (researcher)**	**Analysis**
(Brand et al. 2008)	To investigate socio-cultural barriers and enablers to reducing risk of vitamin D deficiency among dark-skinned and veiled community group in a Melbourne to create a culturally suitable health promotion campaign.	None	• Characteristics: - 18 - 75 years old or more - Dark-skinned or veiled participants (homogenous sample). - Both genders, irrespective of the parental and employment status. It was not mentioned if English speakers were only included. • Recruitment technique: Not specified, however they were recruited from community-dwelling people. • Sample size: Five focus groups (total 34 participants): a) Islamic Lecture Group (N = 11) b) Eritrean men's group (N = 6) c) Horn of Africa playgroup (N = 4) d) Somali young men's group (N = 5) e) Somali women's sewing group |(N = 8)	Australia (Melbourne, city of Moonee Valley areas, and Victoria), which are culturally diverse, and homes vary from low cost, low rise and high-rise flats.	Qualitative Study (Grounded Theory)	• Data collection method: - Five community-based consumer focus groups conducted by a facilitator (trained Horn of Africa Community healthcare worker) and an independent observer. - A draft of the finding was subject to further review by the project community partnership group who had close associations with these groups and could affirm face validity of the thematic analysis. • Technique for recording findings: - Manual documentation. • Duration: - 1.5 hours (90 minutes). • Location of interview:	Thematic Analysis (Braun & Clarke 2008)

			- Ethical approval was granted, and verbal consents were obtained.			- Not specified	
(Bonevski et al. 2013)	To explore vitamin D and sun exposure attitudes, knowledge and practices.	SCT and HBM.	- <u>Characteristics:</u> - Adults > 18 years old - Both genders (almost equal number of males and females except for the primary school teachers, where there were 6 females and only 1 male). - English speakers. - Ethnicity was not specified. - <u>Recruitment technique</u>: - Purposeful sampling technique from three groups of interest (teachers, 2 group; primary and secondary schools, office workers, 2 groups; and elderly those who are community living and in residential aged care facilities, 2 groups). - The recruitment was done by an accredited agency. - <u>Sample size:</u> Six focus groups, four of them were held in a location with a high migrant population to increase the cultural mix of sample. Total number of participants: 52 (23 males and 29 females):	Australia (Sydney).	Qualitative study (design: not specified)	- <u>Data collection method:</u> - Six focus groups conducted through an independent social market research organization, but one of the authors was the observer. - <u>Technique for recording findings:</u> - Audio-recording. - <u>Duration:</u> - 1 to 1.5 hours. - <u>Location of interview:</u> - Not specified	Not specified (probably thematic analysis).

			a) Group 1: Office workers (N = 9) b) Group 2: Independent living adults ≥65 (N = 9) c) Group 3: Office workers (N = 9) d) Group 4: Community aged home residents ≥65 (N = 9) e) Group 5: Primary school teachers (N = 7) f) Group 6: Secondary school teachers (N = 9) • Ethical approval was granted, and verbal consents were obtained. • All participants were offered $80				
(Christie & Mason 2011)	To investigate the knowledge, attitude and practice towards vitamin D deficiency, sun exposure, supplementation and fortification in a sample of female Saudi Arabian students.	None	• <u>Characteristics:</u> - Aged between 20 and 25. - 17 female students recruited from Prince Sultan University (PSU). - Most of them were Saudi Arabian origin, and only three were Palestinian or Syrian origin. - Muslim. - It was not specified if this was restricted to a certain language, but definitely Arabic as all are Arabs. • <u>Recruitment technique:</u>	Saudi Arabia (Riyadh, Prince Sultan University).	Qualitative study (design: not specified).	• <u>Data collection method:</u> - One in-depth focus group and 8 one-to-one interviews by the field researcher whom is a female and working at PSU. • <u>Technique for recording findings:</u> - Audio-recording. • <u>Duration:</u> - Focus group: 1 hour. - Semi-structured interview: 30 to 40 minutes	Thematic analysis

			- Through posters that were distributed on the campus (Convenience sampling). - <u>Sample size:</u> - 17 female students recruited from Prince Sultan University (PSU). - Ethic approval was granted, and consent forms were signed prior participating.			- <u>Location of the interview :</u> - University classrooms.	

(Kotta et al. 2015)	To explore lay knowledge, beliefs and attitudes towards vitamin D.	None	- <u>Characteristics:</u>
			  - Age range: 25 to 85 years old.
			  - Three main groups of interest, which are adults with asthma or COPD (African, Bangladeshi, blank British, Indians/ Pakistani, white British)
			  - adults over 65 years and healthy adults under 65 years.
			  - Both genders.
			  - All are able to speak English frequently.
			- <u>Recruitment technique:</u>
			  - Recruitment was done from a large general practice in east London using purposive sampling.
			- <u>Sample size:</u>
			Nine focus groups, with a total number of participants of 58 (18 males and 40 females):
				United Kingdom (East London).	Qualitative study (design: not specified).	- <u>Data collection method:</u>
						  - Nine focus groups, where these were facilitated by trained researchers.
						- <u>Technique for recording findings:</u>
						  - Audio-recording.
						- <u>Duration:</u>
						  - Not specified.
						- <u>Location:</u>
						  - All focus group sessions occurred at the practice except for the Bangladeshi group which was carried out at a patient's home.
							Thematic analysis

			a) African (With asthma or COPD) (N = 7) b) Bangladeshi (With asthma or COPD) (N = 5) c) Black British (With asthma or COPD) (N = 7) d) Indian or Pakistani (With asthma or COPD) (N = 5) e) White British (With asthma or COPD) (N = 5) f) Adults over 65 years – Group 1 (N=10) g) Adults over 65 – Groups 2 (N = 11) h) Healthy adults under 65 – Group 1 (N = 4) i) Healthy adults under 65 – Groups 2 (N = 5) • Ethic approval was granted, and consent forms were signed prior participating.				
(Pirrone et al. 2013)	This study's purpose was three-fold: 1) to explore the individual perception, experience and understanding of	HBM	• <u>Characteristics:</u> • Age range : not specified. • Females who were self-identified as being dark-skinned, wore a veil and resided in	Australia (Melbourne).	Qualitative study (design: not specified).	• <u>Data collection method:</u> - Five focus groups, and an interpreter was available at five FGs to assist those who could not read English (for one occasion – Somali).	Thematic analysis.

	VDD amongst African migrant women (dark-skinned and veiled) African migrant women residing in high rise public housing in the western region of Melbourne. 2) to identify their most useful sources of information about preventing and addressing VDD 3) to report the strategies and potential barriers to addressing VDD in future community based interventions.		high-rise public housing in the inner west region of Melbourne. • From the Horn of Africa (mostly Somalia and small proportion from other African countries including, Eritrea and Oromo). • Arrived to Australia as Humanitarian Refugees within the last five years, few women had been in Australia for approximately ten years. • Muslim and wearing hijab. • All participants were able to verbally communicate in English interpreter was used on one occasion (Somali). • Recruitment technique: - Did not specify but seems to be convenience sampling. Access to the participants was facilitated by the Vitamin D Project Worker from the neighboring Community Health Service who had a long-standing relationship with the women. • Sample size: - Total number of participants was 30 females.			• Technique for recording findings: - Audio-recording and in certain instances were hand written. • Duration: - Duration about 40 minutes. • Location: - Not specified	

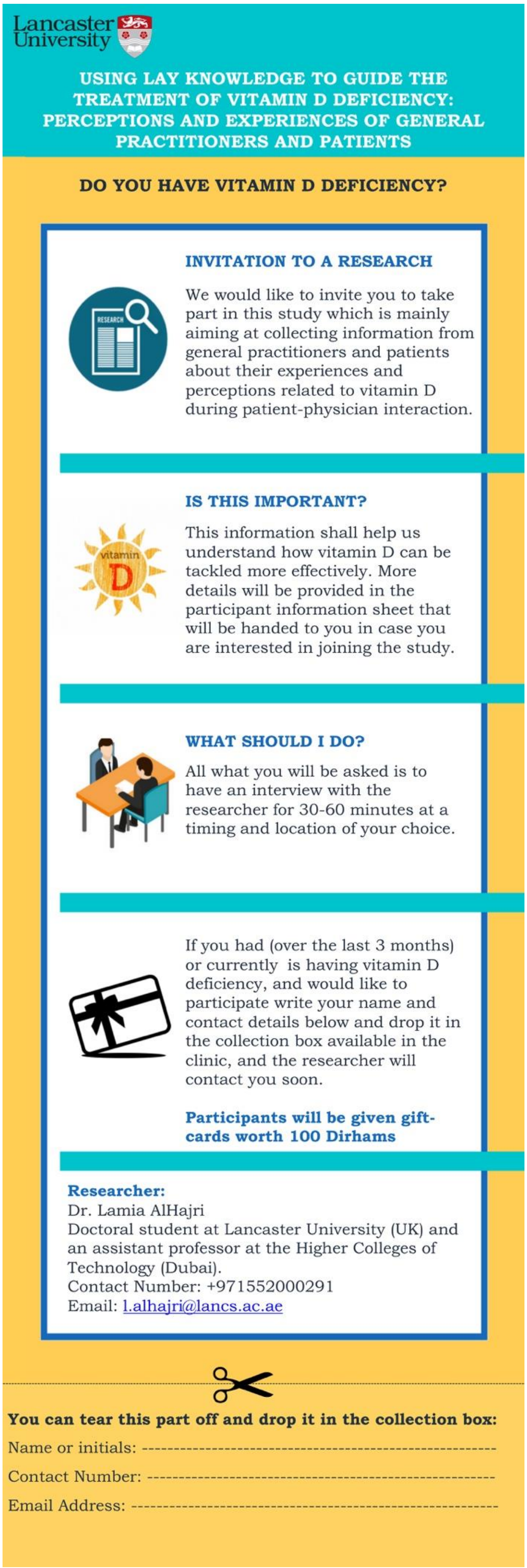
			- Ethic approval was granted, and consent forms were obtained.				
(Durvasula et al. 2010)	The aims of the study were: 1) ascertain the current and early life attitudes to sunlight exposure in older people living in intermediate care facilities (known as aged care hostels in Australia) in northern Sydney region of southern Australia 2) to determine the participants' knowledge of vitamin D and its effect. By the factors that determine sun exposure in this population and whether these have	None	- <u>Characteristics:</u> - Age range: 70 years or over (70 – 107 years). - Being independently mobile (or able to walk with aids). - Both genders (39 women and 18 men). - Participants were excluded if they were currently taking vitamin D or calcium supplements or having a history of skin cancer within the last 3 years. - The ethnicity of participants was not specified. - <u>Recruitment technique:</u> - The participants were drawn from a list of those people who were eligible for inclusion in the FREEDOM study. However, the recruitment technique was not specified. The participants from the FREEDOM study were recruited from intermediate care facilities in northern Sydney region of Australia. These facilities (usually referred as Low Level	Australia (Sydney, intermediate care facilities in northern Sydney).	Qualitative study (design: not specified).	- <u>Data collection method:</u> - Two parts: Semi-structured interviews and structured interviews. - <u>Technique for recording findings:</u> - Audio recording. - <u>Duration:</u> - Not specified. - <u>Location:</u> - Home care facility/ resident.	No specified.

