Acta Scientific NUTRITIONAL HEALTH (ISSN:2582-1423)

Volume 7 Issue 7 July 2023

Research Article

Knowledge and Perception of Bariatric Surgery Among Primary Care Physicians, Riyadh, Saudi Arabia

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DOI: 10.31080/ASNH.2023.07.1255

Received: May 19, 2023

Published: June 03, 2023

Abstract

Background: Obesity is one of the most common health problems in Saudi Arabia affecting people of both gender and all ages. Primary care physicians are key health personnel that encounters obese patients regularly. However, few physicians are knowledgeable about the management of morbid obesity, especially surgical treatment and procedures.

Objective: To provide information contributing to the improvement of the knowledge and perception among primary care physicians about bariatric surgery, and their ability to care for patients who suffer from morbid obesity.

Methods: The study design was cross-sectional. The study population was Primary care physicians working at Prince Sultan Military Medical City, Riyadh, Saudi Arabia. A questionnaire developed by researchers of the university health network -Toronto adapted and modified to fit the setting of practice in the study population. The questionnaire was distributed among the physicians over 3 waves until 170 completed questionnaires were collected.

Results: Of the total 170 respondents, Most of the participants (64.1%) reported measuring their patient's weight on each clinic visit. The majority (97.6%) used BMI to assess the weight of a patient (88.8%) of respondents had referred obese patients for bariatric surgery. The majority of responses admits the lack of knowledge for all types of surgery in question. Regarding the questions in the survey, a significant difference in the comparison between those who referred versus who did not refer patients to bariatric surgery is obvious in the percentage of morbidly obese patients seen in the last 12 months (p-value 0.015) and the ideal bariatric procedure in average patients (p-value 0.043).

Conclusions and Recommendations: The study conclude that the knowledge of physicians in the bariatric surgical treatment of morbid obesity is insufficient.

More guidelines and continuing education should be emphasized regularly to the physicians in order to improve their knowledge on management of obesity.

Keywords: Bariatric Surgery; Obesity; Knowledge; Physician; Primary Care; Saudi Arabia

Introduction

Obesity is one of the most common health problems in Saudi Arabia affecting people of both gender all ages. It is defined as a disease process that results from excessive body fat accumulation due to many factors including food intake, physical inactivity and genetics [1]. On a community-based national epidemiological health survey, conducted over a 5-year period between 1995 and 2000 in KSA reported results showed prevalence of overweight among adults age group of 30-70 years population was 36.9% and prevalence of obesity was 35.6% [1,2].

Overweight defined as a body mass index (BMI) of 25 to 29.9 kg /m2, and obesity as a BMI ≥ 30 kg/m2 [3].

The Saudi Health Information Survey (SHIS) which is a national multistage survey of men and women aged 15 years or older maintained and updated by the KSA Census Bureau was conducted in 2013, showed that 28.7% (3.6 million), Saudis aged 15 years or older were obese. This prevalence ranged from 24.1% among men to 33.5% among women [4].

Obesity association with non- communicable diseases such as diabetes, hypertension, hyperlipidemia, obstructive sleep apnea, and osteoarthritis has been studied and indicated that obesity is a major risk factor for illness and death. Risk of obesity was higher among men who reported low levels of physical activity than among active men. Obesity among women were not significantly associated with diet and physical activity [4].

Weight loss of 5% to 10% has been linked with noted reductions in the risk for chronic diseases and with reducing the incidence of diabetes [5]. In the long term, diet therapy is relatively ineffective in treating obesity. Another problem seen in virtually all studies of dietary therapy for obesity is weight regain after the period of weight loss [6]. Additionally, there are currently no truly effective drug medications to treat obesity, especially morbid obesity [7]. Diet control plus the obesity drugs can lead to modest weight reductions of approximately 5 kg or less at 1 year. Available evidence is lacking on the effect of these drugs on long-term weight loss, health outcomes such as cardiovascular events and diabetes, and adverse effects [8].

The increasing prevalence of obesity have led toward development of surgical treatments to achieve weight loss, and a diverse of surgical techniques has been used [5]. According to the European Clinical Practice Guidelines, surgery is the most effective treatment for morbid obesity in terms of long-term weight loss [10]. It improves comorbidities and quality of life and decreases overall mortality. Also, several recent studies demonstrate dramatic benefits in diabetes in obese patients treated surgically [6].

