Title Page

Title: Global variations in preoperative practices concerning patients seeking primary bariatric and metabolic surgery (PACT Study): A survey of 634 bariatric healthcare professionals

Running Title: Global variations in preoperative BMS practices

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Global variations in preoperative practices concerning patients seeking primary bariatric and metabolic surgery (PACT Study): A survey of 634 bariatric healthcare professionals

ABSTRACT

Background Bariatric and Metabolic Surgery (BMS) is a popular weight-loss intervention worldwide, yet few scientific studies have examined variations in preoperative practices globally. This study aimed to capture global variations in preoperative practices concerning patients planned for BMS.

Methods A 41-item questionnaire-based survey was designed and the survey link was freely distributed on social and scientific media platforms, email groups and circulated through personal connections of authors. The survey included eight parts: basic information; criteria for BMS; preoperative nutritional screening; preoperative weight loss; preoperative diets for liver size reduction; preoperative glycemic control; other laboratory investigations and preparations; decision making, education, and consents. Descriptive statistics were used to analyse data and graphs were used for representation where applicable.

Results Six hundred thirty-four bariatric healthcare professionals from 76 countries/regions completed the survey. Of these, n=310 (48.9%) were from public hospitals, n=466 (73.5%) were surgeons, and the rest were multidisciplinary

professionals. More than half of respondents reported using local society/association guidelines in their practice (n=310, 61.6%). The great majority of respondents routinely recommend nutritional screening preoperatively (n=385, 77.5%), mandatory preoperative diets for liver size reduction (n=220, 53.1%), routine screening for T2DM (n=371, 90.7%), and mandate a glycemic control target before BMS in patients with T2DM (n=203, 55.6%). However, less than half (n=183, 43.9%) recommend mandatory preoperative weight loss to all patients. Most respondents (n=296, 77.1%) recommend psychological intervention before surgery for patients diagnosed with psychological conditions. Variations were also identified in laboratory investigations and optimisation; and in the aspects of decision making, education and consent.

Conclusions This survey identified significant global variations in preoperative practices concerning patients seeking primary BMS. Our findings could facilitate future research for the determination of best practice in these areas of variations, and consensus-building to guide clinical practice while we wait for that evidence to emerge.

Keywords: Preoperative practices; gastric bypass; sleeve gastrectomy; bariatric surgery; metabolic surgery

INTRODUCTION

Hundreds of thousands of Bariatric and Metabolic Surgical (BMS) procedures are carried out annually worldwide (1). An increasing body of evidence suggests that BMS procedures are safe (2) and effective in terms of weight loss and improvement of comorbidities such as Type 2 Diabetes Mellitus (T2DM) (3). This group of patients forms a unique subset of high-risk surgical patients because of severe obesity and all its associated comorbidities.

As opposed to patients seeking other types of surgeries, many preoperative screening and interventions are being used for patients seeking BMS. Some of these practices may even prolong the time and cost of preoperative preparation. Similarly, in several healthcare systems, patients are required to "successfully" go through medical weight management before they can "qualify" for BMS(4). However, the rationale of this requirement is unclear and some authors have labelled them as tools for rationing (5).

There is currently a lack of robust evidence to guide the preparation of patients seeking BMS. Determination of best practice is academically only possible when we are fully aware of all the prevalent practices as even the commonest practice may not be the best practice. Hence, we conducted a comprehensive global survey of healthcare professionals involved in the care of patients seeking BMS to capture global variations in preoperative practices concerning patients seeking BMS.

METHODS

A multi-disciplinary team of BMS professionals from several countries formed an expert steering group for this study. The team included four surgeons (KM, WY, RS, CB), two physicians/endocrinologists (AT, JL), three psychologists (JO, DR, VS), three dietitians (MO, SA, SSD), one clinical academic (YG), and one patient representative (PC).

