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Bodyweight status misperception among reproductive-aged women in primary care settings

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Abstract

Introduction: It is common, and many international and local studies confirm this, that women of reproductive age misperceive their body-weight status. This phenomenon can lead to their being less likely to adopt a healthy lifestyle which later exposes them to increased health problems and risks including those of a gynecological and obstetric nature. Generally, there have been inconsistent findings concerning the association between the self-perceived weight status and sociodemographic factors, physical activities, and previous weight loss attempts of women of reproductive age in an Asian population like Malaysia.

Objective: This study aimed to determine the factors associated with body weight status misperception among reproductive-aged women at a primary care setting in Malaysia.

Methods: This is a cross-sectional study conducted at Klinik Kesihatan Durian Tunggal in 2016-2017. The questionnaire included questions on the perception of weight status, sociodemographic factors, smoking status, level of physical activity, and weight loss attempts. Logistic regressions were used for statistical analysis to examine the association between body weight status misperception and related factors.

Results: The study recruited 630 reproductive-aged women. The mean age and SD of the respondents was 32.7 + 8.9 years, and 84% of the respondents were Malays. More than three-quarters of the respondents (75.5%, n = 476) had received up to a secondary level of education. The majority of the respondents were in the overweight/obese group (59.4%, n = 374). The mean BMI of the respondents was 27.1 kg/m2 + 6.61. Approximately 65.4% (n = 412) of the respondents had an inactive lifestyle. However, 60% (n = 378) of the respondents reported that they had attempted to reduce their weight in the last year. A total of 141 respondents (22.4%) misperceived their weight status with 113 (80.1%) of them underestimating their weight status. Women with primary-level education (OR: 3.545, 95% CI: 1.530-8.215, p = 0.003) and secondary-level education (OR: 1.933, 95% CI: 1.065-3.510, p = 0.030) had a greater likelihood of misperceiving their body weight status as compared to those who have a tertiary level of education. Women with no weight loss attempts were also at risk of body weight status misperception (OR: 1.850, 95% CI: 1.195, 2.865, p = 0.006).

Conclusion: Bodyweight status misperception among reproductive-aged women was associated with a low level of education and with those who had made no weight loss attempts. Identifying women who are at risk of misperceiving their weight status would enable early counseling on weight management.

Background

The global prevalence of obesity is increasing.[1] In Malaysia, the obesity prevalence had an increase of 280% in fewer than ten years and the trend is expected to continue rising over time.[1] The National Health and Morbidity Survey in 2011 on the prevalence of overweight and obesity among adult Malaysians reported that the overall prevalence of overweight and obesity were 33.6% and 19.5% respectively, with more females being obese than males.[2] Besides the rising prevalence of overweight and obesity, Asian women are underweight in a larger proportion comparing with other countries. In Asian countries, the underweight prevalence is particularly high. For Thailand, this is a rate of 19.2%,[3] for Malaysia 9.6%,[3] and for Vietnam 20.9%.[4] When compared to populations of other ethnicities, pre-gravid low maternal weight was more common in women of Asian (8.6%) and Hispanic (4.3%) ethnicity compared to Caucasian (2.5%) or African American (1.9%)[5] women. Both underweight, as well as overweight, coexist in all countries and many developing countries face the dual challenge of continuing underweight populations and an expanding overweight population.[6]

Women who were overweight or obese before their first pregnancy have a propensity to maintain their weight or gain more weight after pregnancy than those of a normal weight.[7] Maternal obesity is thus a natural extension of obesity in the general population. Such body habitus has its complications. It may interrupt the menstrual cycle, which can lead to low potential to become pregnant and, should such women become pregnant, their overweight or obese status could lead to a complicated or problematic gestation. Obesity can alter oocytes and embryo quality,[8] increase the risk of gestational diabetes mellitus (GDM),[9] increase the risk of post-date delivery,[10] and increase the rate of miscarriage.[11]