The Swedish Obese Subjects (SOS) study, the first long-term, prospective, controlled long-term trial providing information about the effects of surgically induced weight loss showed that surgery is the only treatment for obesity resulting in an average of more than 15% documented weight loss over 10 years [11].

However, surgical treatments for obesity were found to be associated with the greatest magnitude of weight reduction, which was often sustained over the long-term, but this treatment is reserved for a small proportion of obese adults with morbid obesity and can be associated with clinically important postoperative complications [9].

Guidelines for the surgical therapy of morbid obesity established by National Institutes of Health U.S. in 1991, (BMI ≥ 40 or BMI ≥ 35 with significant comorbidities). The Interdisciplinary European Guidelines on Metabolic and Bariatric Surgery recommends similar BMI criteria with more details, and stated that there is insufficient evidence-based data to suggest how to assign a patient to a specific bariatric/metabolic procedure with no evidence in favor of any particular procedure [7,12].

Saudi Arabian Society of Metabolic and Bariatric Surgery (SASMBS) established Guideline Adoption Group (GAG) to work on adopting evidence based clinical practice guidelines for prevention and management of obesity in Saudi Arabia [1].

Surgical procedures nowadays were grouped mainly into three performed operation: sleeve gastrectomy (SG), adjustable gastric band (AGB) and Roux-en-Y gastric bypass [13]. Jejunoileal bypass was performed in 1954, reported as the early start of bariatric surgery. Mason and Ito in 1967 reported the first gastric bypass, more modifications resulted in the Roux- en-Y gastric bypass (RYGB), which is the most commonly weight loss procedure performed worldwide as shown in 2002-2003 survey data [5].

Counseling is defined as a cooperative mode of interaction between the patient and primary care physician or related healthcare staff members to assist patients in adopting behaviors associated with improved health outcomes [14]. Despite the high prevalence of obesity and its associated harmful health effects, physicians frequently fail to counsel patients about nutrition and weight management and frequently report and demonstrate a lack of training and competence in obesity management [15].

Physicians have a responsibility to recognize obesity as a disease and help obese patients with appropriate treatment. The treatment should be based on good clinical care and evidence-based interventions. Moreover, obesity treatment should focus on realistic goals and lifelong management. So, patients should only be referred to units able to assess patients prior to surgery, able to offer a comprehensive approach to diagnosis, assessment and treatment, and able and willing to provide long-term follow-up. However, the referring physician and the inter-disciplinary team should collaborate closely to optimize the long-term post-operative care [10].

In a Canadian study they found that 92.5% of primary care physicians would like to receive more education about bariatric surgery. And physicians with no history of referral were earlier into their practices and had less morbidly obese patients than physicians with previous referrals. They were also less likely to discuss bariatric surgery with their patients and less likely to feel comfortable explaining procedure options and providing postoperative care [16].

In Kuwait, a study discussing that few eligible candidates are referred from primary care for bariatric surgery, concluded that "Training in the referral process should ensure that primary care physicians obtain the skills necessary to expand their scope of practice, when appropriate and determine when and why a patient should be referred" [17].

A study conducted to assess the knowledge of Polish primary care physicians about surgical treatment of obesity, they mentioned that nowadays bariatric surgery is a recognized method of treatment, but physicians remain reluctant to refer their patients for surgical treatment of obesity [18].

A study in Ohio, US, discussed the same issue reveled that the physicians are largely aware of the indications and benefits. Also far fewer are comfortable in management of patients after surgery. A lack of supplemental information and concerns regarding the cost of surgery can affect treatment and referrals [19].

Primary care physicians (PCP's) are the first line of health care system to encounter patients. Since obesity has a high prevalence in our community, the PCP's will face a number of patients with obesity in their daily clinical practice. By assessing the knowledge and attitude about bariatric surgery among PCP's that will provide useful information in order to improve the quality of care and management of obese patients who would benefit from surgical therapy. This study aimed to provide information contributing to the improvement of the knowledge and perception among primary care physicians about bariatric surgery, and their ability to care for patients who suffer from morbid obesity. Our objectives were: To determine the knowledge and perceptions of primary care physicians about bariatric surgery. And To explore factors associated with physician referral for bariatric surgery.