	changed on the course of the participants' lives, it may be possible to develop strategies to facilitate optimal and safe sun exposure and prevent vitamin D deficiency.		Residential Care Services, or Hostels in Australia). 9 intermediate care facilities and 57 residents consented and completed the interviews. • Sample size: 57 participants (39 women and 18 men). • Ethic approval was granted, and consent forms were obtained.				
(Aljefree et al. 2017)	The aims of this qualitative study were to: (1) explore participants' knowledge and their sources of information about vitamin D; (2) explore participants' attitudes regarding sun exposure; and (3) explore the social and cultural factors that might potentially	None	• Characteristics: - Age range: between18 and 49 years old - Marital status: single or married - Gender: males and females - Nationality: Saudis or not, living in urban or semi-rural. - Educational level and employment: irrespective of their educational level, employment status and income were considered eligible. • Recruitment technique: - It was not mentioned, but thought to be convenience sampling as participants were asked whether they were willing to participate in qualitative interviews as part of a quantitative study. • Sample size:	Saudi Arabia (three hospitals located in Western Region of Saudi, in the cities of Jeddah and Makkah) which are King Abdullah Medical City, King Abdulaziz University,	Qualitative study (design: not specified).	• Data collection method: - 22 face-to-face semi-structured interviews. • Technique for recording findings: - Audio-recording • Duration: - 25 to 35 minutes. • Location: The interviews took place in the three hospitals where the quantitative study was undertaken: King Abdullah Medical City (KAMC), King Abdulaziz University (KAU), and Tunsi private hospital.	Thematic analysis

	contribute to vitamin D deficiency in Saudi Arabia.		Total number of participants = 22 (11 males and 11 females): - 10 cases and 12 control. - 4 < 49 years old while 18 ≥ 49. - 1 single, 17 married and 4 divorced. - 17 Saudis and 5 non-Saudis. - 21 live in urban areas, while 1 live in semi – rural area. - 15 have high school, diploma or bachelor’s degree, 3 only primary levels and 4 graduate degrees. - 15 employed, while 7 unemployed (student, retired or housewife). - 6 with family income < 5000, 9 between 5000 – 15000 and 7 15000 - ≥ 25000 • Ethical approval was obtained from the university, and study subjects confirmed their agreement to participate in the interviews by signing informed consent forms.	and Tunsi private hospital.			

(Jang et al. 2013)	The aim was to provide qualitative insights into knowledge about cultural factors including fair skin preference that may be related to sun-exposure attitudes and behaviors among East Asian women living in Australia.	None	• Characteristics: - Age group: Between 18 – 83 years old. - Gender: Female. - Nationality: either Korean or Chinese (China, Hong Kong, Macau and Taiwan). - Nearly half of the women (49%) had lived in Australia for ≥10 years. - No language restriction as the researchers were able to speak Cantonese or Korean. • Recruitment technique: - Researchers asked a stratified random sample of women if they were willing to volunteer for the qualitative study (convenience sampling). • Sample size: 36 (20 Chinese and 16 Korean) volunteered. • Ethic approval was granted, and consent forms were obtained.	Australia	Qualitative study (design: not specified but seems to be grounded theory).	• Data collection method: - 36 in-depth individual interviews conducted by researcher who are native speakers of the languages of participants. • Technique for recording findings: - Audio-recording • Duration: - About 40 minutes to one hour • Location: - Participants' homes	Thematic Analysis (Charmaz 2006)

9.4 Invitations in English and Arabic



Lancaster University

USING LAY KNOWLEDGE TO GUIDE THE TREATMENT OF VITAMIN D DEFICIENCY: PERCEPTIONS AND EXPERIENCES OF GENERAL PRACTITIONERS AND PATIENTS

DO YOU HAVE VITAMIN D DEFICIENCY?

INVITATION TO A RESEARCH

We would like to invite you to take part in this study which is mainly aiming at collecting information from general practitioners and patients about their experiences and perceptions related to vitamin D during patient-physician interaction.

IS THIS IMPORTANT?

This information shall help us understand how vitamin D can be tackled more effectively. More details will be provided in the participant information sheet that will be handed to you in case you are interested in joining the study.

WHAT SHOULD I DO?

All what you will be asked is to have an interview with the researcher for 30-60 minutes at a timing and location of your choice.

If you had (over the last 3 months) or currently is having vitamin D deficiency, and would like to participate write your name and contact details below and drop it in the collection box available in the clinic, and the researcher will contact you soon.

Participants will be given gift-cards worth 100 Dirhams

Researcher:
Dr. Lamia AlHajri
Doctoral student at Lancaster University (UK) and an assistant professor at the Higher Colleges of Technology (Dubai).
Contact Number: +971552000291
Email: l.alhajri@lancs.ac.ae

You can tear this part off and drop it in the collection box:

Name or initials: --

Contact Number: --

Email Address: ---

Lancaster University

اعتقادات وتجارب المرضى والأطباء في استخدام معرفة المرضى التجريبية المكتسبة في علاج نقص فيتامين د.

هل تعاني من نقص فيتامين د؟

دعوة للمشاركة في بحث علمي

يسرنا دعوتكم للمشاركة في هذا البحث الذي يهدف لمعرفة اعتقادات وتجارب الأطباء والمرضى مع نقص فيتامين د.

ما أهمية هذا البحث؟

نأمل من خلال جمع هذه المعلومات أن نستطيع فهم نقص فيتامين د بشكل أعمق وأدق لنستطيع معالجته بطريقة أكثر فاعلية. سوف يتم تزويدكم بالمزيد من المعلومات في حال رغبتكم بالمشاركة في هذا البحث.

ماذا يتطلب المشاركة في البحث؟

مشاركتكم ستكون مقتصرة على مقابلة الباحث لمدة (٣٠ – ٦٠)دقيقة للتحدث عن فيتامين د في المكان والزمان الذي تختارونه.

إذا كنت تعاني من نقص في فيتامين د حاليًا أو خلال الأشهر الثلاثة الماضية، ولديك الرغبة بالمشاركة ما عليك سوى كتابة اسمك وأرقام التواصل في الأسفل ورمي هذه القصاصة في الصناديق المخصصة الموجودة في العيادة، وسوف يتم التواصل معك قريبا.

سوف يتم إعطاء كل مشارك بطاقة ائتمانية بقيمة ١٠٠ درهم.

معلومات عن الباحث:

د. لمياء الهاجري
باحث في جامعة لانكاستر (المملكة المتحدة)، وأستاذ مساعد في كليات التقنية العليا (دبي).
هاتف: +971552000291
البريد الإلكتروني: lalhajri@lancs.ac.ae

ارمي هذا الجزء في صناديق التجميع وسوف يتم التواصل معك:

الاسم: --

رقم التواصل: --

البريد الإلكتروني: --

9.5 The pack

9.5.1 Pack instruction sheet

Patients/ General Practitioners

Project Title: Using patients' lay knowledge to guide the treatment of vitamin D deficiency: Perceptions and experiences of general practitioners and patients.

Thank you for registering your details and your interest in participating in this study. This pack contains three important documents and we would like you to go through them in the following order:

1) Participant information sheet.
2) Consent form.
3) Expression of interest.

Once you have done this, we will need you to either email us or call us to be able to get the consent form and expression of interest from you. The papers that need to be returned to us are marked with this sign ⮌.

Your participation will be confirmed shortly after collecting these documents back.

Kind Regards,

Lamia AlHajri

l.alhajri@lancaster.ac.uk

9.5.2 Participants 'general practitioners' information sheet

Project title: Using patients' lay knowledge to guide the treatment of vitamin D deficiency: Perceptions and experiences of general practitioners and patients.

My name is Lamia AlHajri a PhD student in the public health program at Lancaster University, United Kingdom.

What is the study about?

The purpose of this study is to uncover whether or not patients own knowledge and experience is used by general practitioners in deciding on appropriate treatment and prevention options in relation to vitamin D deficiency.

Why have I been approached?

You have been approached because it is likely that you have had conversations with your patients about vitamin D deficiency at some point. We are particularly interested in hearing about your experiences as a general practitioner both in terms of the advice and guidance you provide to patients.

Do I have to take part?

No. It's completely up to you to decide whether or not you take part. Whether you take part or not will have no impact on your professional endeavour.

What will I be asked to do if I take part?