We designed a 41-item questionnaire-based survey on SurveyMonkey® in the English language ***(Supplementary file 1)*** following good practice in the conduct and reporting of survey research, recommended by the EQUATOR network guidelines(6). The steering group for this study together designed the questions included in the survey. The survey was made live on 19th April 2021 and closed for analysis on 21st July 2021. The survey link (https://www.surveymonkey.com/r/PACTstudy) was freely shared on social and scientific media platforms (WhatsApp®, WeChat®, Facebook®, Twitter®, ResearchGate®, LinkedIn®) email groups of BMS professionals, and circulated through personal network of authors.

The survey included 8 parts: (1) Basic information; (2) Criteria for BMS; (3) Preoperative nutritional screening; (4) Preoperative weight loss; (5) Preoperative diets for liver size reduction; (6) Preoperative glycemic control; (7) Other laboratory investigations and preparations; (8) Decision making, education, and consents.

160 The survey answers were prepopulated with all the variations in practices that the expert
161 steering group members were aware of. Comment boxes were provided to capture
162 “other” practices and an option to select "not applicable to my specialty" was given for
163 all questions to ensure survey participants could enter all variations in practices
164 including those not suggested by us; and that they were not forced to comment about
165 an area out of their expertise. This was keeping the multidisciplinary nature of bariatric
166 teams in mind where not all survey respondents would feel able to comment about all
167 areas of practice. This explains the different denominators for each response.
168 Percentages were worked out for each response based on the total number of
169 respondents who answered that question. All authors contributed to the survey design.
170 The survey underwent both a process of content validity and face validity by the authors
171 listed in the paper (experts in the field of BMS). All data were analysed using Microsoft
172 Excel®. Descriptive statistics were used to analyse data and graphs were used for
173 representation where applicable. Statement of informed consent was not applicable.
174 IRB approval was not applicable.
175

RESULTS

A total of 634 respondents from 76 countries/regions completed the survey ***(Supplementary file 2)***. Of these n=310 (48.9%) were from public hospitals, n=193 (30.4%) were from private hospitals, n=127 (20.0%) worked in both and n=4 (0.6%) were from other settings. In terms of health profession, n=466 (73.5%) were surgeons, n=45 (7.1%) were nurses, n=44 (6.9%) were dietitians/nutritionists, n=28 (4.4%) were physicians (of them 8 endocrinologists), and n=19 (3.0%) were psychologists / psychiatrists.

Eligibility for BMS

Table 1 provides a complete breakdown of various guidelines used by respondents to determine the suitability of patients for BMS. More than half of the respondents (n=293, 58.3%) reported that they followed local metabolic and bariatric society or association guidelines. ***Table 2*** provides a complete breakdown of parameters used for determining eligibility for BMS. The great majority of respondents reported Body Mass Index (BMI) (n=480, 95.4%), presence of T2DM (n=399, 79.3%), and presence of other comorbidities related to obesity (n=386, 76.7%) as the main determinants of eligibility criteria for BMS. ***Table 3*** shows the minimum BMI level that the respondent would consider for primary BMS in patients with and without T2DM. The commonest answer for patients with T2DM was BMI of 30 kg/m² (n=156, 31.0%) and for patients without T2DM was BMI of 35 kg/m² (n=198, 39.4%). ***Table 4*** presents the results of the responses obtained when asked regarding contraindications to BMS in certain clinical