Methods

- **Design:** A cross-sectional design was used in this study.
- **Setting:** Prince Sultan Military Medical City, Riyadh, Saudi bia.
- **Target population:** Primary care physicians working at Prince Sultan Military Medical City, Riyadh, Saudi Arabia.
- **Study population:** The study include all physicians currently working at primary health care centers of PSMMC in total of about 294 physicians distributed in 17 different health care centers.

Inclusion criteria

The physicians who are currently working in primary care centers of PSMMC and registered in official rota of family and community department.

Exclusion criteria

The physicians who are currently on leave i.e., annual, educational…etc.

Sample size:

Sample size = $\frac{\mathbf{Z^2 p(1-P)}}{\boldsymbol{\delta^2}}$

- **Z**: represents the confidence level, 95% confidence level is the standard choice and for this level Z = 1.96
- **P**: the expected prevalence from the data.
- **δ**: Error tolerance

Because this study is original and the prevalence not estimated in previous studies, we will maximize the sample size

Sample size = $\frac{(1.96)^2(0.5)(0.5)}{(0.05)^2}$

=384

Since the population in the study is finite, so we will use corrected sample size

Corrected sample size = $\frac{uncorrected\ sample\ size}{1+\frac{un\ corrected\ sample\ size-1}{population}}$

$=\frac{384}{1+\frac{384-1}{294}}$

=167

Study variables

Age, gender, nationality, years in practice, patient volume.

The sampling technique was surveying of all the physicians. The physicians currently working at primary health care centers of are 294 physicians Prince Sultan Military Medical City. The questionnaire was distributed among the physicians over 3 waves until 170 completed questionnaires were collected. The response rate was 57.8% which indicates a good level of response.

Data collection tool

Perception and awareness of bariatric surgery among primary care physicians questionnaire

The questionnaire was developed by researchers of university health network -Toronto based on a MEDLINE literature review and the expertise of bariatric surgeons at a large tertiary academic center, then modified and validated from the feedback of a focus group of seven primary care physicians of a tertiary academic center the questionnaire.

The final questionnaire consisted of 28 questions that were used to identify perceptions and knowledge of bariatric surgery, as well as to understand primary patient care in this setting [16].

The above mentioned questionnaire adapted and modified to fit the setting of practice in prince sultan military medical city, riyadh, saudi arabia.

Permission to adapt and modify the questionnaire acquired from the author, letter of permission attached in appendix.

Data management and statistical analysis

All data entered into database [IBM® SPSS® Statistics version 20.0.0]. Data cleaning obtained by cross tabulation and detecting the outliers.

For the purpose of data analysis, each response presented in numbers and percentages. Numeric presentation in form of mean, median, and standard deviation reported for continuous type of response. Univariate analysis used to compare demographic characteristics and responses between physicians who had made previous referrals for surgery versus those with no history of referral. For group comparisons for categorical data Fisher's exact test used as appropriate, while continuous data (age and years in practice) compared using the Mann-Whitney U test. P-value of less than 0.05 with confidence interval 95% will be taken for level of significance. Data will be shown in tabular and graphic presentation.

Ethical Consideration

Ethical approval obtained from the research ethics committee in Prince Sultan Military Medical City and research ethics committee in Saudi commission for health specialty. consent and a statement detailing the purpose of the study and what it entailed, and provides assurances that participation is voluntary and participants identity will remain anonymous and confidential. Permission to adapt and modify the questionnaire acquired from the author, letter of permission attached in appendix.

Results

The demographic characteristics of the study population is described in table 1. The mean age of the physicians participated in this survey is 34 years with a standard deviation of almost 9 years. The mean years in current practice is almost 9 years with standard deviation of 8 and half year. The majority of the respondents are males representing almost 56 percent of the study population. The patients load was estimated by the number of patients visits per week, most physicians in this study reported they have more than 100 visits per week representing almost 30 percent.