If you decide you would like to take part, with your permission the researcher will ask some introductory details about yourself and various aspects related to vitamin D. You will be invited to a one-to-one interview which will last for about 30 to 60 minutes in a location and at a time of your choice. This will be audio recorded, and information collected will be used to meet the objectives of this study. You can stop the interview at any point without giving a reason. If, within two weeks of the interview you decide that you wish for your data to be withdrawn from the study then you can notify the researcher who will destroy you recording and associated material. After 2 weeks, it will be impossible to withdraw your data from the study but your contribution will be anonymised and every care will be taken to ensure that you are not recognisable.

Will my data be Identifiable?

The information you provide is confidential. You will not be disadvantaged in any way if you choose not to take part of this study. All data whether it was electronic or paper-based files will be stored securely, and only the researchers conducting this study and no one else will have access to this data:

- Audio recordings will be transferred immediately to a laptop (encrypted and password protected), and will be anonymised. Any data remaining on the device will be deleted immediately. However, the anonymised typed version of the transcripts of the interviews' will be archived for 10 years at Lancaster University, and will only be accessed after gaining an official approval from the university and the researchers.
- Written anonymised encrypted manuscripts will be stored in a secured repository at Lancaster University and separated from any personal identifier for 10 years and destroyed.
- The personal identifier files (expression of interest and consent forms) will be stored in a separated locked cabinet, will be access only by the principle researcher (Lamia AlHajri), and will be destroyed immediately after submitting the final report.
- Any softcopy or electronic file will be encrypted (that is no one other than the researcher will be able to access them), and the computer itself will be password protected.
- Anonymised direct quotations from your interview may be used in the reports or publications from the study, but your name will not be attached to them.
- All your personal data will be confidential and will be kept separately from your interview responses.
- You have a right to request a copy of any information that the research team hold on you for ten years after you are interviewed.
- There are some limits to confidentiality: if what is said in the interview makes me think that you, or someone else, is at significant risk of harm, I will have to break confidentiality and speak to a member of staff about this. If possible, I will tell you if I have to do this.

For further information about how Lancaster University processes personal data for research purposes and your data rights please visit our webpage: www.lancaster.ac.uk/research/data-protection

What will happen to the results?

The results will be summarised and reported in a dissertation of the student (Lamia AlHajri). Also, papers on the findings may be submitted for publication to peer reviewed academic journals and conferences. You can ask for withdrawing your data two weeks from conducting the interview without having to give any reasons. After 2 weeks, it will be impossible to withdraw your data from the study but your contribution will be anonymised and every care will be taken to ensure that you are not recognisable. We will confirm that this has been done in writing to you.

Are there any risks?

There are no risks anticipated with participating in this study. However, if you experience any issues contact the principle researcher, contact information are provided at the end of this sheet.

Are there any benefits to taking part?

Although you may find participating interesting, there are no direct benefits in taking part. However, some may find it a positive experience. That is due to the fact that through our conversations, you might gain more information related to the concept of own knowledge and contexts. As a token of appreciation, participants will be offered a gift card to the value of 100 Dirhams.

Who has reviewed the project?

This study has been reviewed and approved by the Faculty of Health and Medicine Research Ethics Committee at Lancaster University, as well as the Ethics Committee at the Dubai Health Authority (DHA).

Where can I obtain further information about the study if I need it?

If you have any questions about the study, please contact the research tem

1) Lamia AlHajri (Principle researcher) - Email: l.alhajri@lancaster.ac.uk
2) Dr. Mark Limmer (Primary Academic Supervisor) – Email: m.limmer@lancaster.ac.uk
3) Dr. Paula Holland (Secondary Academic Supervisor) – Email: p.j.holland@lancaster.ac.uk
4) Dr. Abdulla AlRasasi (Co-supervisor) – Email: AAAlrasasi@dha.gov.ae

Complaints

If you wish to make a complaint or raise concerns about any aspect of this study and do not want to speak to the researcher, you can contact:

Professor Catherine Waslhe Tel: +44 (0)1524 510124
Director of Year 3+ of the PhD programs at the Department of Health Research
Email: c.walshe@lancaster.ac.uk
Department of Health Research – Palliative Care
Lancaster University
Lancaster
LA1 4YG

If you wish to speak to someone outside of the public health Doctorate Programme, you may also contact:

Professor Roger Pickup Tel: +44 (0)1524 593746

Associate Dean for Research Email: r.pickup@lancaster.ac.uk
Faculty of Health and Medicine
(Division of Biomedical and Life Sciences)
Lancaster University
Lancaster
LA1 4YG

Resources in the event of distress

Should you feel distressed either as a result of taking part, or in the future, please contact the principle investigator or Dr. Abdulla AlRasasi.

Thank you for taking the time to read this information sheet.

9.5.3 Participants ‘patients’ information sheet

Project title: Using patients’ lay knowledge to guide the treatment of vitamin D deficiency: Perceptions and experiences of general practitioners and patients.

My name is Lamia AlHajri a PhD student in the public health program at Lancaster University, United Kingdom.

What is the study about?

The purpose of this study is to uncover whether or not patients own knowledge and experience is used by general practitioners in deciding on appropriate treatment and prevention options in relation to vitamin D deficiency.

Why have I been approached?

You have been approached because it is likely that you have had conversations with your general practitioner about vitamin D deficiency at some point. We are particularly interested in hearing about your experiences as a patient both in terms of the advice and guidance you were given and how this impacted on your decisions in relation to addressing vitamin D deficiency.

Do I have to take part?

No. It’s completely up to you to decide whether or not you take part. Whether you take part or not will have no impact on the services you receive from your physician.

What will I be asked to do if I take part?

If you decide you would like to take part, with your permission the researcher will ask some introductory details about yourself and various aspects related to vitamin D. You will be invited to a one-to-one interview which will last for about 30 to 60 minutes in a location and at a time of your choice. This will be audio recorded, and information collected will be used to meet the objectives of this study. You can stop the interview at any point without giving a reason. If, within two weeks of the interview you decide that you wish for your data to be withdrawn from the study then you can notify the researcher who will destroy you recording and associated material. After 2 weeks, it will be impossible to withdraw your data from the study but your contribution will be anonymised and every care will be taken to ensure that you are not recognisable.

Will my data be Identifiable?

The information you provide is confidential. You will not be disadvantaged in any way if you choose not to take part of this study. All data whether it was electronic or paper-based files will be stored securely, and only the researchers conducting this study and no one else will have access to this data:

- Audio recordings will be transferred immediately to a laptop (encrypted and password protected), and will be anonymised. Any data remaining on the device will be deleted immediately. However, the anonymised typed version of the transcripts of the interviews' will be archived for 10 years at Lancaster University, and will only be accessed after gaining an official approval from the university and the researchers.
- Written anonymised encrypted manuscripts will be stored in a secured repository at Lancaster University and separated from any personal identifier for 10 years and then destroyed.
- The personal identifier files (expression of interest and consent forms) will be stored in a separated locked cabinet, will be access only by the principle researcher (Lamia AlHajri), and will be destroyed immediately after submitting the final report.
- Any softcopy or electronic file will be encrypted (that is no one other than the researcher will be able to access them), and the computer itself will be password protected.
- Anonymised quotations from your interview may be used in the reports or publications from the study, but your name will not be attached to them.
- All your personal data will be confidential and will be kept separately from your interview responses.
- You have a right to request a copy of any information that the research team hold on you for ten years after you are interviewed.
- There are some limits to confidentiality: if what is said in the interview makes me think that you, or someone else, is at significant risk of harm, I will have to break confidentiality and speak to a member of staff about this. If possible, I will tell you if I have to do this.

For further information about how Lancaster University processes personal data for research purposes and your data rights please visit our webpage: www.lancaster.ac.uk/research/data-protection

What will happen to the results?

The results will be summarised and reported in a dissertation of the student (Lamia AlHajri). Also, papers on the findings may be submitted for publication to peer reviewed academic journals and conferences. You can ask for withdrawing your data two weeks from conducting the interview without having to give any reasons. After 2 weeks, it will be impossible to withdraw your data from the study but your contribution will be anonymised and every care will be taken to ensure that you are not recognisable. We will confirm that this has been done in writing to you.

Are there any risks?

There are no risks anticipated with participating in this study. However, if you experience any issues contact the principle researcher, contact information are provided at the end of this sheet.

Are there any benefits to taking part?

Although you may find participating interesting, there are no direct benefits in taking part. However, some may find it a positive experience. That is due to the fact that through our conversations, you might gain more knowledge related to vitamin D and your context. You might as well gain a better understanding and widen your knowledge regarding the health benefits of the vitamin D, and the consequences of the deficiency. As a token of appreciation, participants will be offered a gift card to the value of 100 Dirhams.

Who has reviewed the project?

This study has been reviewed and approved by the Faculty of Health and Medicine Research Ethics Committee at Lancaster University, as well as the Ethics Committee at the Dubai Health Authority (DHA).

Where can I obtain further information about the study if I need it?

If you have any questions about the study, please contact the research tem

5) Lamia AlHajri (Principle researcher) - Email: l.alhajri@lancaster.ac.uk
6) Dr. Mark Limmer (Primary Academic Supervisor) – Email: m.limmer@lancaster.ac.uk
7) Dr. Paula Holland (Secondary Academic Supervisor) – Email: p.j.holland@lancaster.ac.uk
8) Dr. Abdulla AlRasasi (Co-supervisor) – Email: AAAlrasasi@dha.gov.ae

Complaints

If you wish to make a complaint or raise concerns about any aspect of this study and do not want to speak to the researcher, you can contact:

Professor Catherine Waslhe Tel: +44 (0)1524 510124
Director of Year 3+ of the PhD programs at the Department of Health Research
Email: c.walshe@lancaster.ac.uk
Department of Health Research – Palliative Care
Lancaster University
Lancaster

LA1 4YG

If you wish to speak to someone outside of the Public of Health Doctorate Programme, you may also contact:

Professor Roger Pickup Tel: +44 (0)1524 593746
Associate Dean for Research Email: r.pickup@lancaster.ac.uk
Faculty of Health and Medicine
(Division of Biomedical and Life Sciences)
Lancaster University
Lancaster
LA1 4YG

Resources in the event of distress

Should you feel distressed either as a result of taking part, or in the future, please contact the principle investigator or Dr. Abdulla AlRasasi.

