

Prevalence of Weight-Based Stigmatization in a Multi-ethnic Asian Population – A Cross-Sectional Study

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Abstract

Aim:

Weight-based stigmatization is prevalent. They have been reported in schools, work and healthcare settings. However, almost all the literature on such weight-based stereotypes were from Western countries. The study aims to evaluate the prevalence of weight-based stigmatization in an Asian population.

Methods:

An anonymized questionnaire-based cross-sectional study was conducted. Respondents were asked about their socioeconomic status, followed by questions on perceived weight-based stigmatization across 4 domains (self, social, healthcare, work and education). A subsequent subgroup analysis was performed to evaluate the impact of different obesity classes on perceived stigmatization across these domains.

Results:

A total of 101 respondents replied. Respondents with higher BMI were middle-aged ($p = 0.040$), Malays ($p = 0.018$), low-income ($p = 0.041$) and had lower educational qualifications ($p = 0.038$). Total prevalence of perceived weight-based stigmatization was 65.6%. Class III obesity respondents were more stigmatized at work (Prevalence Rate Ratio (PRR) 5.73, 95% Confidence Interval (CI): 1.16–28.47), and resort to increased consumption of unhealthy food or partake in lesser exercise due to stigma (PRR 24.94, 95% CI: 3.61-172.41).

Conclusion:

Obesity stigmatization is equally prevalent in Asian societies. Individuals with higher BMI were more likely to report perceived stigmatization in the workplace, as well as maladaptive dietary and exercise behaviours in response to stigmatization, regardless of socioeconomic status.

Introduction

Obesity-related stigmas are ubiquitous. In the United States, it is the third leading cause of perceived discrimination [1]. Unlike gender, age or race based prejudice, where there are laws in place to protect vulnerable persons, weight-based stigmatization lacks any form of such legal sanctions [2]. Such perceived stigmatization is prevalent and well documented in Western societies [3], often pervasive in many different aspects, including at the workplace, in schools and even in healthcare settings [4]. In Asia, weight-based stereotypes are rife in the media. This includes advertisements of slimming pills and comparative photos of individuals before and after weight loss sessions [5], with a certain desirability being attributed to the thin physique especially for women [6]. Such obesity-related stigmas could lead to mood and anxiety disorders [7], substance abuse [7], worsen atherosclerotic disease [7], and are even associated with mortality [8]. With the increasing prevalence of obesity in Asia [9], the burden and consequences of such obesity-related stigmas and are expected to increase with time. Yet, in contrast to Western societies, literature documenting the prevalence of such obesity-related stigmas in Asia is sparse.

Thus, this study aims to evaluate the prevalence of weight-based stigmatization perceived by individuals in a multi-ethnic Asian society and investigate their differences amongst social and demographic subgroups.

Subject, Materials And Methods

Between 1st October 2019 to 31st October 2020, an anonymized survey was administered to all consecutive patients presenting to a multidisciplinary weight management clinic in an academic medical institution and district general hospital. The multidisciplinary weight management clinic comprised of specialist physicians and endocrinologists with a special interest in diabetes and obesity management, specialist upper gastrointestinal and bariatric surgeons, allied health professionals including physiotherapists, dieticians and clinical psychologists with special interest and training in weight management, together with specialist nurses. The survey results were subsequently retrospectively analysed in a cross-sectional study. The questionnaire was self-administered in English and was based on an online survey administered by the United Kingdom All-Party Parliamentary Group on Obesity in 2018 [10]. Informed consent was obtained from all respondents before administering the questionnaire, and all responses were anonymized with no identifying information collected.

The survey was comprised of 2 components. The first section consisted of responder reported social and demographic parameters, such as age, body mass index (BMI), education qualifications and average monthly income. The second section of the survey consisted of responder perceived stigmatization. Questions were structured to evaluate 4 different domains, namely self, social, healthcare and workplace or educational environments. A sample of the questionnaire is attached in Appendix A.

Income level was stratified into low-, middle- and high-income earners, based on the government statistics provided by the Ministry of Manpower, Singapore in 2020 [11]. The 20th and 50th percentile of monthly income of full-time employed residents in Singapore in 2020 was \$2340 and \$4534 Singapore dollars respectively, thus a monthly income of <\$3000 Singapore dollars was taken as the cut-off for low-income (20th percentile), while respondents earning between \$3000–8000 were taken as middle-income earners. Responders earning >\$8000 per month were considered high-income earners.