Descriptive analysis of responses in our survey questions shown in table 2. Most of the participants (64.1%) reported measuring their patients weight on each clinic visit. Along with the weight measurement, almost all participants used BMI alone regularly (97.6%) with the remaining added waist circumference as well. Sixty-seven percent of participants consider BMI of 40 is appropriate for bariatric surgery in patients without weight related comorbidities. The majority of participants (35.9%) estimated the percentage of morbidly obese patients seen in the past 12 months was between 21 to 30 percent. Most of physicians (38.8%) in our study were not supportive of metabolic surgery for diabetic patients with BMI less than 35. Laparoscopic sleeve gastrectomy was chosen to be the ideal bariatric surgical procedure in average patients in 48.2%. It is as well the same type of surgery most of the physicians (64.1%) reported that their patients show interest in. When asked about the number of patients in current practice have had a bariatric procedure, 43.5% reported to see from 1 to 5 patients. Ninety-two of physicians initiated conversations with patients about bariatric surgery. In the other hand, most of physicians (29.4%) reported less than 10% of morbidly obese patients inquire about bariatric surgery. BMI was reported to be the major influence of the decision to refer to surgery by 96.5% of participants. Physicians who referred patients for bariatric surgery accounted for 88.8% of participants. Of those, 25.3% mentioned in the past 12 months they referred 1 to 5 percent of morbidly obese patients were referred. The main reason for not referring morbidly obese patients for surgery is lack of resources reported by 33.3%. When asked about appropriate source availability in their centers, 43.5% of participants agree that they are available and almost the same percentage (47.6%) agree that contacts for managing morbidly obese patients are available. Furthermore, 80.6% of the physicians would refer a family member or a friend for gastric bypass surgery.

Table 3 and 4 demonstrate the participants knowledge regarding the 30-day mortality and morbidity rate for the bariatric procedures. The majority of responses admits the lack of knowledge for all types of surgery in question.

For the statements agreement (table 5), there is an overall majority agreement to each one of the six questions. First, the statement assessing a period of six months as a minimum period of dieting attempts prior to consider a surgical intervention shows an overall agreement of 70 percent (either agree or strongly agree). Almost a similar response of 69.4% were observed for the statement reporting morbidly obese patients successfully losing weight without surgery. Less consistent agreement of 43% of physicians with the statement indicating a sustained weight loss with bariatric surgeries. Regarding their comfort explaining the surgical options to their patients, 58.9% of the respondent feels comfortable while 63% of them feels comfortable providing care to patients who have received a bariatric surgery. The most agreement among all statements of 84.7% is with the need for continuing medical education resources in bariatric surgical care to primary care physicians in PSMMC.

The primary outcome analysis results comparing the characteristics and answers to the other questions in the survey are shown in table 6. There is no statistical difference in the baseline charac-

teristics except for the patients load per week where the patient load distribution in the group who referred for bariatric surgery were almost evenly distributed while higher patient load observed was observed in the group who didn't refer for surgeries with a significant p-value of 0.002. Regarding the questions in the survey, a significant difference in the comparison between those who referred patients versus who did not refer to bariatric surgery is obvious in the percentage of morbidly obese patients seen in the last 12 months (p-value 0.015) and the ideal bariatric procedure in average patients (p-value 0.043). Highly significant difference between the two groups also found in number of patients in current practice who had bariatric procedure, initiating conversation about bariatric surgery with patients, percentage of morbidly obese patients inquiring about bariatric surgery and the availability of appropriate resources and equipment (all p-value < 0.001).

	Total
Age/year, mean (SD)	34.45 (8.8)
Years in practice, mean (SD)	8.89 (8.6)
Gender, N (%)	
Male	95 (55.9)
Female	75 (44.1)
Nationality, N (%)	
Saudi	101 (59.4
Non-Saudi	69 (40.6)
Patient load per week, N (%)	
< 25	24 (14.1)
25 - 50	48 (28.2)
51 - 100	48 (28.2)
> 100	50 (29.4)

Table 1: Demographic characteristics of study population.