Thank you for taking the time to read this information sheet.

9.5.4 Consent form

Patients/ General Practitioners

Project Title: Using patients' lay knowledge to guide the treatment of vitamin D deficiency: Perceptions and experiences of general practitioners and patients.

We are asking if you would like to take part in a research project which is mainly aiming at uncovering whether or not own knowledge is being used to contexualise vitamin D advices, and the perception of patients and general practitioners regarding the use of lay knowledge to understand context and contextualise medical advices.

Before you consent to participating in the study we ask that you read the participant information sheet and mark each box below with your initials if you agree (for example Abdulla Khalid is written A.K.). To further understand and if you have any questions or queries before signing the consent form please speak to the principal investigator [Lamia AlHajri], contact information are available in the participation information sheet.

Please initial each statement

1. I confirm that I have read the information sheet and fully understand what is expected of me within this study. ☐
2. I confirm that I have had the opportunity to ask any questions and to have them answered. ☐
3. I understand that my interview will be audio recorded and then made into an anonymised written transcript. ☐
4. I understand that audio recordings will be kept until the research project has been examined. ☐
5. I understand that my participation is voluntary and that I am free to stop the interview without giving any reason, without my medical care or legal rights being affected. ☐
6. I understand that I have 2 weeks from the time of conducting the interview to request withdrawing my participation, and after 2 weeks, it will be impossible to withdraw my data from the study, but I know that my contribution will be anonymised and every care will be taken to ensure that I am not recognised. I understand that I will be informed once this is done. ☐
7. I understand that the information from my interview will be pooled with other participants' responses, anonymised and may be published. ☐
8. I consent to information and quotations from my interview being used in reports, conferences and training events. ☐
9. I understand that the researcher will discuss data with their supervisor as needed. ☐
10. I understand that any information I give will remain confidential and anonymous unless it is thought that there is a risk of harm to myself or others, in which case the principal investigator will/may need to share this information with their research supervisor. ☐
11. I consent to Lancaster University keeping anonymised written transcriptions of the interview for 10 years after the study has finished. ☐
12. I consent to take part in the above study. ☐

Name of Participant__________________ **Signature**____________________ **Date** ___________

Name of Researcher ___________________**Signature** _____________________**Date** ____________

For General practitioners, ID Code: 001GP

For patients, ID Code: 001P

9.5.6 Expression of interest

Patients/ General practitioners

Project title: Using patients' lay knowledge to guide the treatment of vitamin D deficiency: Perceptions and experiences of general practitioners and patients.

This document will be dealt with as a personal identifier, which means it will be kept in a secured place to ensure confidentiality (see participants' information sheet).

Write your initials beside the following options if you agree to take part in this study (example Abdulla Khalid: A.K.).

- ○ I have read and understood the participation information section/sheet ________
- ○ I have signed the consent form prior looking at the expression of interest _______
- ○ I am interested in taking part in this project, therefore I signed the consent form ______

Please provide us with the following information so we can ensure your eligibility for participation.

1. Gender: ____

2. If female, are you pregnant?: Yes/ No

3. Age: ____

4. Where do you live (in which emirate)? ______________________________

5. Housing: Villa/ Apartment/ Penthouse Others: ______________

6. Year of graduation: ____

7. Specialty: ____

8. Workplace environment: Indoor Outdoor

9. Years of experience: ____

10. Nationality: ____

11. Ethnic group or race: ____

12. Languages you speak: ____

13. Do you have a vitamin D deficiency? Yes/ No

14. If yes, since when? ___________________________

15. Where have you been diagnosed with the vitamin D deficiency?

Dubai Health Authority facilities Others, please specify ________________________

16. Where are you getting your treatment for the vitamin D deficiency?

Dubai Health Authority facilities Others, please specify ________________________

Please complete this document, and provide us with contact information you are happy to share, so we can contact you to answer any of your enquiries and during the recruitment phase if you wish to participate.

Name: ______________________________________

Mobile Phone or other phone number: ______________________________________

Email: ______________________________________

Postal Address: ______________________________________

9.6 Interviews topic guides

Interview Topic guide for general practitioner (Subject to change based on the input from the first interview)
Introduction of the interviewer
My name is Lamia AlHajri, a doctoral student at Lancaster University and a faculty at the Higher Colleges of Technology, and I thought it would be a good idea to interview you, to obtain more information about certain aspects related to vitamin D as you probably have read in the information sheet. During the interview, I would like to ask you some questions about your background, your education, some experiences you had related to vitamin D. There are no right or wrong answers, and your replies will be anonymised. I hope to use this information to better understand your experiences with vitamin D related talks and counseling advices during patient-physician interaction. The interview should take about 30 to 60 minutes maximum. Are you available to respond to some questions at this time? I would like to bring to your attention that you have been contacted after signing the consent form. This interview will be audio recorded, and the record will only start after obtaining your demographic information, therefore your identity will remain anonymous, where I will be using your ID code from the consent form instead of your name.

General demographics information

- Gender
- Age
- Specialty
- Year of graduation
- Country of graduation
- Years of experience
- Title: Resident Specialist Consultant Others: ___________
- Clinic you are working in
- Ethnic group/ race
- Nationality

Code number: ____________________ (To substitute names for anonymity purposes)

RECORD WILL BE STARTED

General questions about the deficiency and participants experience with the deficiency:

Main questions/ topics	**Additional questions**	**Clarifying questions/ Probes**
1) Do you suffer from vitamin D deficiency?	**Expansion on question 1:** - Why do you think you are deficient? Or why do you think you are not deficient (what are your	– Can you expand a little on this? – Can you tell me anything else? – Can you give me some examples?

2) What is your opinions on the various sources of vitamin D? 3) What is your experience with various sources of vitamin D? 4) In your opinion, what do you think might be the underlying cause/s of the deficiency? 5) Do you feel you have enough information to treat vitamin D deficiency cases? Sources of your information? 6) How do you assess whether or not your information regarding vitamin D is updated?	strategies to keep yourself away from the deficiency)? - What is your experience with the deficiency? **Expansion on question 3:** - Sunlight? How long? When? What portion of the body should be exposed? - Do you get sufficient exposure? How and why? - How would you ensure getting sufficient vitamin D through sunlight? - What time of the day is suitable for vitamin D acquisition through sunlight? - What do you use to guide your judgment on sufficient exposure, right timing and duration and avoid hazardous exposure (for example UVI and % of skin exposed)? - Concerns related to sun exposure. - Plausibility of obtaining vitamin D through sunlight. - Fortified products? How do you calculate your intake? Do you know how to read the labels?	

7) Do you attend any continuing medical education about vitamin D? 8) When did you graduate? 9) Did your curriculum include anything related to vitamin D? 10) How do you find the vitamin D knowledge of medical interns'? 11) Do you think there is a lack of knowledge in general, and if yes mention why? How? 12) Do you think people understand the seriousness of the problem after talking to them?	- Plausibility of getting vitamin D through fortified products? - Why do you think it would be easy to get sufficient vitamin D through sunlight, supplements, food or sub-beds? Or Why do you think it would not be easy to get sufficient vitamin D through sunlight, supplements, food or sub-beds? - How would you prefer getting your vitamin D, through supplements or natural sources? **Expansion on question 4:** - How prevalent is vitamin D deficiency in UAE? - Why do you think the prevalence is high in UAE and worldwide? - Why do you think vitamin D started gaining momentum? **Expansion on question 7:** – How often? – Do you think it is useful? – Why do you attend? Or why you do not attend?	

<table>
<tr><td></td><td>Expansion on question 9:
- Do you think your curriculum addressed vitamin D at an appropriate level? Why and why not?
- How did you judge the appropriateness?
- Would you prefer it to be addressed in much more details? Why and why not?
- If your curriculum was not addressing vitamin D, how did you gain your clinical knowledge? (source?)
- Would you recommend to incorporate vitamin D deficiency in medical, pharmacy, nursing … curriculums? Why? How?
Expansion on question 12:
- What do you do to ensure that patients understand the seriousness of the problem?
- Why do you think patients do not appreciate the seriousness of the problem?</td><td></td></tr>
<tr><td colspan="3">Targeted sub-topic : The experiences of patients and GPs with vitamin D related talks and counselling advices during patient-physician interaction</td></tr>
</table>

Main questions/ topics	Additional questions	Clarifying questions/ Probes
1) Type of information discussed with patients regarding vitamin D. 2) Do you discuss all possible options with patients? (supplements, sunlight …etc) 3) Do you provide information other than the medicinal ones? 4) Do you tell them anything about the impact on various system? 5) Variation in information provided based on age, gender, nationality, religion, cultural background, context, educational level, attire ….etc 6) Variation in advices provided based on age, gender, nationality, religion, cultural background ….etc 7) Upon first time diagnosis with vitamin D deficiency, what would be the first option you would recommend? Would your	**Expansion on question 1:** - How do you discuss or provide the information? (method of providing information) **Expansion on question 2:** - Why? - How? - How are the treatment options communicated to patients? (imposed or collaborative shared activity?) - Is it important to discuss all treatment options with patients? Why? Why not? - Do you discuss the plausibility of adopting them? Why? Why not? - Based on what you choose the treatment option? **Expansion on question 4:**	– Can you expand a little on this? – Can you tell me anything else? – Can you give me some examples?

recommendation vary? If yes, based on what exactly? 8) Do you provide any advice related to the behaviour and practices of patients? 9) Do you verify patients' knowledge? (Recommended daily allowance, sun exposure per day, types of food rich in vitamin D focusing on dairy products, and fish, vitamin D products, diseases, and drugs that affect vitamin D levels, and factors that limit the effect of sun exposure on vitamin D activation). Why? Why not? Is it important? 10) Test the competencies and understanding of patients regarding vitamin D acquisition (reading dietary labels, using UVI to guide exposure).	- Why? Why not? - What exactly do you tell them? **Expansion on question 8:** - What advice exactly do you provide? - Why do you ensure providing such an information? - Is it important? - Do you think it is plausible? - Do you feel you are confident enough to provide this advice? **Expansion on question 11:** - How? - Why? Why not? - Is it important? - Do you think what you provide as an advice is plausible? How do you know or assess? - How do you choose the treatment plan? Based on what?	

