

Public perceptions of obesity and bariatric surgery in Singapore: a pilot study

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INTRODUCTION Obesity is a real and dangerous problem with rising incidence. This study aimed to examine public perceptions of obesity as a disease, as well as the community's impression of the various modalities in the management of obesity, particularly bariatric surgery, in Singapore.

METHODS Volunteers from the public were approached in 2010 to complete a questionnaire that collected both their demographic data and perceptions on obesity, management of obesity and bariatric surgery. The perceptions of the respondents were analysed based on various demographic factors.

RESULTS The incidence of obesity was 16.8%. Consistent with previous studies in developed countries, the highest mean body mass index was noted in the age range of 41–50 years. 95.6% of the population surveyed were aware that obesity was related to significant medical conditions. 60% of the population surveyed had attempted weight loss in the past, with 41.7% expressing lack of success, and 58.4% expressed that they had not heard of surgery as a modality.

CONCLUSION This study shows that the majority of the population understands the significance of obesity as a medical problem and would take steps to combat it. However, there is suboptimal knowledge of the various modalities of managing obesity as a disease, especially with regard to surgical options. More education on the modalities available and access to them would help in the combat of this obesity epidemic.

Keywords: bariatric surgery, obesity, public perceptions
Singapore Med J 2012; 53(2): 104–108

INTRODUCTION

The prevalence of obesity is high in many parts of the world, with several studies showing a rising incidence, along with an increase in obesity-related significant disabilities and premature deaths. According to the World Health Organization (WHO) projection in 2008, approximately 1.5 billion adults (age 20+ years) were overweight, and of these, more than 200 million men and nearly 300 million women were obese. WHO further projects that by 2015, approximately 2.3 billion adults would be overweight and more than 700 million obese.⁽¹⁾

This increasing trend is also shown in a recent review of the “epidemic” of obesity by Low et al in 2009.⁽²⁾ The same worrying trend is reflected in the Singapore National Health Survey in 2004, which showed an increase in the prevalence of obesity from 5.1% in 1992 to 6.0% in 1998 and 6.9% in 2004.⁽³⁾ Even more concerning is the fact that the 2004 figures were based on the WHO international cut-off for obesity as a body mass index (BMI) of ≥ 30 kg/m²; should the figures be recalculated based on the revised Asian cut-off for obesity of ≥ 27 kg/m² (due to the higher percentage body fat at lower BMI found in studies),^(4,5) the prevalence of obesity may be as high as 16%.⁽⁶⁾ Several demographic factors have been shown to affect the incidence of obesity in various studies, especially socioeconomic status, age and gender.^(2,7-10)

Obesity is identified as a cause of serious health consequences, with the risk of these consequences increasing with BMI. WHO has identified raised BMI as a major risk factor

for chronic diseases such as cardiovascular disease (the world number one cause of death), diabetes mellitus (a rising global epidemic), musculoskeletal disorders and certain cancers.⁽¹⁾ This burden of co-morbidities and premature death has prompted the World Health Assembly in 2004 to formulate the WHO Global Strategy on Diet, Physical Activity and Health in an attempt to stave off this epidemic.

As evidenced by the above, obesity is a real and dangerous problem requiring strategies to prevent its onset and also methods to manage it in view of the rising prevalence. These include conservative methods such as dietary modifications and exercise, medical options of pharmacological interventions and surgery. Conservative and medical options have been shown to give inconsistent and unsustainable results;⁽⁶⁾ however, surgical intervention for the management of obesity is currently not a well-recognised modality in Singapore.^(6,11-13) Public perception of obesity and bariatric surgery has not been well described in previous studies, as these were mainly epidemiological studies.

Therefore, this prospective cohort pilot study aimed to examine public perceptions of obesity as a disease and the demographic factors influencing the prevalence of obesity. We also explored public knowledge and perception of the options for management of obesity (including bariatric surgery).

METHODS

A questionnaire was designed to collect demographic data and public perceptions of the above (Appendix). The questionnaire

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Table I. Demographics of the sample population (n = 137).