	Total
Frequency of measurement, N (%)	
Each visit	109 (64.1)
Every year	49 (28.8)
Never	12 (7.1)
Weight assessment measurement, N (%)	
BMI	166 (97.6)
BMI and waist circumference	4 (2.4)
Minimum BMI considered Appropriate for bariatric surgery	
for patient without Weight related comorbidities, N (%)	
35	45 (26.5)
40	115 (67.6)
45	10 (5.9)
< 21 %	59 (34.7)
21 - 30 %	61 (35.9)
31 - 40 %	38 (22.4)
41 - 50 %	12 (7.1)
Supportive of bariatric surgery for patients with	
Diabetes Mellitus with BMI <35, N (%)	
Yes	54(31.8)
No	66(38.8)
Unsure	50(29.4)
What is the ideal bariatric surgical procedure in average patients, N(%)	
Laparoscopic roux-en-Y gastric bypass	26 (15.3)
Laparoscopic sleeve gastrectomy	82 (48.2)
Laparoscopic adjustable gastric band	13 (7.6)
Duodenal switch/ biliopancreatic diversion	2 (1.2)
Unsure	47 (27.6)
Type of bariatric surgery patients show	
the most Interested in, N (%)	
Laparoscopic roux-en-Y gastric bypass	8 (4.7)
Laparoscopic sleeve gastrectomy	109 (64.1)
Laparoscopic adjustable gastric band	4 (2.4)
More than two of the above	27 (15.9)
Not specified	22 (12.9)
Patients in your current practice have	
had bariatric procedures, N (%)	
No patients	11 (6.5)
1 to 5	74 (43.5)
6 to 10	28 (16.5)
11 to 15	13 (7.6)
16 to 20	10 (5.9)
more than 20	34 (20)
Initiate conversations with patients	
about bariatric surgery, N (%)	
Yes	155 (91.2)
No	15 (8.8)
Morbidly obese patients inquire about bariatric surgery, N (%)	
< 10 %	50 (29.4)
10 to 20 %	37 (21.8)
21 to 30 %	37 (21.8)
31 to 40 %	28 (16.5)
more than 40 %	18 (10.6)
(Table 2) cont.	
Decision influence to refer to bariatric surgery, N (%)	

BMI	164 (96.5)
Comorbidities	148 (87.1)
Age	56 (32.9)
Number of attempts at dieting	84 (49.4)
Use of pharmacotherapy for obisity	48 (28.2)
Ever referred your patients for bariatric surgery, N (%)	
Yes	151 (88.8)
No	19 (11.2)
Morbidly obese patients refered in the past 12 months, N (%)	
< 1 %	29 (17.1)
1 to 5 %	43 (25.3)
6 to 10 %	32 (18.8)
11 to 20 %	24 (14.1)
more than 20 %	21 (12.4)
Reason for not referring morbidly obese for surgery, N (%)	
Lack of resources	5 (33.3)
Limited benefits from procedure	2 (13.3)
Disagree with procedure	2 (13.3)
Concerns with follow up	2 (13.3)
More than one reason	4 (26.7)
Procedures covered by PSMMC, N (%)	
Laparoscopic Roux-en-Y gastric bypass	94 (55.3)
Laparoscopic sleeve gastrectomy	110 (64.7)
Laparoscopic adjustable gastric band	52 (30.6)
Appropriate resources and equipment availability, N (%)	
Yes	74 (43.5)
No	51 (30)
Unsure	45 (26.5)
Contact availability for managing morbidly obese patients, N (%)	
Yes	81 (47.6)
No	36 (21.2)
Unsure	53 (31.2)
Would refer a family member or a friend for gastric bypass, N (%)	
Yes	137 (80.6)
No	33 (19.4)

Table 2: Questionnaire responses of study participants.

	< 0.1%	0.1 to 0.2%	0.3 to 1.0%	2.1 to 4%	Don't know
Laparoscopic Roux-en-Y gastric bypass:	7 (4.1)	34 (20)	8 (4.7)	12 (7.1)	99 (58.2)
Laparoscopic sleeve gastrectomy	41 (24.1)	14 (8.2)	22 (12.9)	0 (0)	89 (52.4)
Laparoscopic adjustable gastric band	47 (27.6)	10 (5.9)	5 (2.9)	0 (0)	100 (58.8)

Table 3: Estimated 30-day mortality rate for the bariatric procedures, N (%).