11) Do you discuss the plausibility of implementing the medical advises you provide? 12) Do you discuss the appropriate method of exposure to sunlight (avoiding hazardous)? 13) Barriers and facilitators encou7ntered by you when educating and counselling. 14) Are you inviting patients with vitamin D deficiency to collaborate with their knowledge and experience, assess treatment options with regards to their feasibility and plausibility from patients ‘perspectives given the fact that they are the expert in their own context, and allow them to brainstorm and provide pragmatic (feasible/ plausible) solutions (treatment options) to accommodate their context?	**Expansion on question 12** - How? - Why? Why not? - Is it important? **Expansion on question 13, 14:** - How? - Why? Why not? **Expansion on question 15:** - How? - Why? Why not? - If you are concerned about the context, what information related to context would you want to know? Do you obtain this information? Why do you try to obtain this information? **Expansion on question 17:** - How? - Why? Why not?	

15) Do you think the context of the patient is playing a role? 16) Do you assess the context on your own? Or you try to include patients in such an activity? Why? 17) Do you try to design a treatment plan in collaboration with patients?	- Is it important? Why? Why not?	

Targeted sub-topic : GPs use of lay knowledge to contexualise vitamin D advices

Main questions/ topics	**Additional questions**	**Clarifying questions/ Probes**
1) Do you ask anything about patients' context (occupation, attire, housing …etc)? 2) Do you discuss the plausibility of adopting medical advices in relation to patients' context?	**Expansion on question 1:** - Why and why not? - What do you exactly ask about? - What do patients tell you? - What do you do with the information funnelled to you by patients? **Expansion on question 2:** - Why yes? Why no? - Does this discussion take place straight away after telling the	- Can you expand a little on this? - Can you tell me anything else? Can you give me some examples?

	patient about the treatment plan? Or after having to try to implement your advice? - What happens if the advice is not suitable? How do you know?	
Targeted sub-topic : The perception of patients and GPs regarding the use of lay knowledge to understand context and contextualise medical advices.		
Main questions/ topics	**Additional questions**	**Clarifying questions/ Probes**
1) What is your opinion on obtaining more information related to patients' context initially, and then use this in designing a treatment plan that would accommodate patients' unique context?	- Do you think it is an important step? Why? Why not? - Do you think it would optimise treatment plans? How? Why? Why not? - Would you like to discuss context? Why? Why not? Do you actually do that? Why? Why not?	- Can you expand a little on this? - Can you tell me anything else? Can you give me some examples?
CONCLUSION: Well, it has been a pleasure finding out more about you. I appreciate the time you took for this interview. I would like to remind you that you have 2 weeks from today to withdraw your data, please contact me at any time if you feel you need to discuss this further (business card provided). Would it be acceptable to contact you if I have any more questions? Thanks again. Handing over the gift-card.		

Interview Topic guide for patients (Subject to change based on the input from the first interview)
Introduction of the interviewer
My name is Lamia AlHajri, a doctoral student at Lancaster University and a faculty at the Higher Colleges of Technology, and I thought it would be a good idea to interview you, to obtain more information about certain aspects related to vitamin D as you probably have read in the information sheet. During the interview, I would like to ask you some questions about your background, your education, some experiences you had related to vitamin D. There are no right or wrong answers, and your replies will be anonymised. I hope to use this information to better understand your experiences with vitamin D related talks and counseling advices during patient-physician interaction. The interview should take about 30 to 60 minutes maximum. Are you available to respond to some questions at this time? I would like to bring to your attention that you have been contacted after signing the consent form. This interview will be audio recorded, and the record will only start after obtaining your demographic information, therefore your identity will remain anonymous, where I will be using your ID code from the consent form instead of your name.

General demographics information

- Gender If female, are you pregnant? ___________
- Age
- Highest educational degree
- Specialty
- Ethnic group/ race
- Nationality
- Occupation (indoor/ outdoor)
- Which clinic do you usually visit?
- Is there any specific reason for visiting the clinic? Chronic illness?
- Attire
- Marital status
- Housing (villa/ apartment)
- Emirate of residency
- Are you deficient? If yes, since when?

Code number: _____________________ (To substitute names for anonymity purposes)

RECORD WILL BE STARTED

General questions about the deficiency and participants experience with the deficiency:

Main questions/ Topics	**Additional questions**	**Clarifying questions/ Probes**

1) Do you suffer from vitamin D deficiency? 2) What do you know about vitamin D in general? 3) How do you know about vitamin D? (Source of information). 4) How can you obtain vitamin D? (sources of vitamin D) 5) How much vitamin D do you need per day? 6) What is your experience with the various sources of vitamin D? 7) What is your opinion on the vitamin D? 8) Do you think vitamin D deficiency is a serious problem? Why? Why not? 9) In your opinion, what do you think might be the underlying cause of the deficiency? 10) Do you think there is a lack of knowledge in general? if yes mention why?	**Expansion on question 1:** - Why do you think you are deficient? Or why do you think you are not deficient (what are your strategies to keep yourself away from the deficiency)? - What is your experience with the deficiency? **Expansion on question 2:** - How prevalent is vitamin D deficiency? - Why do you think the prevalence is high in UAE and worldwide? - What is the daily recommended requirement of vitamin D? - What is the vitamin D serum level we should be aiming for? - Why do you think vitamin D started gaining momentum? **Expansion on question 4:**	– Can you expand a little on this? – Can you tell me anything else? – Can you give me some examples?

11) Do you feel you have sufficient information related to vitamin D? Sources of your information? 12) Is it important though to have sufficient information? 13) Do you know anything about the consequences of vitamin D? 14) Do you think people understand the seriousness of the problem? Why? Why not? 15) Do you take your supplements? 16) When you run out of them do you get a re-fill? (do you get it straight away or not?) from where do you get the refill? (insurance issues?) 17) Do you do your blood test? How often? How regular? Why? Why not? (insurance issues?) 18) Which hospital/ clinic do you visit for this? Why (any chronic conditions)?	- Sunlight? How long? When? What portion of the body should be exposed? - Do you get sufficient exposure? How and why? Why not? - How would you ensure getting sufficient vitamin D through sunlight? - What time of the day is suitable for vitamin D acquisition through sunlight? Why? When do you get exposed? Is it the same as the timing you mentioned above? Why? Why not? - What do you use to guide your judgment on sufficient exposure, right timing and duration and avoid hazardous exposure (for example UVI and % of skin exposed)? - Concerns related to sun exposure. - Plausibility of obtaining vitamin D through sunlight.	

19) Why you were tested for vitamin D deficiency?	- Fortified products? How do you calculate your intake? Do you know how to read the labels? - Plausibility of getting vitamin D through fortified products? - What is an IU? - Why do you think it would be easy to get sufficient vitamin D through sunlight, supplements, food or sub-beds? Or Why do you think it would not be easy to get sufficient vitamin D through sunlight, supplements, food or sub-beds? - How is your knowledge regarding recommended daily allowance, sun exposure per day, types of food rich in vitamin D focusing on dairy products, and fish, vitamin D products, diseases, and drugs that affect vitamin D levels, and factors that limit the effect of sun exposure on vitamin D activation?	

	- How would you prefer getting your vitamin D, is it through supplements or natural sources? Why? - How do you ensure getting sufficient vitamin D through supplement or natural sources (for example reading labels)? - Do you understand what is written on the labels of dietary products? - Sources of your information?	
Targeted sub-topic : The experiences of patients and GPs with vitamin D related talks and counselling advices during patient-physician interaction		
Main questions/ Topics	**Additional questions**	**Clarifying questions/ Probes**
1) What do the physician tell you about the vitamin D? 2) Type of information discussed regarding vitamin D. 3) Do they discuss all possible options with you? 4) Do you get information other than the medicinal ones?	**Expansion on question 2:** – How does this discussion take place? **Expansion on question 3:** - Why? Why not? - How?	– Can you expand a little on this? – Can you tell me anything else? – Can you give me some examples?