On the other hand, being underweight may also produce risks for reproductive-aged women as adequate pre-pregnancy weight and weight gain during pregnancy have been associated with better maternal and neonatal outcomes.[12] Ehrenberg et al. reported that women with pre-gravid low maternal weight were at greater risk of intrauterine growth retardation (IUGR), maternal delivery complications, prematurity, and low birth weight babies.[5]

A study in Australia found that overweight and obese people were unconcerned about their excessive weight,[13] or that they did not recognize themselves as being overweight.[14] Similarly, a Malaysian study found that over one-fifth of the study's obese subjects (21.7%) viewed themselves as being a normal weight and thus had no intention of reducing their weight.[15] Misperception of body weight status might impede a person's adoption of beneficial weight-related attitudes and [16]behaviors,[17] and would eventually lead to unhealthy weight-loss behaviors and a lack of desire to lose weight or to do more physical activity.[18]

As reported in the literature, cultural and community perceptions and tolerance may play a role in the perception of body image.[19] However, most studies on women's body weight perception were conducted in Western countries or among adolescent age groups. Less is known about the association of self-perceived weight status with sociodemographic factors, physical activities, and weight loss attempts of women of reproductive age in an Asian population such as that of Malaysia. Hence, determining the degree of misperception of body weight is crucial especially in women within the reproductive-age group. Factors that are associated with or related to body weight misperception may also play a major role in planning or delivering efforts related to weight control action plans and strategies, especially among reproductive-age women. The objective of this study, therefore, was to determine body weight perception and its associated factors among reproductive-age women in a primary care setting in Malaysia.

Methods

This cross-sectional study carried out at Klinik Kesihatan Durian Tunggal, a suburban health clinic in Melaka, Malaysia was conducted between 1 December 2017 and 28 February 2018. A total of 630 participants were included in the study. The sample size was calculated with a 95% confidence interval and a 5% margin of error using the estimation between two proportions formula.[20] A study done by Shagar et al.[21] determined the factors which are significantly associated with body weight status perception; ethnicity (p = 0.045), and level of self-esteem (p = 0.012). Household income, parent's educational level, weight status, eating habits, and media influence were associated with a similar p-value of less than 0.001. The researcher obtained the largest sample size of 450 concerning ethnicity. This was then was divided by 0.8 (estimated response rate) and further divided by the percentage of eligibility (0.9) to get the final sample size of 630. This took into account of either any subjects with a non-response, incomplete information or refusal to participate or any subjects who did not meet the eligibility criteria for the study. Therefore, the minimum total of respondents required for this study was 630. Those included were women aged between 18 and 49 who are literate in Malay or English. Women with an acute emergency illness that needed urgent management or referral, those with comorbidity conditions that impeded physical activities and those who were pregnant or within the post-partum period were excluded because the measurement of their body weight during pregnancy or in the post-partum period might not be reflective of their actual weight status.

Height and weight measurement

Height and weight measurements were taken from the respondents using calibrated equipment (A Seca body meter scale for the height and a calibrated digital measuring scale for weight). These were taken twice before the averaged value was taken. Height was recorded in meters (m) and weight in kilograms (kg). During weighing the respondent wore light

clothing without leaning against or holding anything. Shoes, watches, keys, wallets, purses, and belts were not allowed to be worn during the weighing session. The weight was recorded to an accuracy of 0.5 kg. For the height measurement session, respondents were not allowed to wear any footwear. The respondent was required to stand erect with arms at their sides, feet positioned close together, and weight evenly distributed across both feet. The researcher stood on the respondent's right side and her chin was held firmly by the researcher's right hand. The respondent's occiput was aligned with the Frankfurt horizontal plane (an imaginary line joining the tragus of the ear and the eye). The movable sagittal-plane headpiece was put onto the respondent's head until it applied a slight pressure to reduce the thickness of the hair. The reading was measured to the nearest of 0.1cm. Body mass index (BMI) was calculated and recorded to one decimal place. To reduce the bias of weight status perception, the height and weight measurements were taken by the researcher after the respondent completed the questionnaire. The BMI categories were based on the Malaysian Clinical Practice Guideline of Management of Obesity[22]:<18.5 underweight, 18.5-22.9 normal weight, and ≥23.0 overweight/obese.