Statistical analyses were conducted via SPSS 26.0 (SPSS, Inc., Chicago, IL). Continuous variables were represented by their medians with its interquartile range, while categorical variables were represented by n (%). A univariate analysis was performed amongst categorical variables using an analysis of variance (ANOVA) test. As weight categories and socioeconomic status are often interlinked [12, 13], to minimise selection bias, a propensity score was estimated by incorporating baseline parameters that were potentially significant ($p < 0.10$). A subsequent subgroup analysis was performed to evaluate the differences in perceived stigmatization amongst respondents with obesity. This was performed by segregating respondents into class I, class II and class III obesity, in accordance with the World Health Organisation recommendations but modified to the interventional thresholds recommended for Asian populations [14], which is in accordance with the Singaporean Health Promotion Board guidelines [15]. A multinomial logistical regression was then conducted, incorporating the propensity score as a continuous covariate, to evaluate the differences in perceived stigmatization across different obesity categories. This was then presented as their prevalence rate ratios (PRR), with their 95% confidence intervals (CI). Missing data was handled via complete case analysis.

Results:

Study Cohort

During the study period, a total of 101 respondents completed the anonymized survey. The median age of the respondents was 39 years old (interquartile range: 31.25–48.75 years old), and the median BMI was 39.34 kg/m² (interquartile range: 34.31–46.30). Table 1 summarised the social and demographic parameters of the study population. Majority of the study population were middle-aged adults from the 31–40 years old (34%) and the 41–50 years old (23%) age group, with a slight female predominance (56.4%). Given that the study was administered to patients attending a multidisciplinary weight management clinic, majority of individuals have either class II (27%) or class III obesity (46%). The highest educational qualification attained was post-secondary (non-tertiary) qualification (44.6%), and majority of respondents were in the low-income group (64.4%). Majority of respondents were working individuals, with 10 respondents being unemployed or retired (9.9%), and an additional 3 respondents who are homemakers (3.0%). There were no differences between various job industries on income level ($p = 0.843$).

Table 1
Social and Demographic Data of the Study Population (n = 101)

	n (%)
Social and Demographic Parameters	
Age (years)	21 (21.0)
21–30	34 (34.0)
31–40	23 (23.0)
41–50	14 (14.0)
51–60	8 (8.0)
> 60	
Gender	44 (43.6)
Male	57 (56.4)
Female	
Ethnicity	48 (47.5)
Chinese	34 (33.7)
Malay	15 (14.9)
Indian	4 (4.0)
Others	
BMI (kg/m ²)	3 (3.0)
23 to 27.4 (overweight)	24 (24.0)
27.5 to 34.9 (class I obesity)	27 (27.0)
35 to 39.9 (class II obesity)	46 (46.0)
≥ 40 (class III obesity)	
Highest educational qualification	11 (10.9)
Primary school	18 (17.8)
Secondary school	45 (44.6)
Post-secondary (non-tertiary) ¹	15 (14.9)
Tertiary or undergraduate degree	12 (11.9)
Post-graduate	
Average gross monthly income (Singapore dollars)	65 (64.4)
< \$3000	30 (29.7)
Between \$3000 to \$8000	6 (5.9)
> \$8000	
¹ Includes post-secondary education, diplomas and other non-tertiary professional qualifications	

Prevalence of Perceived Stigma in the Study Cohort

Table 2 summarised the prevalence of perceived stigma experienced by the respondents surveyed. While only just more than half (54.5%) of respondents consider obesity a disease, most respondents surveyed feel that their weight is their own responsibility (76.2%) and blame themselves for their own weight issues (74.3%).

Table 2
Perceived Stigmatization reported by Respodents across 4 Domains (n = 101)