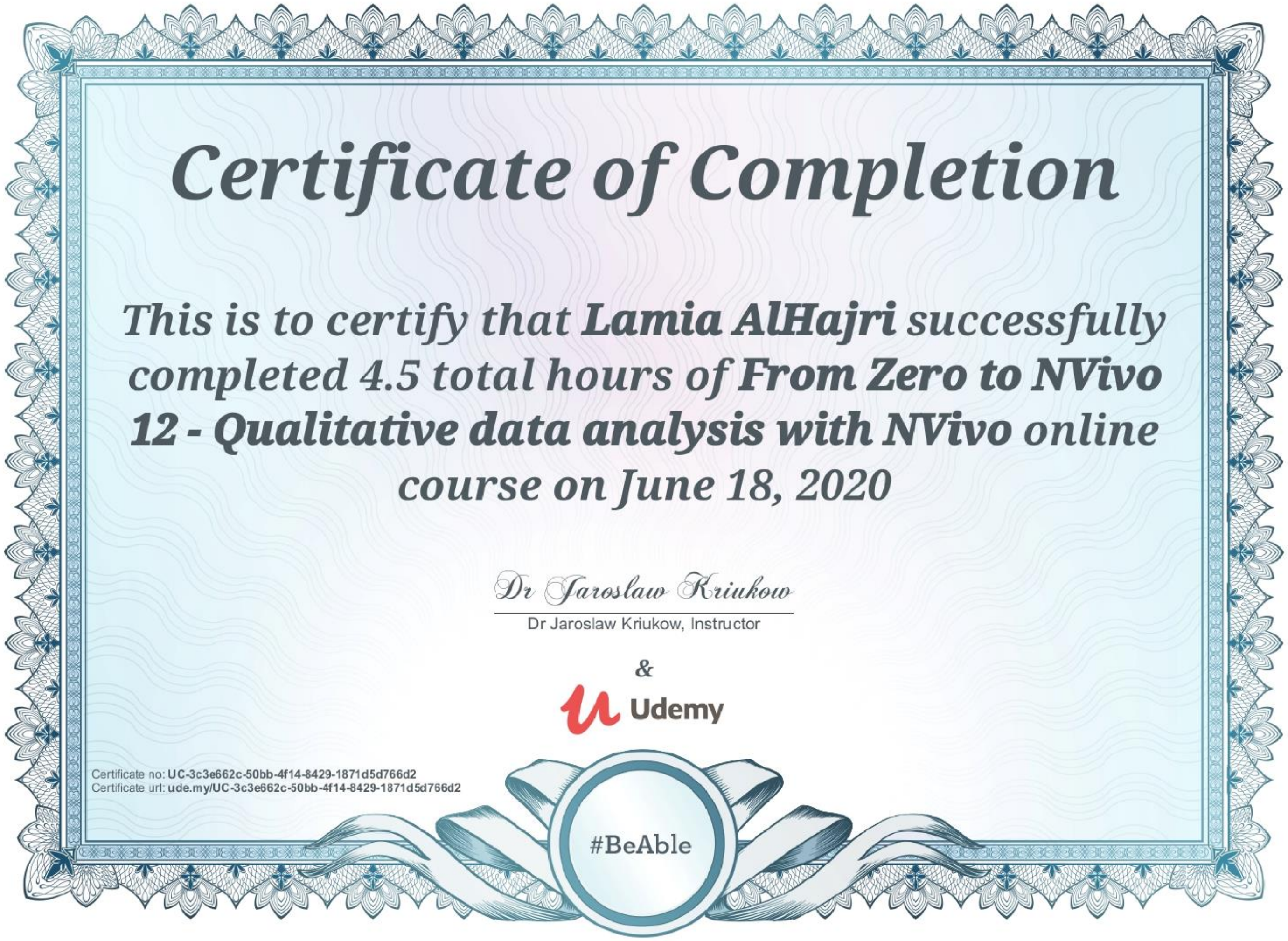
5) Do they tell you anything about the impact on various system? 6) Variation in information provided whether it was first diagnosis or not. 7) Variation in information provided based on age, gender, nationality, religion, cultural background, context, educational level, attire ….etc of yourself or physician. 8) Upon diagnosing you with vitamin D deficiency, what was the advice? (treatment with supplements or …)? 9) Any advice related to the behaviour and practices? 10) How is the treatment options communicated to you? (imposed or collaborative shared activity?) 11) Do you think your context is playing a role? 12) Do GPs' try to design a plan that is suitable for you and your context? Is it in collaboration with the physician?	- How are the treatment options communicated to you? (imposed or collaborative shared activity?) - Is it important to discuss all treatment options with you? - Does the plausibility of adopting them get discussed? Why? Why not? When? (after a trial or while discussing a possible solution?) **Expansion on question 5:** - Why? Why not? - What exactly do you tell them? **Expansion on question 8:** – Discussing context with your physician. – Do you think back then this was a plausible solution? Did you tell your physician whether or not you find it plausible?	

13) Do you discuss the plausibility of treatment options informed by the physician? 14) Do the physician test your competencies and understanding regarding vitamin D acquisition (reading dietary labels, using UVI to guide exposure)? 15) Do the physician verify your understanding? 16) Are patients with vitamin D deficiency invited to collaborate with their knowledge and experience, assess treatment options with regards to their feasibility and plausibility from patients‘ perspectives given the fact that they are the expert in their own context, and allow them to brainstorm and provide pragmatic (feasible/ plausible) solutions (treatment options) to accommodate their context? 17) How is the advice or treatment options been communicated to you?	– Is it important to discuss context? Why? **Expansion on question 11, 12** - How? - Why? Why not? - If you are concerned about the context, what information related to context do you or would you try to discuss with your physician exactly? **Expansion on question 13, 14:** - How? - Why? Why not? - Is it important? **Expansion on question 15:** - How? - Why? Why not? - Is it important? **Expansion on question 16:**	

	- How? - Why? Why not? - Is it important? - Have you ever been asked to do such a thing?	
Targeted sub-topic : GPs use of lay knowledge to contexualise vitamin D advices		
Main questions/ Topics	**Additional questions**	**Clarifying questions/ Probes**
1) Does the physician ask you anything about your context (occupation, attire, housing …etc)? 2) Do you feel physicians try to accommodate whatever is clear to them related to your context (e.g. attire) in their advices? 3) Do you try to discuss the plausibility of GPs advices regarding the vitamin D deficiency in relation to your context?	**Expansion on question 1:** - Why and why not? - What do they ask you about? - What do you tell them? - Do you try to tell them if they do not ask? **Expansion on question 3:** - Why yes? Why no? - Does this discussion take place straight away after telling you about the treatment plan? Or after	- Can you expand a little on this? - Can you tell me anything else? Can you give me some examples?

<table>
<tr><td></td><td>having to implement the advice funneled to you by the physician?
- What happens if you feel their advices are not suitable? How do you know its’ suitability?
- Have you ever experienced difficulties in adopting advices? What did you do?</td><td></td></tr>
<tr><td colspan="3">Targeted sub-topic : The perception of patients and GPs regarding the use of lay knowledge to understand context and contextualise medical advices.</td></tr>
<tr><td>Main questions/ Topics</td><td>Additional questions</td><td>Clarifying questions/ Probes</td></tr>
<tr><td>1) What is your opinion on obtaining more information related to your context by the physician initially, and then use this in designing a treatment plan that would accommodate your unique context?</td><td>- Do you think it is an important step? Why? Why not?
- Do you think it would optimise treatment plans? How? Why? Why not?
- Would you like to discuss context? Why? Why not?</td><td>- Can you expand a little on this?
- Can you tell me anything else?
Can you give me some examples?</td></tr>
<tr><td colspan="3">CONCLUSION: Well, it has been a pleasure finding out more about you. I appreciate the time you took for this interview. I would like to remind you that you have 2 weeks from today to withdraw your data, please contact me at any time if you feel you need to discuss this further (business card provided). Would it be acceptable to contact you if I have any more questions? Thanks again. Handing over the giftcard.</td></tr>
</table>

9.7 Nvivo training certificate



Certificate of Completion

This is to certify that ***Lamia AlHajri*** *successfully completed 4.5 total hours of* ***From Zero to NVivo 12 - Qualitative data analysis with NVivo*** *online course on June 18, 2020*

Dr Jaroslaw Kriukow

Dr Jaroslaw Kriukow, Instructor

&

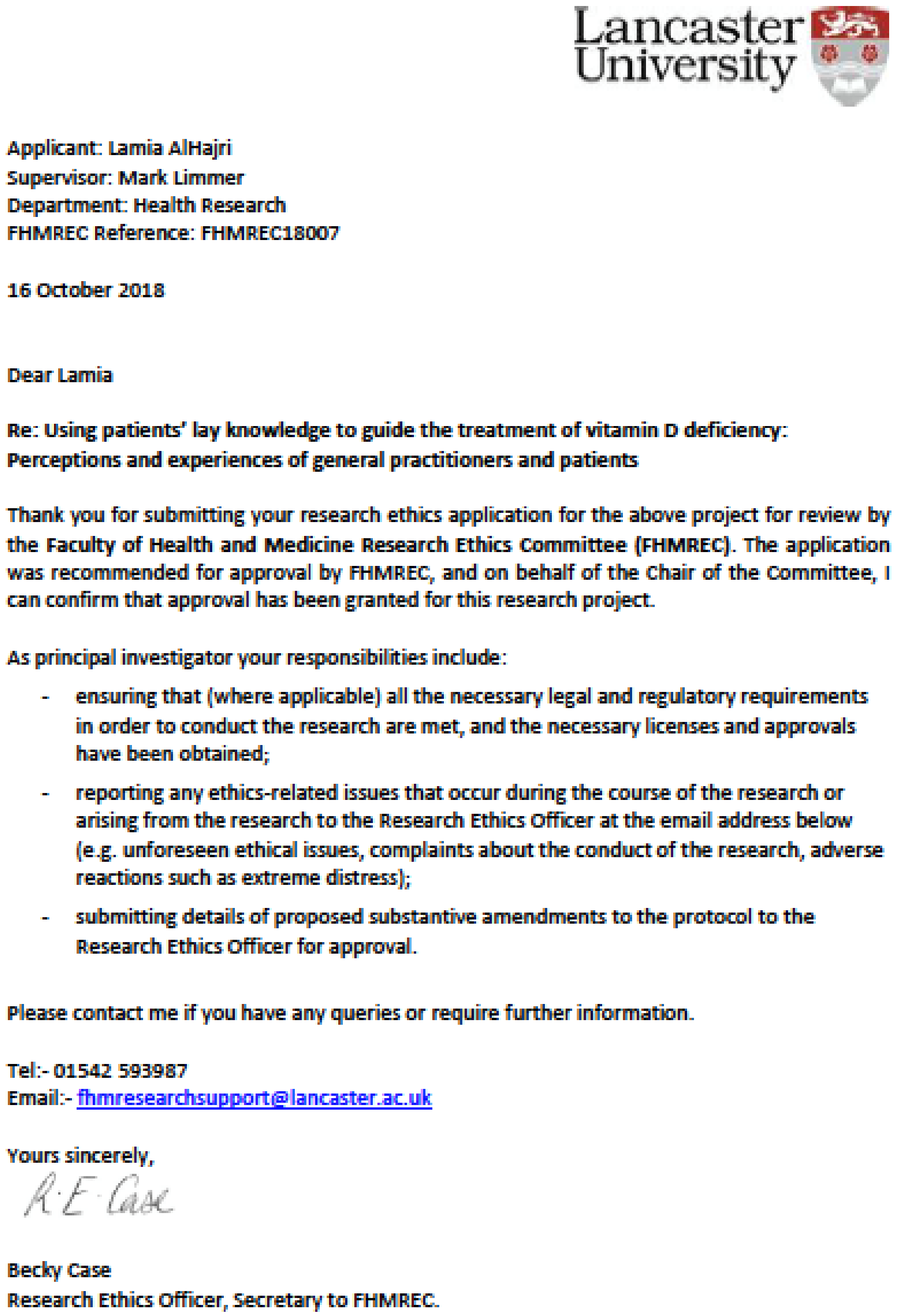
Udemy

Certificate no: **UC-3c3e662c-50bb-4f14-8429-1871d5d766d2**
Certificate url: **ude.my/UC-3c3e662c-50bb-4f14-8429-1871d5d766d2**