Questionnaires

A self-administered questionnaire consisting of four parts was used. The first part was a single question on body weight status perception adapted from Lim and Wang.[23] The question asked was "*How do you describe your body weight?*" and the options ranged from "*very underweight,*" "*slightly underweight,*" "*about the right weight,*" "*slightly overweight,*" to "*very overweight.*" The second part concerned the participant's socio-demographic profile including age, ethnicity, level of education, employment status, and household income as well as smoking status. The third part, related to weight loss attempts, was adapted from Wardle et al. that asked "*Are you trying to lose weight within this one year?*" with a possible "*Yes/No*" response.[24] This question included a self-reporting of any method (recommended or unhealthy) that was being used or had been used to lose weight in the preceding year. The last part of the questionnaire was the International Physical Activities Questionnaire – Short Form (IPAQ-SF) developed by the Centres for Disease Control and Prevention (CDC) in collaboration with 14 countries. The IPAQ-SF consists of 7 items with acceptable measurement

properties for use in many settings and with different languages.[25-29] Both the long-form and short forms have acceptable measurement properties for use in many settings and with different languages.[25-29] Although the IPAQ-Malay version short-form validation studies were not available, the IPAQ-Malay version (IPAS-M) long-form was developed and tested for reliability and validity by Chu & Moy in a study involving eighty-one Malay adults.+ Intra-class correlation coefficients (ICC) revealed moderate to good correlations (ICC = 0.54-0.92; $p< 0.001$) on items categorized by intensities and domains and a kappa (κ) of 0.73 for total activity. The study suggested that IPAQ-M demonstrated good reliability and validity for the evaluation of physical activity. For IPAQ scoring, there are three categories of physical activity: Level 1 for inactive, Level 2 for minimally active, and Level 3 for highly active. From the proposed categories, respondents who performed at levels 2 and 3 were considered to have adequate and good physical activity levels. For this study, the IPAQ-SF was set in dual languages, English and Bahasa Malaysia to enable respondents to have a better understanding of the questions.

Bodyweight status misperception

Misperception of body weight status in this study is defined as the subject's perception of her body weight status that is discordant with her actual BMI, as measured by the researcher during the study period. Either underestimation or overestimation of by a patient of their weight status will be considered misperception of body weight status. Respondents whose weight status perception was below their actual BMI would be considered as underestimating weight status and a respondent whose weight status perception was above her actual BMI would be considered as overestimating weight status.

Recruitment of participants took place between 1 December 2017 and 28 February 2017 using universal sampling by identifying potential respondents from the patient list in the outpatient clinic's registration book during the data-collection period. Written consent was obtained from the participants. The participants were given a set of questionnaires to answer and return on the same day. All questions other than the IPAQ-SF were self-administered. After completion of the questionnaire, the height and weight measurements were taken by the researcher followed by a face-to-face interview by the researcher for the IPAQ component.

Brief counseling was given to those with body-weight misperception regarding the importance of recognizing their weight status and of adopting a healthier lifestyle. The researcher also checked the completeness of the questionnaires and clarified missing or incomplete responses with the participants.