	n (%)
Self-Domain	55 (54.5)
1. Do you consider obesity a disease?	
Yes	46 (45.5)
No/ Unsure	77 (76.2)
2. Do you believe that your weight is solely your own responsibility?	
Yes	24 (23.8)
No/ Unsure	76 (75.2)
3. Do you believe that pressures (out of your control) have affected how you manage your weight?	
Yes	25 (24.8)
No/ Unsure	75 (74.3)
4. Do you blame yourself for your weight issues?	
Yes	26 (25.7)
No	
Social Domain	61 (60.4)
1. Have you ever been stigmatized, criticised, or abused as a direct result of your weight?	
Yes	40 (39.6)
No	40 (65.6)
2. Has this (stigmatization) affected your motivation to gain better health by healthy diet and exercise?	
Yes	21 (34.4)
No	40 (65.6)
3. Has this (stigmatization) led you to consume unhealthy food, over consume food or partake in less exercise?	
Yes	21 (34.4)
No	53 (86.9)
4. Has this (stigmatization) affected your overall confidence level and sense of self-worth?	
Yes	8 (13.1)
No	45 (73.8)
5. Has this (stigmatization) caused you to have low mood or feel depressed?	
Yes	16 (26.2)
No	34 (33.7)
6. Have you ever been blamed by others for your weight issues?	
Yes	67 (66.3)
No	

	n (%)
Healthcare Domain	69 (68.3)
1. Have you discussed being overweight or losing weight with a healthcare provider over the last 5 years?	
Yes	32 (31.7)
No	86 (85.1)
2. Do you feel comfortable discussing about your weight problems at the polyclinic?	
Yes	15 (14.9)
No	21 (21.6)
3. Have you ever felt that you were not treated with dignity and respect by healthcare professionals, or discouraged to discuss about your weight problems?	
Yes	76 (78.4)
No	
Workplace or Education Domain	34 (33.7)
1. Have you ever been bullied at school because of your weight?	
Yes	67 (66.3)
No	28 (27.7)
2. Have you ever missed out on jobs, overlooked for job promotions, or retrenched because of your weight?	
Yes	73 (72.3)
No	

In total, 60.4% of respondents reported that they have felt stigmatized, criticised, or abused as a direct result of their weight. However, only around one-thirds of respondents (33.7%) reported that they have been blamed by others for their weight issues. Amongst respondents who felt stigmatized, the most common consequence was an affected confidence level and sense of self-worth (86.9%).

A sizeable majority of respondents have discussed their weight issues with a healthcare provider over the last 5 years (68.3%), and most respondents are comfortable discussing their weight issues in the primary care setting (85.1%). Most respondents have not felt stigmatized in the healthcare setting, with only 21.6% reporting that they were not treated with dignity and respect by healthcare professionals or were discouraged to discuss their weight problems with them.

In schools, 33.7% of respondents reported to have been bullied due to their weight. In terms of employment, most respondents did not experience any stigmatization because of their weight (72.3%).

Social and Demographic Differences across Weight Categories

In total, 100 respondents provided information for both their height and weight to allow calculation of their BMI. One respondent did not provide their height data and hence was excluded from the analysis. A univariate analysis was then subsequently performed to identify differences between various social and demographic subgroups and their associations with various BMI subgroups (see Table 3). There were significantly more respondents in the middle-aged age groups (31–40, 41–50) who were class II or class III obese ($p = 0.040$). There were a disproportionately larger number of Malays and Indians in the higher BMI categories compared to Chinese respondents ($p = 0.018$). There was a larger proportion of respondents with secondary school and post-secondary school education qualifications that were class III obese compared to university graduates or post-graduates ($p = 0.038$). Most respondents with class III obesity belonged to the low- and middle-income groups ($p = 0.041$). There appeared to be a larger proportion of females who were class II and class III obese, though it did not reach statistical significance ($p = 0.065$).

Table 3
Univariate Analysis of Social and Demographic Parameters amongst Different Weight Categories (n = 100)