	0 to 5 %	5 to 10%	10 to 15%	15 to 20 %	> 20%	Don't know
Laparoscopic Roux-en-Y gastric bypass:	12 (7.1)	35 (20.6)	16 (9.4)	8 (4.7)	4 (2.4)	95 (55.9)
Laparoscopic sleeve gastrectomy	52 (30.6)	18 (10.6)	6 (3.5)	2 (1.2)	0 (0)	92 (54.1)
Laparoscopic adjustable gastric band	51 (30)	8 (4.7)	10 (5.9)	2 (1.2)	0 (0)	99 (58.2)

Table 4: Estimated 30-day morbidity rate for the bariatric procedures, N (%).

	Strongly Disagree	Dis agree	Neutral	Agree	Strong Agree
Morbidly obese patients should attempt dieting for at least 6 months before considering surgery	8 (4.7)	27 (15.9)	16 (9.4)	64 (37.6)	55 (32.4)
I have had morbidly obese patients who were successful at losing weight without surgery	2 (1.2)	22 (12.9)	28 (16.5)	85 (50)	33 (19.4)
Bariatric surgeries result in sustained weight loss	11 (6.5)	36 (21.2)	50 (29.4)	54 (31.8)	19 (11.2)
I feel comfortable explaining the procedural options to a patient	8 (4.7)	32 (18.8)	30 (17.6)	79 (46.5)	21 (12.4)
I feel comfortable providing care to patients who have received bariatric surgery	10 (5.9)	28 (16.5)	25 (14.7)	86 (50.6)	21 (12.4)
Additional continuing medical education resources in bariatric surgical care would be useful to primary care physicians in PSMMC	6 (3.5)	0 (0)	20 (11.8)	62 (36.5)	82 (48.2)

Table 5: Physician agreement to statements, N (%).

	P value		
	Referred	**Did not refer**	
Age/years, mean (SD)	34.4 (8.05)	34.84 (13.77)	0.893
Years in practice, mean (SD)	8.75 (7.79)	10 (13.6)	0.700
Gender, N (%)			0.328
Male	82 (54.3)	13 (68.4)	
Female	69 (45.7)	6 (31.6)	
Nationality, N (%)			1.000
Saudi	90 (59.6)	11 (57.9)	
Non-Saudi	61 (40.4)	8 (42.1)	
Patient load per week, N (%)			0.002
< 25	18 (11.9)	6 (31.6)	
25 - 50	43 (28.5)	5 (26.3)	
51 - 100	48 (31.8)	0 (0)	
> 100	42 (27.8)	8 (42.1)	
Frequency of measurement, N (%)			0.445
Each visit	99 (65.6)	10 (52.6)	
Every year	42 (27.8)	7 (36.8)	
Never	10 (6.6)	2 (10.5)	
Weight assessment measurement, N (%)			1.000
BMI	147 (97.4)	19 (100)	
BMI and waist circumference	4 (2.6)	0 (0)	
Minimum BMI considered Appropriate for bariatric surgery			
for patient without Weight related comorbidities, N (%)			0.123
35	43 (28.5)	2 (10.5)	
40	98 (64.9)	17 (89.5)	
45	10 (6.6)	0 (0)	
Percentage of morbidly obese patients seen in last 12 months, N (%)			0.015
< 21 %	49 (32.5)	10 (52.6)	
21 - 30 %	52 (34.4)	9 (47.4)	
31 - 40 %	38 (25.2)	0 (0)	
41 - 50 %	12 (7.9)	0 (0)	
Supportive of bariatric surgery for patients with			
Diabetes Mellitus with BMI <35, N (%)			0.560
Yes	50 (33.1)	4 (21.1)	
No	57 (37.7)	9 (47.4)	
Unsure	44 (29.1)	6 (31.6)	
What is the ideal bariatric surgical procedure			
in average patients, N (%)			0.043
Laparoscopic roux-en-Y gastric bypass	26 (17.2)	0 (0)	
Laparoscopic sleeve gastrectomy	75 (49.7)	7 (36.8)	
Laparoscopic adjustable gastric band	11 (7.3)	2 (10.5)	
Duodenal switch/ biliopancreatic diversion	2 (1.3)	0 (0)	
Unsure	37 (24.5)	10 (52.6)	