Data were analysed using the IBM Statistical Package for the Social Sciences (SPSS) version 22.0. The level of confidence (α) was set at 0.05 with a CI of 95%. A *p*-value of less than 0.05 was considered statistically significant. The study participant's characteristics were noted using descriptive analysis. A chi-squared test was used to determine any association between the independent and the dependent variables, and to measure the strength of any existing associations using the Phi coefficient or Cramer's V values. The dependent variable for this study was having or not having body-weight status misperception. The independent variables were: (i) age, (ii) ethnicity, (iii) level of education, (iv) employment status (v) household income, (vi) BMI status, (vii) smoking status, (viii) level of physical activity, and (xi) weight-loss attempts. A test for multicollinearity among the independent variables was performed before conducting a simple logistic regression (SLR). For univariate analysis, and because the dependent variable was dichotomous, the association of the factors with bodyweight misperception was conducted one by one using SLR analysis. Subsequently, variables with a p-value of less than 0.3 from the simple logistic regression analysis, as well as clinically significant variables were included in the multiple logistic regression (MLR) analysis for further analysis. The p-value was set larger than the level of significance to allow for more important variables to be included in the model.[30] Furthermore, Bendel & Afifi and Mickey & Greenland reported that the traditional p level of less than 0.05 could fail to identify variables known to be important.[31-32] The model, on the other hand, did fulfill the goodness-of-fit model using the Hosmer–Lemeshow test.

This study was approved by the Ethics Committee of the Universiti Putra Malaysia (JKEUPM Ref. No.: FPSK (EXP16) P072) and the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia (NMRR-16-728-29762). Permission from Jabatan Kesihatan Negeri Melaka and the Medical Officer and Health of Alor Gajah Health District Office was obtained.

Results

A total of 660 women were approached for the study but only 635 gave consent to participate. Five of these were excluded because of incomplete questionnaire, thus leaving a total of 630 respondents for inclusion in the study. The response rate was 95%.

Table 1. Demographic profiles and Lifestyle characteristics of respondents.

Demographic Variables and Lifestyle factors	N = 630	
	n	%
Age		
18–29 years old	256	40.6
30–49 years old	374	59.4
Ethnicity		
Malay	529	84
Chinese	38	6
Indian	58	9.2
Other	5	0.8
Religion		
Muslim	533	84.6
Buddhist	35	5.6
Christian	8	1.3
Hindu	53	8.4
Other	1	0.2
Education		
Never been to school	5	0.8
Primary school	42	6.7
Secondary school	351	55.7
Diploma	125	19.8
Degree	93	14.8
Masters	13	2.1
PhD	1	0.2
Occupation		
Unemployed	205	32.5
Employed	425	67.5
Income		
RM 0–2000	194	30.8
RM 2001–5000	310	49.2
RM 5001–10,000	113	17.9
Above RM 10,000	13	2.1
BMI status (kg/m²)		
<18.5	80	12.7
18.5 – 22.9	176	27.9
>22.9	374	59.4
Smoking status		
No	620	98.4
Yes	10	1.6
Level of physical activity		
Inactive	412	65.4
Minimally active	160	25.4
Highly active	58	9.2
Weight-loss attempts		
Yes	378	60
No	252	40

In this study, the mean age and SD were 32.7 and ±8.9 years, with a range in age from 18 to 49 years, and 84% of the respondents were Malay. In terms of the level of education, more than three-quarters of the respondents (75.5%, n = 476) received up to a secondary level of education, while 67.5% (n= 425) were employed part-time or were involved in the private sector or served as government workers. Concerning household income, almost half of the respondents had income between RM 2,001–5,000 (49.2%, n = 310). A majority of the respondents were in the overweight/obese group (59.4%, n = 374) followed in lower numbers by those of normal weight (27.9%, n = 176) and those who were underweight (12.7%, n = 80). The mean BMI of the respondents was 27.1 kg/m2 ± 6.61.

Concerning lifestyle factors, 98.4% (n = 620) of the respondents did not smoke while approximately 65.4% (n = 412) of the respondents had an inactive lifestyle (based on the duration and metabolic equivalent (MET) of physical activity undertaken. However, 60% (n = 378) of the respondents reported that they had attempted to reduce their weight in the last year.

Table 2. Weight-loss attempts according to weight status.