#BeAble

9.8 Ethics

Lancaster University Ethics Approval



Lancaster
University

Applicant: Lamia AlHajri
Supervisor: Mark Limmer
Department: Health Research
FHMREC Reference: FHMREC18007

16 October 2018

Dear Lamia

Re: Using patients' lay knowledge to guide the treatment of vitamin D deficiency: Perceptions and experiences of general practitioners and patients

Thank you for submitting your research ethics application for the above project for review by the Faculty of Health and Medicine Research Ethics Committee (FHMREC). The application was recommended for approval by FHMREC, and on behalf of the Chair of the Committee, I can confirm that approval has been granted for this research project.

As principal investigator your responsibilities include:

- ensuring that (where applicable) all the necessary legal and regulatory requirements in order to conduct the research are met, and the necessary licenses and approvals have been obtained;
- reporting any ethics-related issues that occur during the course of the research or arising from the research to the Research Ethics Officer at the email address below (e.g. unforeseen ethical issues, complaints about the conduct of the research, adverse reactions such as extreme distress);
- submitting details of proposed substantive amendments to the protocol to the Research Ethics Officer for approval.

Please contact me if you have any queries or require further information.

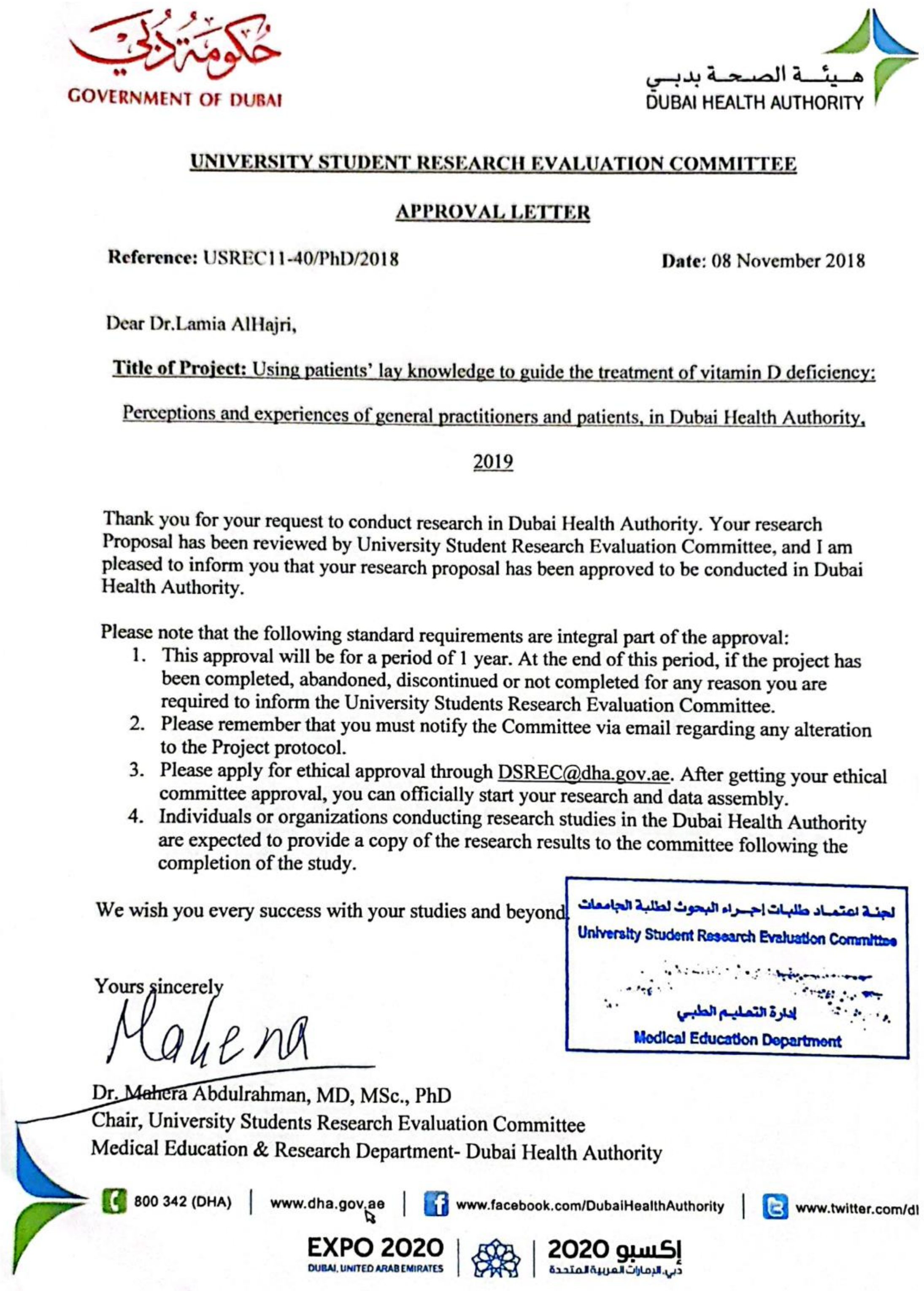
Tel:- 01542 593987
Email:- fhmresearchsupport@lancaster.ac.uk

Yours sincerely,

R.E Case

Becky Case
Research Ethics Officer, Secretary to FHMREC.

Dubai Health Authority Ethics Approval



حكومة دبي
GOVERNMENT OF DUBAI

هيئة الصحة بدبي
DUBAI HEALTH AUTHORITY

UNIVERSITY STUDENT RESEARCH EVALUATION COMMITTEE

APPROVAL LETTER

Reference: USREC11-40/PhD/2018 **Date:** 08 November 2018

Dear Dr.Lamia AlHajri,

Title of Project: Using patients' lay knowledge to guide the treatment of vitamin D deficiency: Perceptions and experiences of general practitioners and patients, in Dubai Health Authority, 2019

Thank you for your request to conduct research in Dubai Health Authority. Your research Proposal has been reviewed by University Student Research Evaluation Committee, and I am pleased to inform you that your research proposal has been approved to be conducted in Dubai Health Authority.

Please note that the following standard requirements are integral part of the approval:

1. This approval will be for a period of 1 year. At the end of this period, if the project has been completed, abandoned, discontinued or not completed for any reason you are required to inform the University Students Research Evaluation Committee.
2. Please remember that you must notify the Committee via email regarding any alteration to the Project protocol.
3. Please apply for ethical approval through DSREC@dha.gov.ae. After getting your ethical committee approval, you can officially start your research and data assembly.
4. Individuals or organizations conducting research studies in the Dubai Health Authority are expected to provide a copy of the research results to the committee following the completion of the study.

We wish you every success with your studies and beyond.

لجنة اعتماد طلبات إجراء البحوث لطلبة الجامعات
University Student Research Evaluation Committee
إدارة التعليم الطبي
Medical Education Department