198 situations. The commonest reported contraindications included present addiction to
199 alcohol or drugs state (n=388, 77.1%), untreated eating disorder (n=337, 67.0%) and
200 unwillingness to take vitamin and mineral supplementation (n=231, 45.9%).
201
202 **Non-surgical Methods of Weight Loss to qualify for BMS**
203 Most respondents indicated that they routinely recommended lifestyle and dietary
204 interventions for weight loss before surgery (n=388, 77.1%), weight loss by
205 pharmacological methods (n=203, 40.3%), weight loss by endoscopic means (n=107,
206 21.2%) and a minority (n=65, 13.0%) do not recommend any of the above.
207
208 **Preoperative Nutritional Screening and Treatment**
209 ***Table 5*** presents nutritional screening routinely recommend before BMS and ***Table 6***
210 presents nutritional deficiencies or abnormalities that respondents correct
211 preoperatively. Most respondents (n=385, 77.5%) routinely recommend preoperative
212 nutritional screening for all patients whereas only a minority recommend it according
213 to the type of the surgery (n=41, 8.2%), in specific cases (n=40, 8.0%) or never
214 recommend any preoperative screening (n=13, 2.6%). Similarly, most respondents
215 (n=274, 64.6%) routinely recommend preoperative treatment for nutritional
216 deficiencies or abnormalities for all patients, but a minority would only correct
217 preoperative deficiencies for some specific surgery types (n=58, 13.7%) or patients
218 (n=83, 19.6%).
219

Mandatory Preoperative Weight Loss

Less than half of the respondents (n=183, 43.9%) indicated that they recommended mandatory preoperative weight loss for all patients. Approximately 40.5% (n=169) would only do so for specific cases, and 10.3% (n=43) would never recommend it. The commonest reasons provided for mandatory preoperative weight loss were to make surgery easier technically (n=271, 75.5%), safer (n=260, 72.4%), to assess patient's motivation for surgery (n=202, 56.3%), to improve weight loss outcomes (n=110, 30.6%), and to fulfil the requirement from the funding body (n=49, 13.7%). When asked regarding the magnitude of mandatory preoperative weight loss, a quarter of respondents (n=93, 25.9%) indicated that they ask for 5% total body weight loss, fifth (n=76, 21.2%) recommend 10% of total body weight loss, third (n=124, 34.5%) suggested that the amount depended on the patient, while the others ask for 5-10 kg (n=38, 10.6%) and ≤5.0 kg weight loss (n=19, 5.3%).

Preoperative Diets for Liver Size Reduction

About half of respondents (n=220, 53.1%) recommended mandatory preoperative diets for liver size reduction for all patients, whereas the rest recommend it in specific cases only (n=124, 30.0%) or never recommend it (n=53, 12.8%). The most commonly recommended diet types for liver size-reduction preoperatively were low-calorie diet (47.5%) and very-low-calorie diet (41.9%) (***Figure 1***). The most-reported recommended duration for such diets was 8-14 days (44.3%) (***Figure 2***).

Preoperative Glycaemic Control, Laboratory Investigations, and Preparations

Most of the respondents (n=371, 90.7%) routinely screen patients for T2DM. Common tests used for this purpose are HbA1c (92.1%) and serum fasting blood glucose (75.3%) (***Figure 3***). Commonly recommended targets for glycemic control before BMS in patients with T2DM are presented in ***Table 7***. Other recommended screenings and tests before BMS are presented in ***Table 8***.

Most respondents (n=261, 68.0%) screen for Helicobacter Pylori (HP) by endoscopy, and only a few respondents (n=21, 5.5%) never screen for it, while blood tests (n=44, 11.5%), breath tests (n=97, 25.2%), and stool tests (n=56, 14.6%) are also used to screen for HP. For patients with positive test for HP, the majority of the respondents (n=275, 71.6%) would recommend eradication before surgery. For preoperative screening for OSA, approximately 39.8% (n=153) use STOP BANG score, approximately 37.5% (n=144) use Epworth Sleepiness Score, , and 32.3% (n=124) use Sleep Studies.

Most respondents (n=242; 63.0%) indicated that they insist patients quit smoking before considering any BMS (i.e., surgery will not happen if they don't), and only a few (n=61, 15.9%) insist patients quit smoking only for patients planned for a gastric bypass surgery type. A minority (n=68, 17.7%) do not insist that patients quit smoking for patients undergoing any procedure.