Weight status	Weight loss attempts (N = 630)	
	No (n = 252)	Yes (n = 378)
Underweight	48 (96.0%)	2 (4.0%)
Normal weight	93 (69.9%)	40 (30.1%)
Overweight	111 (24.8%)	336 (75.2%)

As shown in Table 2, more than three quarters (75.2%) of overweight or obese respondents attempted to lose weight in the year preceding the study while only four percent of respondents who were underweight had attempted to lose weight. A third of normal weight respondents had also attempted to lose weight.

Table 3. Weight-loss attempts according to weight status.

Items	N = 630	
	n	%
Respondent's perception		
Underweight	80	12.7
About the right weight	176	27.9
Overweight	374	59.4
Estimation (N=141)		
Underestimate	113	80.1
Overestimate	28	19.9
Weight status perception		
Correct perception	489	77.6
Misperception	141	22.4

Table 3 set out the descriptive analysis of body-weight status perception. The results of the study showed that 77.6% of the respondents had an accurate perception while 22.4% had a misperception with regards to their body-weight status. The majority (59.4%) of the respondent perceived that they belonged in the overweight/obese category. More than 80% of the respondents underestimated their weight status.

Table 4. Simple logistic regression of factors associated with bodyweight misperception among reproductive-age women.

Factors	Correct perception n=489 (%)	Misperception n=141 (%)	χ^2	Crude OR	95% CI		p-value
					Lower	Upper	
Age (years)			0.41				
18–29 #	202 (78.9)	54 (21.1)		1			0.520
30–49	287 (76.7)	87 (23.3)		1.13	0.77	1.67	

Ethnicity			0.01				
Malay #	411 (77.7)	118 (22.3)		1			0.918
Non-Malay	78 (77.2)	23 (22.8)		1.03	0.62	1.71	
Level of education			7.75				
Tertiary #	90 (85.7)	15 (14.3)		1			0.020
Secondary	368 (77.0)	110 (23.0)		1.79	1.00	3.22	
Primary	31 (66.0)	16 (34.0)		3.10	1.37	6.99	
Employment status			0.41				
Employed #	333 (78.4)	92 (21.6)		1			0.526
Unemployed	156 (76.1)	49 (23.9)		1.14	0.77	1.69	
Household income			2.22				
≤ RM2000 #	145 (74.7)	49 (25.3)		1			0.538
RM 2001-5000	244 (78.7)	66 (21.3)		0.80	0.52	1.22	
RM5001-10000	91 (80.5)	22 (19.5)		0.72	0.41	1.26	
> RM10000	9 (69.2)	4 (30.8)		1.32	0.39	4.46	
Smoking status			0.90				
No #	480 (77.4)	140 (22.6)		1			0.300
Yes	9 (90.0)	1 (10.0)		0.38	0.050	3.03	
BMI status			1.97				
Underweight #	40 (80.0)	10 (20.0)		1			0.021
Normal weight	91 (68.4)	42 (31.6)		1.85	0.84	4.04	
Overweight	358 (80.1)	89 (19.9)		0.99	0.48	2.07	
Physical activity			3.04				
Highly active #	45 (77.6)	13 (22.4)		1			0.206
Minimally active	132 (82.5)	28 (17.5)		0.73	0.35	1.54	
Inactive	312 (75.7)	100 (24.3)		1.11	0.58	2.14	
Weight-loss attempts			11.79				
Yes #	311 (82.3)	67 (17.7)		1			0.001
No	178 (70.6)	74 (29.4)		1.93	1.32	2.82	

# Reference group
OR = Odds Ratio
CI = Confidence Interval

Univariate analysis was conducted to assess the presence of an association and to identify factors associated with body-weight status misperception among reproductive-age women as set out in Table 4. From Simple logistic regression (SLR) analysis, out of all the factors, only three were noted to have a significant association with body weight misperception; the level of education (p = 0.020), BMI status (p = 0.021) as well as weight loss attempts (p = 0.001).