Type of bariatric surgery patients show			
the most Interested in, N (%)			0.722
Laparoscopic roux-en-Y gastric bypass	8 (5.3)	0 (0)	
Laparoscopic sleeve gastrectomy	96 (63.6)	13 (68.4)	
Laparoscopic adjustable gastric band	4 (2.6)	0 (0)	
More than two of the above	25 (16.6)	2 (10.5)	
Not specified	18 (11.9)	4 (21.1)	
Patients in your current practice have			
had bariatric procedures, N (%)			< 0.001
No patients	5 (3.3)	6 (31.6)	
1 to 5	65 (43)	9 (47.4)	
6 to 10	28 (18.5)	0 (0)	
11 to 15	13 (8.6)	0 (0)	
16 to 20	8 (5.3)	2 (10.5)	
more than 20	32 (21.2)	2 (10.5)	
Initiate conversations with patients			
about bariatric surgery, N (%)			< 0.001
Yes	143 (94.7)	12 (63.2)	
No	8 (5.3)	7 (36.8)	
Morbidly obese patients inquire about bariatric surgery, N (%)			< 0.001
< 10 %	37 (24.5)	13 (68.4)	
10 to 20 %	37 (24.5)	0 (0)	
21 to 30 %	31 (20.5)	6 (31.6)	
31 to 40 %	28 (18.5)	0 (0)	
more than 40 %	18 (11.9)	0 (0)	
Appropriate resources and equipment availability, N (%)			< 0.001
Yes	74 (49)	0 (0)	
No	45 (29.8)	6 (31.6)	
Unsure	32 (21.2)	13 (68.4)	
Contact availability for managing morbidly obese patients, N (%)			0.255
Yes	73 (48.3)	8 (42.1)	
No	34 (22.5)	2 (10.5)	
Unsure	44 (29.1)	9 (47.4)	
Would refer a family member or a friend for gastric bypass, N (%)			0.766
Yes	122 (80.8)	15 (78.9)	
No	29 (19.2)	4 (21.1)	

Table 6: Comparing physicians who did refer versus did not refer patients for bariatric surgery.

	Previous referal	No previous referal	p-value
Morbidly obese patients should attempt dieting for at least 6 months before considering surgery	109 (78.4)	10 (66.7)	0.334
I have had morbidly obese patients who were successful at losing weight without surgery	106 (82.8)	12 (85.7)	1.000
Bariatric surgeries result in sustained weight loss	60 (58.3)	13 (76.5)	0.187
I feel comfortable explaining the procedural options to a patient	87 (70.7)	13 (76.5)	0.778
I feel comfortable providing care to patients who have received bariatric surgery	101 (77.1)	6 (42.9)	0.010
Additional continuing medical education resources in bariatric surgical care would be useful to primary care physicians in PSMMC	132 (97.1)	12 (85.7)	0.098

Table 7: Comparing statements between physicians who referred vs. did not refer patients previously for bariatric surgery, N (%).

Figure 1: Referral status vs. Age vs. Years in practice.

Figure 2: Appropriate Resources and Equipment Availability.

Figure 3: Ideal Bariatric Surgery in Average Patients.

Figure 4: Initiation of Bariatric Surgery Conversations.

Figure 5: Percentage of morbidly obese patients seen in last 12 months.

Figure 6: Percentage of Morbidly Obese Patients Inquire about Bariatric Surgery.

Figure 7: Patients Load Difference.

Figure 8: Number of Patients went for Bariatric Procedures.

Figure 9: Statements Comparison Between Physicians Previously Referred vs. Did not Refer Patients.

Discussion

To the best of our knowledge, this is the first study in Saudi Arabia examining the attitude towards knowledge and preference of bariatric surgery among primary care physicians. This represent a starting point in which future related researches could relay on in comparing their primary care physicians knowledge and preference could be compared to identify the improvement areas in current practices and patients care.

In our study, we observed the practice of measuring patients weight on each clinic visit and that is consistent with the international standards. However the use of BMI alone as a weight assessment tool does not provide a complete evaluation of the patient's obesity. A study done by Fahad S. Al-Shehri in Saudi Arabia presented a guideline for curative and preventive aspects of overweight and obesity at all levels of care. Our physician's current practice are almost consistent with the guidelines. In that guidelines a recommendation to consider bariatric surgery should be on an individual basis following assessment of risk versus benefit for patients who had BMI ≥35 kg/m^2 with presence of one or more severe comorbidities, which are expected to improve significantly with weight loss. In our study the majority considered a minimum BMI of 40 for patients without weight related comorbidities. This could be explained by the high reported patient load of more than 100 visits per week that could be a surrogate indicator to the overwhelmed obesity management system provided the high prevalence of obesity in Saudi Arabia that is estimated to be 75% of the total population. This disproportion between the number of patients who would be potential candidates for bariatric treatment, who are currently under care of participating physicians, and the number of patients who are referred to a bariatric surgeon were observed by Major P., *et al.* in a study conducted in Poland 2016.