Demographic	No. (%)
Mean age; range (yrs)	32.5; 21–67
Mean BMI; range (kg/m²)	23.3; 17.7–42.4
Gender	
Male	60 (43.8)
Female	77 (56.2)
Race	
Chinese	97 (70.8)
Malay	19 (13.9)
Indian	6 (4.4)
Others	15 (10.9)
Monthly income (SGD)	
< 1,000	15 (10.9)
1,000–1,999	31 (22.6)
2,000–2,999	45 (32.8)
3,000–3,999	17 (12.4)
4,000–4,999	9 (6.6)
5,000–5,999	11 (8.0)
≥ 6,000	9 (6.6)
Education level	
Primary	2 (1.5)
Secondary	30 (21.9)
Polytechnic	30 (21.9)
Junior college	8 (5.8)
University Graduate	49 (35.8)
Post-graduate	10 (7.3)
Others	8 (5.8)

BMI: body mass index

was pre-tested by 50 volunteers before being administered to the study population. It was administered in English and Mandarin (where possible) over a two-month period (between August and September 2010).

The questionnaire comprised two sections: the first consisted of demographic data including age, gender, race, educational level, occupation, monthly income and BMI (participants provided their most recent height and weight and the BMI was calculated); and the second consisted of questions on perceptions of ideal weight and medical problems associated with obesity, participants' personal exposure to various methods of weight loss, methods that they would consider, as well as factors that would influence their decision on a particular modality.

The population consisted of individuals (both patients and visitors) at General Surgery Clinic F of Changi General Hospital, Bedok Polyclinic and a general practitioner clinic in the western part of Singapore, as well as a small number of staff members of Changi General Hospital. The population was approached by administrators of the questionnaire and asked to volunteer, after which they were handed the questionnaire to complete. The demographics and number of non-responders were not recorded in this pilot study. To ensure accuracy of responses, only the questionnaires completed by adults (subjects aged ≥ 21 years) were included for final analysis. The Statistical Package for the Social Sciences version 12.0.1 (SPSS, Chicago, IL, USA) was used for univariate, bivariate and multivariate analyses. The perceptions of the participants were further analysed against the demographic factors with exploratory factor analysis.

Table II. Body mass index of the different demographic groups.

Demographic	Body mass index (kg/m ²)			p-value
	Mean ± SD	Min	Max	
Gender				0.009
Male	24.3 ± 3.2	20.1	32.9	
Female	22.6 ± 4.1	17.7	42.4	
Race				0.034
Chinese	22.9 ± 3.4	17.7	33.3	
Malay	25.7 ± 5.6	19.2	42.4	
Indian	23.3 ± 3.7	20.0	28.5	
Others	23.1 ± 3.2	19.4	30.7	
Age group (yrs)				0.001
21–30	22.4 ± 3.0	18.7	33.3	
31–40	23.7 ± 3.6	17.7	32.9	
41–50	25.8 ± 6.2	19.2	42.4	
≥ 50	25.0 ± 4.1	18.5	31.2	
Monthly income (SGD)				0.639
< 1,000	22.0 ± 2.7	17.7	28.6	
1,000–1,999	23.3 ± 3.9	18.7	32.9	
2,000–2,999	24.2 ± 4.5	19.1	42.4	
3,000–3,999	23.0 ± 4.1	18.5	30.5	
4,000–4,999	23.0 ± 3.4	19.1	28.7	
5,000–5,999	23.0 ± 2.5	18.1	27.8	
≥ 6,000	22.7 ± 2.8	18.8	26.1	

SD: standard deviation

RESULTS

A total of 161 fully completed questionnaires were returned, and 137 were included for final analysis (a total of 202 questionnaires were returned with 41 excluded as incomplete and a further 24 were excluded as the subjects were < 21 years of age). Overweight was defined as BMI ≥ 23 kg/m² and obesity BMI ≥ 27 kg/m², based on the recommended Asian cut-offs,⁽⁵⁾

The demographics of the surveyed population (n = 137) was analysed (Table I). 40.1% (n = 5) were found to be overweight by the above criteria and 16.8% (n = 23) were obese. 43.8% were male, and 70.8% were Chinese, 13.9% Malay, 4.4% Indian and 10.9% of other races. From the 2009 population census of Singapore residents,⁽¹⁴⁾ Chinese constitute 74.2%, Malays 13.4%, Indians 9.2% and other races 3.2%; however, the census did not include the 25.3% of non-residents and as such, it was not possible to correlate the racial distribution of the participants with the general population of Singapore (residents and non-residents). The mean age of the participants was 32.5 (range 21–67) years. The majority were between the ages of 21–40 years.