Women who had a lower education level were at risk of body weight misperception. Women who had only primary education had approximately three times likelihood of having body weight misperception (crude OR: 3.10, 95% CI: 1.37–6.99) while women who received secondary education had no significant difference of having body weight misperception (crude OR: 1.79, 95% CI: 1.00–3.22) compared those who had tertiary education. When it comes to BMI status, women who were normal weight have almost twice the likelihood of misperceiving their body weight compared to underweight women (crude OR: 1.85, 95% CI: 0.84 – 4.04, p = 0.021). Similarly, women who had never attempted to lose weight for the last year had an approximately doubled risk of having body weight misperception compared to the counterpart (crude OR: 1.93, 95% CI: 1.32–2.82, p = 0.001). There was no significant difference with regards to age, ethnicity, employment status, household income, smoking status, and physical activity between correct perception and misperception of body weight among reproductive-age women (p > 0.05). However, all the significant factors had a weak effect on body weight misperception as showed by the Phi and Cramer's V values of less than 0.3.

Since only a few factors showed an association with body weight misperception, the researcher decided to select factors that have p < 0.3 to be put into the subsequent multiple logistic regression (MLR). The p-value was set larger to allow for more important variables to be included in the model30 since the value of less than 0.05 could potentially miss in recognizing variables known to be important.31-32 So, the factors that were analysed in MLR were level of education (p = 0.02), smoking status (p = 0.300), BMI status (p = 0.021), physical activity (p = 0.206) and weight loss attempts (p = 0.001).

Table 5. Multiple logistic regression of the associated factors of body weight misperception among reproductive-age women

Factors	B	SE	*p*-value	Adjusted OR	95% CI	
					Lower	Upper
Level of education						
Tertiary #				1		
Secondary	0.659	0.304	0.030	1.93	1.07	3.31
Primary	1.266	0.429	0.003	3.55	1.53	8.22
Smoking status						
No #	-			1		
Yes	1.076	1.089	0.323	0.34	0.40	2.89
BMI status						
Underweight #				1		
Normal weight	0.754	0.407	0.064	2.13	0.96	4.73
Overweight	0.366	0.406	0.368	1.44	0.65	3.19
Physical activity						
Highly active #	-			1		
Minimally active	0.286	0.388	0.460	0.75	0.35	1.61
Inactive	0.056	0.348	0.872	1.06	0.54	2.09
Weight-loss attempts						
Yes #				1		
No	0.615	0.223	0.006	1.85	1.20	2.87

p < 0.05 = significant
# Reference group B = Beta coefficient
SE = Standard error
OR = Odds Ratio
CI = Confidence Interval

Table 5 sets out the multivariate analysis using MLR to determine the predictors for bodyweight misperception. The Omnibus Test of Model Coefficients for logistic regression analysis was statistically significant, χ^2 (df: 8, N = 630) = 28.343, p < 0.05, Nagelkerke R^2: 0.067. The model was 77.6% accurate in its prediction of body weight misperception. The Hosmer–Lemeshow test (for goodness-of-fit) showed that the data was a good fit for the model, χ^2 (df: 6, N = 630) = 8.603, p: 0.197. The findings indicated that a lower level of education was a significant predictor of body weight misperception among reproductive-age women. After adjusting the other factors, women with a primary level of education were 3.5 times more likely to misperceive their body weight compared to those with tertiary-level education (adjusted OR: 3.545, 95% CI: 1.530–8.215, p = 0.003) whereas women who received a secondary level of education had a 1.9 time greater likelihood of misperceiving body weight compared to those with tertiary-level education (adjusted OR: 1.93, 95% CI: 1.07–3.31, p = 0.030). Having no weight-loss attempts was amongst the significant predictors of body weight misperception (adjusted OR: 1.85, 95% CI: 1.20–2.87, p = 0.006). Although BMI status showed an association with body weight misperception in SLR analysis, it had lost its significance once all other factors were controlled. Other variables such as smoking status and level of physical activity did not appear significantly to influence the probability of body weight misperception among reproductive-age women.