Psychological Preoperative Intervention

Most respondents (n=296, 77.1%) recommend psychological intervention before surgery for all patients when the patient is diagnosed with psychological conditions, and others (n=75, 19.5%) recommend it only in specific cases. Most respondents (n=304, 79.2%) would recommend intervention or treatment in cases of eating disorder before surgery, while a few (n=58, 15.1%) would recommend intervention or treatment before surgery only in specific cases of those diagnosed with eating disorders.

Preoperative Referral to Pharmacists or Obstetricians

Only a minority of respondents (n=45, 11.7%) reported that they would routinely refer patients to pharmacists for all patients, whereas approximately 29.7% (n=114) would only do this for specific cases and a half (n=192, 50.0%) would never do so. The majority of the respondents (n=234, 60.1%) reported that they do not routinely refer women in the child-bearing age group to obstetricians for discussion regarding birth control options after surgery, while about a quarter (n=109, 28.4%) reported that they would recommend it. Most respondents (n=345, 89.8%) recommend delaying pregnancy for at least 12-24 months post-surgery.

Decision Making, Education, and Consents

Surgeon (n=364, 97.3%), dietitian (n=306, 81.8%) and psychologist (n=227, 60.7%) were the most common core members that were reported to be part of the MDT **(*Figure 4*)**. Most respondents (n= 244, 65.24%) encourage patients to bring partners, families and/or carers to routine appointments, and only a few (n=33, 8.2%) encourage patients

to bring them to support group meetings, encourage patients to bring them to both (n=53, 14.2%), or do not involve patients/ family/ partners/ carers in routine appointments or support groups (n=32, 8.6%).

About half of respondents (n=190, 50.8%) would "always" involve patients' families in the decision making about surgery whereas the rest (n=162, 43.3%) reported it depends on the case, and a few (n=11, 2.9%) reported they would never do so. Most preoperative education about BMS options with patients was reported to be via face-to-face appointments (n=320, 85.6%), printed materials (n=200, 53.5%), virtual (online) personal appointments (n=153, 40.9%) and websites (n=156, 41.7%). ***Table 9*** provides information on items that respondents would discuss with their patients as part of the consenting process.

Hospitalisation for Surgery and Low Molecular Weight Heparins (LMWH) Prophylaxis

Most respondents (n=199, 53.2%) admit patients on the day of surgery or the day before (n=93, 24.9%) and only a few (n=31, 8.3%) would admit patients two days before surgery or would admit patients ≥ 3 days before surgery (n=32, 8.6%). Most of the respondents (n=175, 46.8%) commence LMWH prophylaxis on the day of surgery, whereas the rest would commence it the day before surgery (n=80, 21.4%) or do not recommend any preoperative LMWH prophylaxis at all (n=22, 5.9%).

DISCUSSION

To the best of our knowledge, this is the first study capturing the broad range of variations in preoperative practices for patients seeking BMS. We found considerable variations in practices with regards to almost every aspect examined. Our findings should lead to focussed studies for the identification of best practices.

Criteria for BMS

The National Institutes of Health (NIH) in the United States of America first established guidelines for bariatric surgery in 1991(7). Approximately 65% of the respondents reported using one of these guidelines in their practice. It is remarkable that bariatric surgery worldwide continues to be largely driven by these guidelines developed more than 30 years ago even though during this time, the safety of surgery and evidence base in favour of it has grown exponentially. There are growing calls for these to be updated (3, 8). Meanwhile, local guidelines have been developed in many areas of the world to address this (9-11), and our survey confirms that about 60% of respondents are using these in their decision-making. There is a need for an up-to-date global consensus for determining eligibility criteria for BMS. A list of some of the local bariatric metabolic and societies guidelines is provided in ***Supplementary File 3***.