Yours sincerely

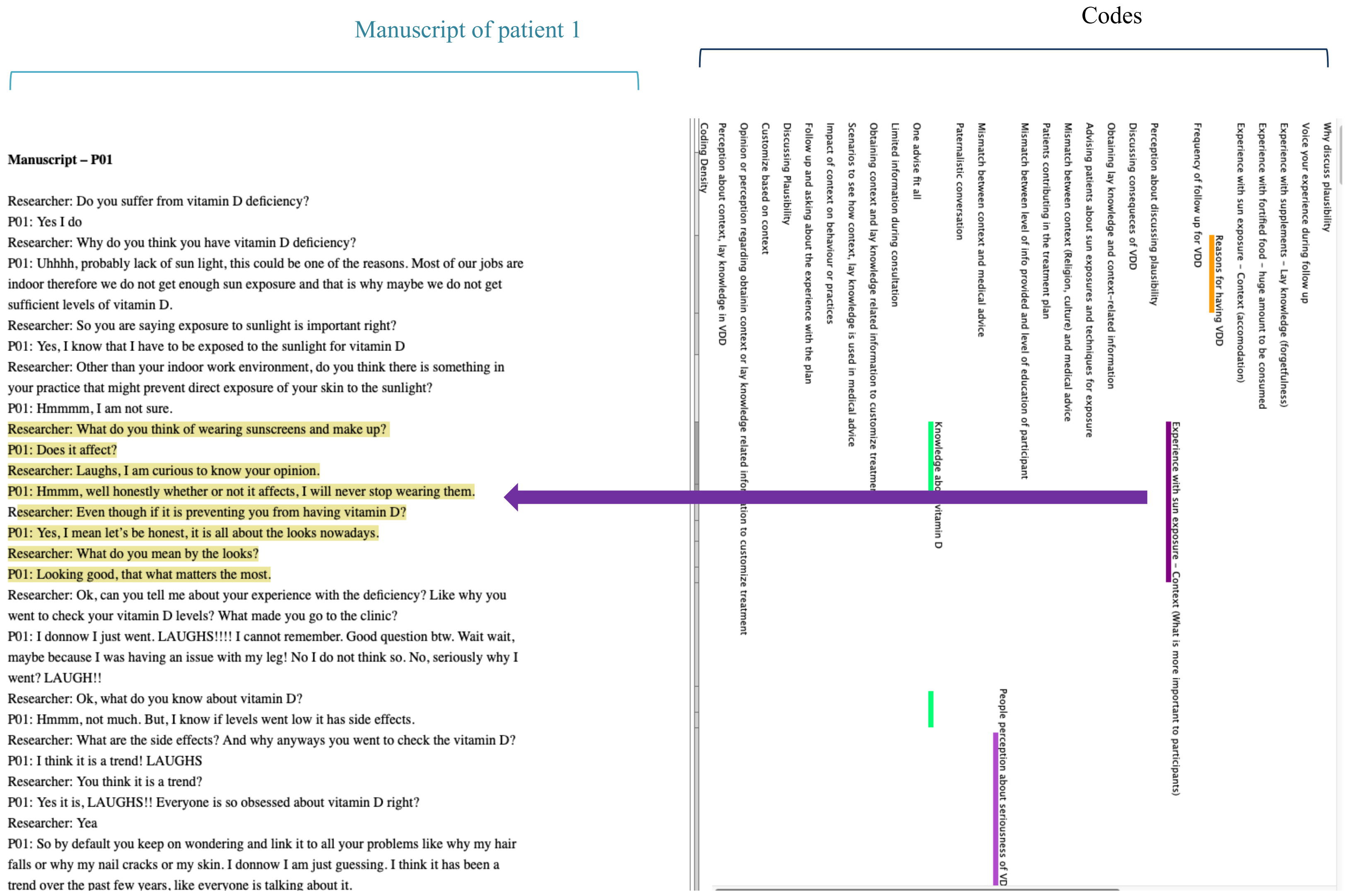
Mahera

Dr. Mahera Abdulrahman, MD, MSc., PhD
Chair, University Students Research Evaluation Committee
Medical Education & Research Department- Dubai Health Authority

9.9 Samples of coded manuscripts from Nvivo

Patient 1

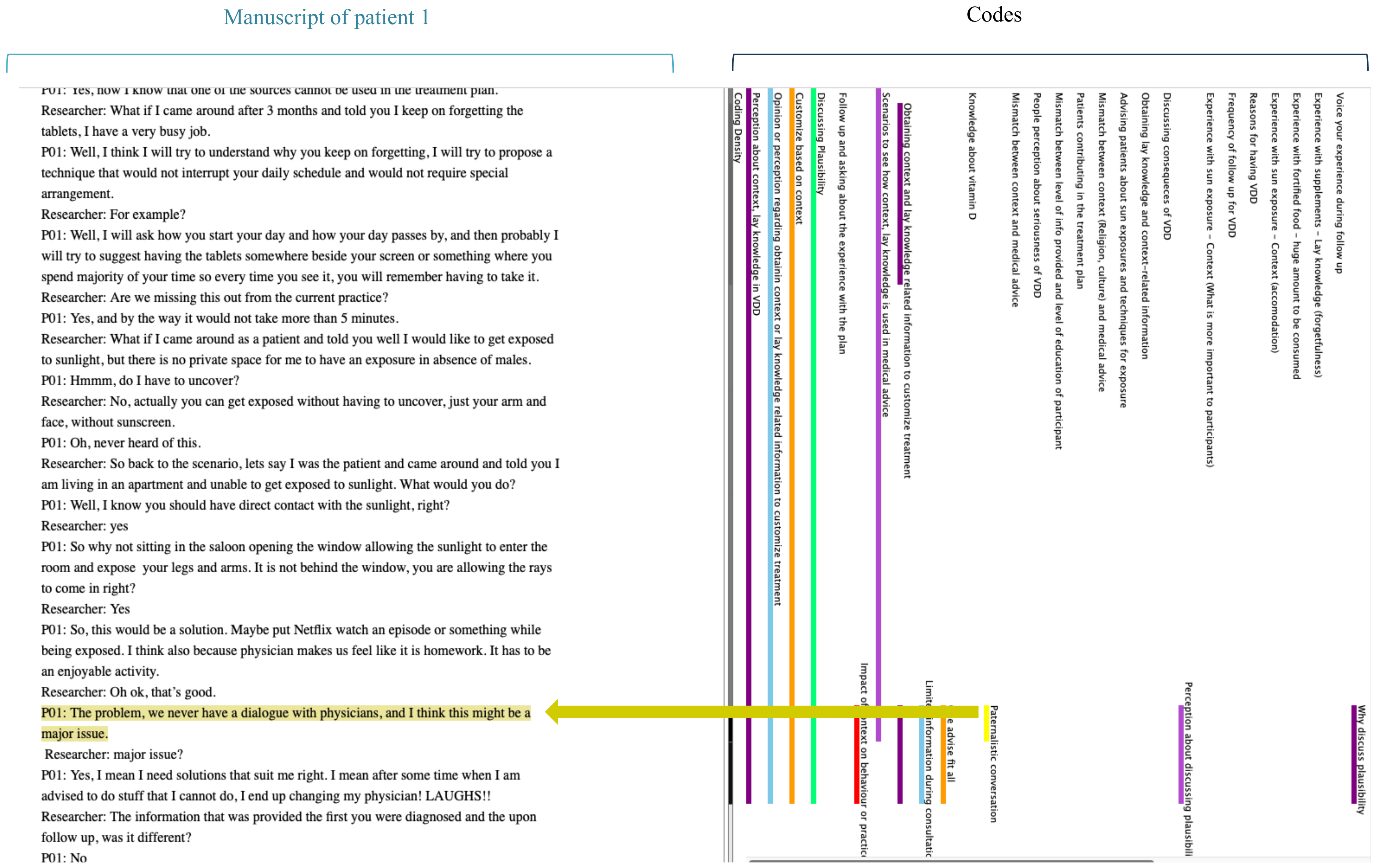
Example showing experience of patient with sun exposure and what it means to her.



Manuscript – P01

Researcher: Do you suffer from vitamin D deficiency?
P01: Yes I do
Researcher: Why do you think you have vitamin D deficiency?
P01: Uhhhh, probably lack of sun light, this could be one of the reasons. Most of our jobs are indoor therefore we do not get enough sun exposure and that is why maybe we do not get sufficient levels of vitamin D.
Researcher: So you are saying exposure to sunlight is important right?
P01: Yes, I know that I have to be exposed to the sunlight for vitamin D
Researcher: Other than your indoor work environment, do you think there is something in your practice that might prevent direct exposure of your skin to the sunlight?
P01: Hmmmm, I am not sure.
Researcher: What do you think of wearing sunscreens and make up?
P01: Does it affect?
Researcher: Laughs, I am curious to know your opinion.
P01: Hmmm, well honestly whether or not it affects, I will never stop wearing them.
Researcher: Even though if it is preventing you from having vitamin D?
P01: Yes, I mean let's be honest, it is all about the looks nowadays.
Researcher: What do you mean by the looks?
P01: Looking good, that what matters the most.
Researcher: Ok, can you tell me about your experience with the deficiency? Like why you went to check your vitamin D levels? What made you go to the clinic?
P01: I donnow I just went. LAUGHS!!!! I cannot remember. Good question btw. Wait wait, maybe because I was having an issue with my leg! No I do not think so. No, seriously why I went? LAUGH!!
Researcher: Ok, what do you know about vitamin D?
P01: Hmmm, not much. But, I know if levels went low it has side effects.
Researcher: What are the side effects? And why anyways you went to check the vitamin D?
P01: I think it is a trend! LAUGHS
Researcher: You think it is a trend?
P01: Yes it is, LAUGHS!! Everyone is so obsessed about vitamin D right?
Researcher: Yea
P01: So by default you keep on wondering and link it to all your problems like why my hair falls or why my nail cracks or my skin. I donwow I am just guessing. I think it has been a trend over the past few years, like everyone is talking about it.

Example showing the paternalistic approach of physician



P01: Yes, now I know that one of the sources cannot be used in the treatment plan.
Researcher: What if I came around after 3 months and told you I keep on forgetting the tablets, I have a very busy job.
P01: Well, I think I will try to understand why you keep on forgetting, I will try to propose a technique that would not interrupt your daily schedule and would not require special arrangement.
Researcher: For example?
P01: Well, I will ask how you start your day and how your day passes by, and then probably I will try to suggest having the tablets somewhere beside your screen or something where you spend majority of your time so every time you see it, you will remember having to take it.
Researcher: Are we missing this out from the current practice?
P01: Yes, and by the way it would not take more than 5 minutes.
Researcher: What if I came around as a patient and told you well I would like to get exposed to sunlight, but there is no private space for me to have an exposure in absence of males.
P01: Hmmm, do I have to uncover?
Researcher: No, actually you can get exposed without having to uncover, just your arm and face, without sunscreen.
P01: Oh, never heard of this.
Researcher: So back to the scenario, lets say I was the patient and came around and told you I am living in an apartment and unable to get exposed to sunlight. What would you do?
P01: Well, I know you should have direct contact with the sunlight, right?
Researcher: yes
P01: So why not sitting in the saloon opening the window allowing the sunlight to enter the room and expose your legs and arms. It is not behind the window, you are allowing the rays to come in right?
Researcher: Yes
P01: So, this would be a solution. Maybe put Netflix watch an episode or something while being exposed. I think also because physician makes us feel like it is homework. It has to be an enjoyable activity.
Researcher: Oh ok, that's good.
P01: The problem, we never have a dialogue with physicians, and I think this might be a major issue.
Researcher: major issue?
P01: Yes, I mean I need solutions that suit me right. I mean after some time when I am advised to do stuff that I cannot do, I end up changing my physician! LAUGHS!!
Researcher: The information that was provided the first you were diagnosed and the upon follow up, was it different?
P01: No