The majority (66.5%) of the participants declared their monthly income to be < SGD 3,000 (Table I). From Singapore population studies,⁽¹⁴⁾ the median household income stood at SGD 5,000 in 2010. As the participants of this study were mainly visitors or patients of government-subsidised specialist clinic or polyclinic, this would explain the income distribution of the participants matching or falling below the median household income of the general population. The vast majority of the surveyed population (98.5%) had at least a secondary education. From the Singapore Census 2000,⁽¹⁴⁾ 68.8% of residents in Singapore had at least a secondary education; this percentage would have increased over the years since that census. A further analysis of the education

distribution of the surveyed population showed that 49.6% comprised those with secondary, polytechnic and junior college education, and 43.1% were at least university graduates.

The BMI distribution of the surveyed population showed a mean BMI of 23.3 (range 17.7–42.4) kg/m². The BMI distribution was further analysed against gender, race, age group and income level (Table II). Males have a higher mean BMI of 24.3 (range 20.1–32.9) kg/m² as compared with females at 22.6 (range 17.7–42.4) kg/m². This was statistically significant ($p = 0.009$). Although the majority of the population surveyed were aged 21–40 years, the highest mean BMI was recorded for the group aged 41–50 years. This corresponds to previous studies, which found that BMI peaks at ages 40–50 years among individuals in developed countries. There was no difference between the BMI among the various races. This was in contrast to studies conducted previously.^(7–10) There was also no statistical difference in the BMI among the income groups. With the monthly income of 66% of the surveyed population being < SGD 3,000, the BMI of this group was further analysed against that of the population with income \geq SGD 3,000; there was again no statistical significance.

95.6% of the surveyed population were aware that obesity was related to some medical conditions. Generally, hypertension, hyperlipidaemia, depression and diabetes mellitus were correctly identified as being related to obesity. On being asked if they thought that they were overweight, 39% of the surveyed population indicated they were not and 31% were affirmative. Although 9% of the population had a BMI > 23 kg/m², they did not think that they were overweight, whereas another 12% with a BMI < 23 kg/m² still felt that they were overweight. Among the 56 (41%) participants who felt that they were overweight, the mean BMI was 26.2 kg/m², with 75% ($n = 42$) having a BMI > 23 kg/m² and 25% ($n = 14$) having a BMI < 23 kg/m². Those who felt that they were overweight were asked to indicate their perceived ideal weight, and this was calculated into their perceived ideal BMI and analysed. The mean perceived ideal BMI was 22.1 kg/m², which was within the normal BMI range.

60% ($n = 82$) of the surveyed population had attempted weight loss in the past. The most common methods employed were exercise and diet (89% and 71%, respectively), while 11% had tried pharmacological means of weight loss, 4% slimming centres and only one participant had tried surgery. Of those who had attempted weight loss in the past, 58.3% ($n = 49$) felt that they had some degree of success. However, the mean weight loss was only about 4 kg, with five (10.2%) having a significant weight loss of ≥ 10 kg. For the 41.7% who attempted weight loss but did not succeed, the most common reason was failure to keep to dietary restrictions (69.7%), followed by having no time or energy to exercise (60.6%). 40% of the surveyed population had made no previous attempts at weight loss. Of these, 75% ($n = 45$) felt they did not need to lose weight. On analysing these 45 individuals, 28.9% had a BMI > 23 kg/m². The most common reasons for not attempting weight loss were no time or energy (36.6%), no