BMI and the presence of comorbidities are still the most commonly used parameter for determining the eligibility of patients for BMS. With increasing awareness of limitations of BMI in measuring adiposity, (12, 13), it was inevitable that clinicians

would use other measures to assess body size and composition. Moreover, it is now further recognised that the BMI thresholds should be different for different ethnicities e.g. reduced by 2.5kg/m^2 for Asian patients (10). Moreover, minimum BMI cut-offs indicated by respondents for patients with and without T2DM also make an interesting finding as 109 (21.7%) respondents indicated that they would consider surgery for patients with BMI ≤ 30 kg/m^2 in without T2DM and 280 (55.7%) would consider this for patients with BMI ≤ 30 kg/m^2 in with T2DM.

Preoperative Nutritional Screening and Treatment

It is known that patients with obesity may have many pre-existing nutritional deficiencies, which may be exacerbated by surgery and may lead to postoperative complications if not treated (14-20). However routine supplementation after surgery with adequate dosages of micronutrients (21, 22) is probably more important than preoperative correction. In our survey, most respondents routinely recommend preoperative nutritional screening (77.5%) and preoperative treatment for nutritional deficiencies or abnormalities (64.6%) for all patients. This is interesting especially because the cost-effectiveness of some of these interventions has not been fully examined. At the same time, it is worth emphasising here that both the American Society for Metabolic and Bariatric Surgery (ASMBS) and the British Obesity and Metabolic Surgery Society (BOMSS) have recommended preoperative nutrition screening and treatment (23, 24) for a variety of micronutrients even though the evidence base for these recommendations was relatively poor.

352

353 ***Preoperative Weight Loss***

354 There is debate in the scientific literature with regards to the benefits of mandatory
355 preoperative weight loss; and the type, duration, and necessity of any preoperative diets
356 (25-27). A systematic review showed that preoperative very-low-calorie diets (VLCD)
357 led to preoperative weight loss and liver volume reduction, but its effect on surgical
358 risks was unclear (28). Our study showed that 53.14% of respondents recommended
359 mandatory preoperative diets for liver size reduction, but there was no consensus on the
360 type and duration of such diet.

361

362 ***Preoperative Glycaemic Control and Helicobacter Pylori eradication***

363 Though there was significant variation, the majority of the respondents used a target
364 HbA1c or glucose level for preoperative diabetes control. However, a minority 6.9%
365 do not use any such preoperative glycaemic target, and 41.6% tailor it depending on the
366 patient. It is worth highlighting here that studies (29) have challenged the need for
367 aggressive preoperative diabetes control for patients undergoing BMS. Similarly,
368 despite widespread routine screening for HP as confirmed in this survey, the rationale
369 of this practice is unclear, especially for patients undergoing Sleeve Gastrectomy, the
370 commonest bariatric procedure worldwide.

371

372 ***OSA Screening***

373 Current guidelines suggested that all patients going forward for bariatric surgery should

374 be screened for OSA to reduce the risk of perioperative complications(30, 31), such as
375 hypoxemia and cardiopulmonary complications. However, this is not routine for
376 patients with severe obesity undergoing other types of surgery – some of which involve
377 a significantly longer time under anaesthesia. Despite the widespread use of screening
378 for OSA, variations exist and further studies should aim to identify which BMS patients
379 can safely avoid OSA screening (32).
380
381 ***Smoking Cessation***
382 Approximately 60% of respondents in this survey insist that patients quit smoking
383 before considering surgery. Possible reasons include improving smoking-related
384 comorbidities and decreasing postoperative complications(33). However, data suggest
385 that most of these patients resume smoking soon after surgery. Better strategies are,
386 therefore, needed for successful long-term smoking cessation (33).
387
388 ***Psychological Preoperative Intervention***
389 Psychosocial interventions can improve eating pathology and psychosocial functioning
390 (34). As such it was expected that the majority of respondents in the survey recommend
391 psychological intervention before BMS for the patients diagnosed with psychological
392 conditions.
393
394 ***Preoperative Referral to Pharmacists or Obstetricians***
395 Studies on the involvement of pharmacists before BMS are limited. In this survey, half

of the respondents do not recommend preoperative referral to pharmacists. Therefore, future research into the role of pharmacists in the bariatric multidisciplinary team and patient support are recommended (35).