Discussion

More than one fifth (22.4%) of the respondents in this study had body weight misperception. Among those with weight misperception, more than 80% of the respondents have underestimated their weight status. The multivariate analysis indicated that the level of education played a significant role in determining body weight misperception. Those with lower levels of education had a higher risk of misperceiving body weight. Furthermore, not having attempted weight loss for the preceding year was found to be a significant factor associated with bodyweight misperception.

In this study, most women who misperceived their weight tended to underestimate their weight status. This is consistent with another local study among adults that reported a significantly higher risk of underestimation of weight status among women aged between 25 and 54, which is the age group most similar to that in our study.[33] In other local studies among adolescent and university students, however, most reported a higher likelihood of women overestimating their body weight.[21,34-35] In planning interventions for weight management, therefore, health-care professionals in primary care may need to take into consideration the age group of the women because interventions for underestimation of body-weight status differ from those for overestimation.

From our multivariate analysis, the level of education played a significant role in determining body weight misperception. A lower level of education was associated with a higher risk of having body weight misperception (both under and overestimation). This was a similar finding to those reported in previous studies.[36-37] Their analyses showed women with less education had significantly higher odds of weight status misperception than their more educated counterparts. A local study by Shagar et al. also suggested a similar pattern (OR: 3.73, 95% CI: 1.93 – 7.18).[21] However, that study was looking at the mothers' level of education because its respondents were among university students. Although Shagar et al. were looking at the education level of the mothers of the study respondents, that a home context of a lower level of education could lead to misperception of weight status was reasonably true. On the contrary, a study by Bhanji et al. found no significant association between weight status misperception and education level.[38] These findings were likely contradictory because of the age of the respondents – the respondents in Bhanji et al. study were in a younger age group (18 years and above). Also, the fact that Bhanji et al. only compared overweight and obese participants in Pakistan means their findings are not comparable to those here.

As was expected, not having undertaken weight loss attempts for the preceding one year was found to be a significant factor associated with bodyweight misperception. In our study, reproductive-aged women who had made no attempts to lose weight in that year had almost double the risk (OR: 1.85, 95% CI: 1.195 – 2.865) of having body weight misperception as compared to those who had made such attempts. This finding contradicts the many studies which reported that weight perception could influence weight-loss behavior.[39-42] For instance, a study by Bhurtun & Jeewon reported that the vast majority of respondents (88.5%) who were involved in weight-loss behaviors overestimated their weight status.[42] This means that a vicious cycle could potentially develop since weight-status perception could influence weight-loss behavior and vice versa. The difference in the findings in our study could be due to the difference in the study age group. The study by Lemon at al.[39] included participants from a wide age range (18–65 years old) and other studies[40-42] involved only teenagers and university students. In our study, more than 80% of the respondents have underestimated their weight status compared to the other studies which reported the association of weight loss attempts with weight status overestimation.[39-42] This observation is significant for women of reproductive age in the context of applied clinical settings concerning providing lifestyle consultation. Having no history of weight loss attempts makes these women more likely to under-estimate their weight status, which might preclude them from following a healthy lifestyle.

BMI status was associated with bodyweight misperception according to a study by Dorosty et al.,[36] that reported participants with normal weight/BMI had significantly higher weight misperception (OR: 8.16, 95% CI: 4.82 – 13.82) than their overweight/ obese counterparts.[36] This study, however, only showed an association with BMI status in a univariate analysis and it did not remain significant at the multivariate level. These

incongruent findings may be due to the influence of cultural standards concerning desired body shape as the latter study was conducted among a Western population rather than an Asian population as was the case here.[19,43] This study population also had the lowest percentage of those identifying as belonging to a Chinese ethnic group and the majority were Malay. This may be another explanation for the insignificant association of BMI with a misperception of body-weight status as, according to national health and morbidity surveys, Malays and Indians have a higher rate of obesity.[44] Again, the influence of cultural standards concerning desired body shape among these ethnic groups may have contributed to the difference.