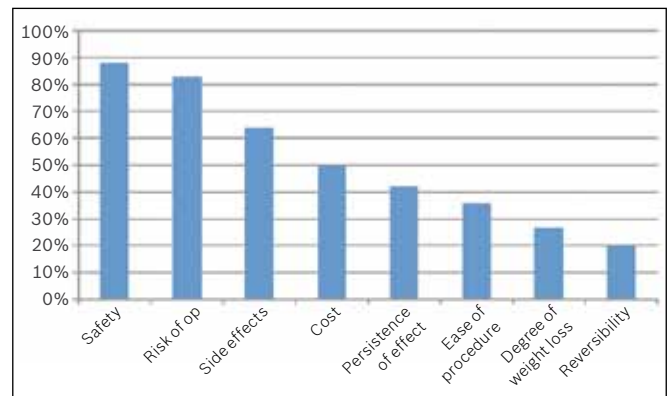


Fig. 1. Factors affecting choice of surgery.

money to explore weight loss options (20.0%) and ignorant of or no access to the options available (18.3%). Consistent with the most commonly attempted means of weight loss as mentioned above, the preferred method of weight loss (should this be needed) was exercise (58.4%), followed by diet (32.8%). Only 7.3% chose pharmacological means, and a small minority (2.2%) would consider surgery.

58.4% of the surveyed population expressed that they had not heard of surgery as a modality for management of obesity. It is hence unsurprising that only 41.6% of the surveyed population knew that bariatric surgery was a medical procedure, while 28.5% felt that it was a cosmetic procedure and 29.9% were unsure. Of the group that had not heard of surgery as an option, 25% had secondary education, 25% polytechnic level, and 28.8% were university graduates. The mean BMI of the group that had not heard of surgery as an option was 23.7 (range 17.7–42.4) kg/m². With regard to the factors influencing the choice of surgery, the safety profile of the procedure and risks of operation were the two main considerations (Fig. 1).

DISCUSSION

This pilot study aimed to examine public perceptions of obesity as a disease, as well as the community's impression of the various modalities in the management of obesity, particularly bariatric surgery, in Singapore. Areas for improvement of the study materials and methodology were identified. In terms of materials, in the background of a multiracial community such as Singapore, the questionnaire would be better administered in the four main languages (English, Chinese, Malay and Tamil), with administrators of the questionnaire being able to translate accurately the questions asked in the various languages and dialects. This could potentially improve the data collected to include the less literate in the community. It is also anticipated that the translations would enable the older population in Singapore to be included in the study, thereby increasing the mean age to be more representative.

As previously mentioned, the surveyed population consisted of a large proportion of those whose monthly income was < SGD 3,000. This was attributed to a large number of the questionnaires being administered at government-subsidised clinics. For improvement of the study and removal of such a confounding factor, a larger and more representative population should be

targeted. Despite the shortcomings of this pilot study, the captured data does show results that were consistent with previous studies as well as population census information.

Although not one of the aims of this study, the study suggests an increased incidence of obesity in the population, especially if calculated based on the recommended Asian cut-off of BMI ≥ 27 kg/m². 40.1% was found to be overweight and 16.8% obese; this was significantly higher than that reflected in the 2004 Census but consistent with the expected rise in the problem of obesity in Singapore. Also of concern is the BMI distribution of the surveyed population, which showed a mean BMI in the overweight range of 23.3 (17.7–42.4) kg/m². However, due to the small and perhaps not truly representative population studied, it is not possible to comment on the above findings. Future population census or epidemiological studies would be needed to make any conclusion as to the rising incidence of obesity in Singapore.

Similar to other developed countries, this study showed that the peak BMI occurs at ages 40–50 years, suggesting that methods to combat obesity should be targeted at the younger age groups in an effort to prevent the onset of obesity and its associated co-morbidities. The vast majority of the surveyed population knew that obesity is related to significant medical conditions. Of those who felt they were overweight, there was a good perception of the ideal body weight (as evidenced by the mean perceived ideal BMI of 22.01 kg/m²).

This study showed minimal weight loss experienced by those who had attempted weight loss with conservative and medical options; however, again, the small sample size makes it impossible to comment on the significance of this finding. The main barriers to successful weight loss with conservative measures appeared to be failure to keep to dietary restrictions and a lack of time or energy for exercise, both of which would be expected problems in a developed westernised country.