Comparing to the study by Mark Auspitz., *et al.* on knowledge and perception of bariatric surgery among primary care physicians, our primary care service is much busier in term of patient load, percentage of the morbidly obese patients seen in the past 12 months. However, the referral for bariatric surgeries are comparable between the two studies and that is mainly explained but higher minimum BMI appropriate for bariatric surgeries referral in our study population. In the other hand our physicians were more hesitant to support bariatric surgery for diabetic patients with BMI less than 35 (31.8% vs. 48.1%). In the study conducted by Major P., *et al.* the great majority of respondents (96.6%), were aware that bariatric surgery is efficient in the treatment of the metabolic syndrome.

In regard to the bariatric surgical procedures knowledge, the ideal bariatric procedure considered ideal in average obese patient were the laparoscopic sleeve gastrectomy in the opinion of our physicians in comparison to the laparoscopic adjustable gastric band in the opinion of the Ontario doctors although the majority were unsure. This correlate well with the patients interest in both studies. This could be an influence between patients and their physicians although the influence direction is not clear.

The correct identification of 30-day mortality and morbidity rates reflects a sufficient knowledge among our participants in all three types of bariatric surgeries shown in tables 4 and 5 except of over estimation of morbidity of Laparoscopic Roux-en-Y gastric bypass. However the majority of respondents indicated lack of knowledge. These responses are more accurate estimation in comparison to the Ontario study population. This finding reflects lack of confidence about the obtained knowledge of bariatric surgeries among primary care physicians in both study populations.

The factors influencing decision to refer morbidly obese patients for bariatric surgery are comparable between the two study populations with the majority indicating BMI and presence of comorbidities with the number of attempts at dieting would come in third frequently chosen factor.

The comparisons between physicians who referred patients to bariatric surgery and who didn't refer any patients before

demonstrating the gap difference in knowledge and the degree of comfort in management of obese patients. Our study results show that physicians who have a sufficient knowledge and comfort managing these patients more likely to refer them for surgery. This is evident by the difference in initiating conversations with patients and morbidly obese patients inquires as well the knowledge of the availability of resources and equipment availability to them. The final statements in our survey didn't shows a significant difference except for the degree of comfort dealing with patients after they went for bariatric surgery.4e

Further more, the degree of agreement regarding the need of continuous medical education resources shines the light of potential gap in knowledge. In a study by Tork D., *et al*. conducted in Ohio in 2015, 70% felt comfortable discussing it with patients as a treatment option in comparison to 58.9% in our study population. In that same study, fewer than half of the respondents felt confident in providing postoperative management while 63% in our study population were confident.

Conclusion

The results obtained in this study provide insight into potential barriers to bariatric surgery referral, influenced by the physicians' knowledge and perception of bariatric surgery for obesity. Bariatric surgery has been proven to be an effective tool for weight loss in the majority of recipients. It reduces patient comorbidities and costs to the health-care system. However, despite its effectiveness and general support from primary care physicians, it appears that bariatric surgery may not be offered to the majority of morbidly obese patients who would benefit most from it.

Study results demonstrated that the knowledge of physicians in the bariatric surgical treatment of morbid obesity is insufficient. This may be due to a knowledge gap in understanding the role of bariatric surgery in the treatment of obesity, discomfort in providing care to bariatric patients, and lack of resources and support, as demonstrated in this study. There is an opportunity to improve education and available resources for primary care physicians surrounding patient selection and follow-up care.

However, most primary care physicians are interested in broadening their knowledge and taking part in continuing education courses in the above-mentioned field, in order to improve their understanding of surgical management of obesity.

Recommendations

In following with the results, it is recommended that continuing education courses on the guidelines and management protocol for morbid obesity be mandatory for primary care physicians.

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