About 90% of respondents recommend patients delay pregnancy for at least 12-24 months post-surgery, but only a few recommend preoperative referral to obstetrics. This may reflect the different healthcare systems. For example, in the UK, it would normally be the general practitioners who would discuss contraception with the patients.

Decision Making, Education, and Consents

The involvement of patients and families in decision-making can support patients make informed choices before they seek to undergo the surgery (36). In this survey, 50.8% of the respondents involved patients and families in decision-making.

LMWH Prophylaxis

Nearly half of the respondents commence LMWH prophylaxis on the day of surgery for the patients undergoing BMS but a minority did not recommend any. A review of the literature showed that LMWHs might be better options than unfractionated heparin (UFH) for venous thromboembolism (VTE) prophylaxis in bariatric patients, but further research and consensus are needed for the best thromboprophylaxis modality, dose, and duration(37-39).

Strengths and Limitations

To the best of our knowledge, this is the first global study reporting on variations concerning a large range of preoperative practices concerning patients seeking BMS. We believe our findings will pave way for future research aimed at identifying best practices for each of the identified preoperative areas discussed in this study. One of the limitations of this study is that we are not able to give a precise response rate due to the distribution methodology. However, given that our objective was to capture all variations in practice, with 634 responses from 76 countries/regions, we believe we have probably achieved that. At the same time, authors would like to caution against the interpretation of commonest practice as best practice. Determining best practices for each of these variations requires further research and is beyond the scope of this paper. Another limitation of this study is that we are unable to carry out a meaningful comparison of practices amongst different countries or continents. This was indeed not the objective of this study and future studies will need to address this gap in the literature.

Conclusions

This survey identifies global variations in preoperative practices concerning patients seeking primary BMS. Our findings identified several areas for future research for the identification of best practices amongst the range of variations.

AUTHOR CONTRIBUTIONS

WY and **KM** conceived and designed the idea, wrote, and drafted the manuscript. **WY**, **YG**, and **KM** led the data analysis, interpretation, and manuscript preparation with input from all authors. All authors contributed to the survey design, survey distribution, data collection, editing, and revising the manuscript, and have read and approved the final manuscript.

CONFLICT OF INTERESTS

Mary O'Kane has been paid honoraria by Novo Nordisk for services provided/consultancy and Johnson and Johnson for educational activities. ***Abd Tahrani*** reports grants from Novo Nordisk, personal fees from Novo Nordisk, non-financial support from Novo Nordisk, personal fees from Eli Lilly, non-financial support from Eli Lilly, personal fees from Janssen, personal fees from AZ, non-financial support from AZ, non-financial support from Impeto medical, non-financial support from Resmed, non-financial support from Aptiva, personal fees from BI, non-financial support from BI, personal fees from BMS, nonfinancial support from BMS, personal fees from NAPP, non-financial support from NAPP, personal fees from MSD, non-financial support from MSD, personal fees from Nestle, personal fees from Gilead, grants from Sanofi, and personal fees from Sanofi outside the submitted work. AAT is currently an employee of Novo Nordisk. This work was performed before AAT became a Novo Nordisk employee and Novo Nordisk had no role in this project. ***Kamal Mahawar*** has been paid

honoraria by Ethicon, Medtronic, Gore, Olympus, and various NHS trusts for educational activities and mentoring colleagues through One Anastomosis Gastric Bypass. ***The other authors*** declare that they have no conflicts of interest.

DATA AVAILABILITY STATEMENT

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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584 **Legends**

585 **Figure 1** Types of diets recommended for liver size reduction preoperatively (n=341)

586 **Figure 2** Recommended duration of the diets for liver size reduction (n=341)

587 **Figure 3** Routine screening for T2DM (n=365)

588 **Figure 4** Core members of multidisciplinary team (MDT) (n=374)

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