Almost 60% of the surveyed population, despite the majority having at least secondary education, had not heard of bariatric surgery as an option, and it is hence not surprising that only 2.2% of the population would consider surgery as a choice for managing obesity. The vast majority expressed concerns in the safety and risks involved in surgical procedures. This shows that there is a real need to improve public education in the available modalities for the management of obesity, especially that of bariatric surgery in those who would fit the criteria for such an intervention. The availability of patient-specific, structured weight loss programmes would help those who have trouble achieving and sustaining weight loss via conservative and pharmacological means.

With studies consistently showing a rising trend in obesity, all efforts must be made to combat this epidemic. As evidence points to a peak BMI in the 40–50 years age group, these efforts should target the younger population so as to provide them with the knowledge of obesity as a disease and the available options for the management of the condition.

In conclusion, Singapore faces a significant, growing incidence of obesity that will bring with it multiple associated co-morbidities and premature mortality, similar to other developed countries. This incidence may be greater than anticipated by previous population studies in view of the lower recommended cut-off for obesity in the Asian population. Future studies using the lower recommended cut-off for obesity would be beneficial to monitor this worrying trend. Greater efforts to increase public education are required in order to combat this epidemic of obesity, with these efforts targeted at the younger population to achieve a preventive effect. Our study found a lack of knowledge of bariatric surgery among the general population, and thus, there is concern that individuals who require these interventions would be excluded due to a lack of access to these specialist services. As such, education on the various modalities for weight loss should include increasing public awareness of bariatric surgery. Incidentally, it is of concern that the surveyed population demonstrated an increased incidence of overweight and obese subjects. Although this may not reflect the incidence of obesity in the general population, future epidemiological studies would be beneficial for monitoring this trend.

ACKNOWLEDGEMENTS

We thank clinical assistants Ms Ann Chua and Ms Karen Chew for their assistance in administering the questionnaires.

REFERENCES

1. WHO Obesity and overweight Fact Sheet No.311; updated Mar 2011. Available at: www.who.int/mediacentre/factsheets/fs311/en/index.html.
2. Low S, Chin MC, Deurenberg-Yap M. Review on epidemic of obesity. *Ann Acad Med Singapore* 2009; 38:57-9.
3. National Health Survey 2004. *Statistics Singapore Newsletter* 2005;19-20.
4. Deurenberg-Yap M, Schmidt G, van Staveren WA, Deurenberg P. The paradox of low body mass index and high body fat percentage among Chinese, Malays and Indians in Singapore. *Int J Obes Relat Metab Disord* 2000; 24:1011-7.
5. Deurenberg-Yap M, Deurenberg P. Is a re-evaluation of WHO body mass index cut-off values needed? The case of Asians in Singapore. *Nutr Rev* 2003; 61(5 pt 2):S80-7.
6. Foo CS, Tay KH, Ravintharan T. Treatment of obesity with laparoscopic adjustable gastric banding in Singapore: an initial experience. *Singapore Med J* 2005; 46:465-70.
7. Sabanayagam C, Shankar A, Wong TY, Saw SM, Foster PJ. Socioeconomic status and overweight/obesity in an adult Chinese population in Singapore. *J Epidemiol* 2007; 17:161-8. Erratum in: *J Epidemiol* 2008; 18:43-4.
8. Sabanayagam C, Shankar A, Saw SM, Tai ES, Wong TY. The association between socioeconomic status and overweight/obesity in a Malay population in Singapore. *Asia Pac J Public Health* 2009; 21:487-96.
9. Cheah JS. Obesity in Singapore. *Ann Acad Med Singapore* 2001; 30:561-2.
10. Ong SK, Fong CW, Ma S, et al. Longitudinal study of the socio-demographic determinants of changes in body weight and waist circumference in a multi-ethnic Asian population. *Int J Obes (Lond)* 2009; 33:1299-308.
11. Sum CF. Pharmacotherapy and surgery in the treatment of obesity: evaluating risks and benefits. *Asia Pac J Clin Nutr* 2002; 11 Suppl 8:S722-5.
12. Ti TK. Singapore experience in obesity surgery. *Obes Surg* 2004; 14:1103-7.
13. Shabbir A, Loi TH, Lomanto D, Ti TK, So JB. Surgical management of obesity – National University Hospital experience. *Ann Acad Med Singapore* 2009; 38:882-90.
14. Department of Statistics, Singapore. Available at: www.singstat.gov.sg.