With regards to the practice of a healthy lifestyle by the study participants, the number of inactive respondents exceeded the number of respondents who attempted weight loss. This may be because the respondents who attempted to lose weight may not have practiced an active lifestyle despite trying to lose weight. A local study by Kuan et al. revealed that some females reported practicing self-induced vomiting and taking laxatives as their method of weight reduction, which are not medically recommended.[35] However, we should not assume that this method was practiced by the respondents in this study since that aspect was not explored. Women tend to be less active than men and the prevalence of physical activity among women was low.[45-48] Results here indicate a similar pattern with 65.4% of respondents not meeting the international recommendations for physical activity. Furthermore, there was no significant association in this study between body-weight status misperception and level of physical activity. This finding did not correlate with the results of the study by Miller et al. which suggested that a sedentary lifestyle was a significant predicting factor among underweight women for overestimating their weight status (OR: 1.63, 95% CI: 1.03–2.57) but a protective factor for the overweight group from underestimating their weight (OR: 0.58, 95% CI: 0.45–0.73).[49] Again, this difference could be explained by the variable of the respondents' social and cultural backgrounds.

This study has highlighted the clinical-practice implications in primary care for screening and weight management of reproductive-age women. More women at reproductive age underestimate their body weight status. Also, those with a low level of education and those who had no weight loss attempts have a high risk of body weight misperception. In routine clinical practice, and especially, in maternal and child health clinics, primary healthcare providers may, therefore, need to identify and screen reproductive-aged women who are at risk of misperceiving their weight status and counsel these women on weight management. This will eventually reduce the risk of developing obesity-related consequences such as diabetes and hypertension among women of reproductive age either at their current stage or in later life.

One of the strengths of this study is that it is one of a few studies conducted among reproductive-age women concerning factors associated with body weight status misperception and can thus serve as baseline information on weight-status misperception among women in this age group in Malaysia. Furthermore, this study had a relatively large sample size and to avoid error or bias, used measured, rather than self-reported, height, and weight for BMI calculation.

There are few limitations noted in this study. Since this is a cross-sectional study, the data could not be used to analyse behavior over a period and the findings could not help the researcher to determine the true cause and effect of misperception. Also, universal sampling and the timing of the data collection was not guaranteed to be representative of the population. Due to the small sample of participants who overestimated their weight status we were unable to analyze the misperception of weight separately for those underestimating and those overestimating their weight status. Interventions might be different for these two groups of participants. Lastly, a third of normal-weight respondents had attempted to lose weight. This could be because this group of participants might have managed to lose weight during the preceding year and were, at the time of the study, in the normal-weight category. We did not, however, explore this information further as the question on weight loss attempt was just one question and trying to elicit any attempt to lose weight. We did not collect data on the method and duration of weight-loss attempts and or of prior weight before such attempts.

Conclusion

The proportion of weight misperception among women of reproductive age was 22.4%. A low level of education was a significant predictor of misperception of weight. The lower the level,

the greater risk they had of misperceiving their weight. Other than that, having not attempted weight loss was the other significant risk factor related to the body-weight misperception among reproductive-aged women. This study's data may serve as a resource to identify women in this age group who are at risk of misperceiving their weight status to counsel them in the benefit of adopting healthy living, including recommending being active. In routine clinical practice, primary healthcare providers may need to identify and screen reproductive-aged women who are at risk of misperceiving their weight status and counsel these women on weight management. This will eventually reduce the risk of their developing obesity-related consequences such as diabetes and hypertension whether at their current stage or in later life. Furthermore, future research could examine the relationship between bodyweight misperception and other important aspects such as psychological factors and eating habits.

How does this paper make a difference to general practice?

- Bodyweight status misperception among reproductive-aged women was associated with a low level of education and with those who had made no weight-loss attempts.
- Primary healthcare providers may be able to make use of these findings to identify reproductive-aged women who are at risk of misperceiving their weight status and counsel these women on weight management.

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