APPENDIX

Questionnaire on perceptions of obesity and bariatric surgery

Name (optional): _____ NRIC (optional): _____

Age: _____ Sex: _____ Race: _____ Height: _____ m Weight: _____ kg BMI: _____

Highest Education level: *[Please circle choice]*

Primary School / Secondary School / Polytechnic/ Junior College / University Graduate / Post-graduate

Occupation: _____

Monthly Income (average): *[Please circle choice]*

< \$1,000 / \$1,000–1,999 / \$2,000–2,999 / \$3,000–3,999 / \$4,000–4,999 / \$5,000–5,999 / \$6,000–6,999 / \$7,000–7,999 / \$8,000–8,999 / \$9,000–9,999 / > \$10,000

1. Do you think that being overweight or obese can cause significant medical problems? Yes/No

2. Which of these do you think is related to obesity? *[Please circle choice(s), can select more than one]*

- | | |
|------------------------|---|
| A. High blood pressure | G. Depression |
| B. Diabetes | H. Weak bones |
| C. High cholesterol | I. Teeth/ Dental problems |
| D. Heart Disease | J. Skin problems (eg. sensitive skin, acne) |
| E. Stroke | L. Asthma |
| F. Cancer | M. Kidney disease |

3. Have you come across the following methods for the management of weight problems?

- | | | | |
|-------------------------|--------|---------------------|--------|
| A. Diet | Yes/No | D. Slimming Centres | Yes/No |
| B. Exercise | Yes/No | E. Western Medicine | Yes/No |
| C. Traditional Medicine | Yes/No | F. Surgery | Yes/No |

4. Do you think you are overweight? Yes/No

A. If Yes, what do you feel is your ideal weight? _____ kg

5. Have you done anything to reduce your weight? Yes/No

A. If Yes, what have you tried?

- | | | | |
|---|--------|----------------------|--------|
| i. Diet | Yes/No | iv. Slimming Centres | Yes/No |
| ii. Exercise | Yes/No | v. Western Medicine | Yes/No |
| iii. Traditional Medicine (Includes
massage therapy/acupuncture) | Yes/No | vi. Surgery | Yes/No |

B. If No, why not?

- | | | | |
|---|--------|--|--------|
| i. Do not feel the need to do anything. | Yes/No | iii. No money. | Yes/No |
| ii. No time or energy. | Yes/No | iv. Do not know where to go/
options. | Yes/No |

6. If you have answered Yes to Qn 5, were you successful in losing weight? Yes/No

A. If Yes, how much weight did you lose? _____

B. If No, why not?

- i. Could not keep to dietary restraints
- ii. No time or energy to exercise
- iii. No money to continue with slimming program
- iv. Side effects of medications

7. If you had a choice of options for management of weight problems, which of the options in Question 5A would you choose, and why? _____

8. Do you think that surgery for obesity is a medical procedure or a cosmetic procedure?

Medical/Cosmetic/Not Sure

9. Which of the following options would you choose for reduction of weight/management of obesity?

[Rank in order of preference (1 to 6)]

- | | | | |
|-----------------------|-------|--|-------|
| A. Diet | _____ | E. Traditional Methods (Spa,
Massage, Traditional Medicine,
Acupuncture) | _____ |
| B. Exercise | _____ | F. Slimming Centres | _____ |
| C. Medicine (Western) | _____ | | |
| D. Surgery | _____ | | |

10. What would influence your choices of surgery? *[Rank in order of importance (1 to 8)]*

- | | | | |
|-------------------------------|-------|------------------------------|-------|
| A. Safety | _____ | E. Cost | _____ |
| B. Degree of weight loss | _____ | F. Ease of procedure | _____ |
| C. Reversibility of procedure | _____ | G. Persistence of effect | _____ |
| D. Risks of operation | _____ | H. Side effects of procedure | _____ |