	BMI (kg/m ²)				p-value
	23 to 27.4 (Overweight)	27.5 to 34.9 (Class I obesity)	35 to 39.9 (Class II obesity)	≥ 40 (Class III obesity)	
Age (years)	1 (4.8%)	8 (38.1%)	2 (9.5%)	10 (47.6%)	0.040*
21–30	0 (0.0%)	6 (17.6%)	7 (20.6%)	21 (61.8%)	
31–40	0 (0.0%)	2 (8.7%)	10 (43.5%)	11 (47.8%)	
41–50	0 (0.0%)	4 (30.8%)	6 (46.2%)	3 (23.1%)	
51–60	2 (25.0%)	4 (50.0%)	1 (12.5%)	1 (12.5%)	
> 60					
Gender	3 (7.0%)	13 (30.2%)	8 (18.6%)	19 (44.2%)	0.065
Male	0 (0.0%)	11 (19.3%)	19 (33.3%)	27 (47.4%)	
Female					
Ethnicity	1 (2.1%)	19 (39.6%)	15 (31.3%)	13 (27.1%)	0.018*
Chinese	1 (3.0%)	2 (6.1%)	7 (21.2%)	23 (69.7%)	
Malay	0 (0.0%)	3 (20.0%)	3 (20.0%)	9 (60.0%)	
Indian	1 (25.0%)	0 (0.0%)	2 (50.0%)	1 (25.0%)	
Others					
Education	0 (0.0%)	1 (9.1%)	5 (45.5%)	5 (45.5%)	0.038*
Primary school	0 (0.0%)	3 (17.6%)	4 (23.5%)	10 (58.8%)	
Secondary school	1 (2.2%)	11 (24.4%)	8 (17.8%)	25 (55.6%)	
Post-secondary	1 (6.7%)	3 (20.0%)	7 (46.7%)	4 (26.7%)	
Tertiary	1 (8.3%)	6 (50.0%)	3 (25.0%)	2 (16.7%)	
Post-graduate					
Monthly income	1 (1.6%)	11 (17.2%)	18 (28.1%)	34 (53.1%)	0.041*
< \$3000	1 (3.3%)	11 (36.7%)	6 (20.0%)	12 (40.0%)	
\$3000-\$8000	1 (16.7%)	2 (33.3%)	3 (50.0%)	0 (0.0%)	
> \$8000					

Income level was noted to be significantly correlated with educational qualifications ($p < 0.001$). In the low-income group, most respondents had only attained either post-secondary school (50.8%, 33/65) or secondary school qualification (21.5%, 14/65). In the middle-income group, the educational qualifications attained by respondents were more distributed amongst post-secondary (36.7%, 11/30), tertiary education (30.0%, 9/30) and post-graduate qualification (23.3%, 7/30). In contrast, amongst those in the high-income group, 50% (3/6) of respondents had attained post-graduate qualification.

Prevalence of Perceived Stigma across Different Obesity Categories

A total of 97 respondents were included in the subgroup analysis. Three respondents were overweight, and 1 respondent did not provide his height for the calculation of BMI and were excluded. A summary of the subgroup analysis was shown in Table 4.

Table 4

Unadjusted and Propensity Score Adjusted Analysis on the Perceived Stigmatization reported by Respondents across Different Weight Categories (n = 97). BMI 27.5 to 34.9 (class I obesity) was taken as the reference category.

	Class I obesity	Class II obesity	Class III obesity	Class II obesity	Class III obesity
	BMI 27.5– 34.9	BMI 35-39.9 (unadjusted)	BMI ≥ 40 (unadjusted)	BMI 35- 39.9 (adjusted)	BMI ≥ 40 (adjusted)
	PRR ¹ (95% CI ²)	PRR ¹ (95% CI ²)	PRR ¹ (95% CI ²)	PRR ¹ (95% CI ²)	PRR ¹ (95% CI ²)
Self-Domain	1				
1. Do you consider obesity a disease?	1	0.79 (0.26– 2.37)	1.10 (0.41– 2.97)	0.84 (0.28– 2.57)	0.92 (0.32– 2.62)
2. Do you believe that your weight is solely your own responsibility?	1	0.25 (0.07– 0.93)*	0.95 (0.26– 3.55)	0.23 (0.06– 0.87)*	0.85 (0.22– 3.33)
3. Do you believe that pressures (out of your control) have affected how you manage your weight?	1	0.34 (0.09– 1.28)	0.82 (0.23– 3.01)		
4. Do you blame yourself for your weight issues?		0.49 (0.15– 1.61)	1.58 (0.48– 5.25)	0.31 (0.08– 1.20)	0.62 (0.16– 2.43)
				0.52 (0.15– 1.79)	1.36 (0.38– 4.89)
Social Domain	1	1.69 (0.55– 5.26)	1.44 (0.53– 3.93)	1.60 (0.51– 5.03)	1.14 (0.40– 3.31)
1. Have you ever been stigmatized, criticised, or abused as a direct result of your weight?	1	0.50 (0.12– 2.14)	2.40 (0.57– 10.05)	0.31 (0.06– 1.56)	4.66 (0.86– 25.38)
2. Has this (stigmatization) affected your motivation to gain better health by healthy diet and exercise?	1	3.54 (0.78– 16.03)	10.80 (2.36– 49.47)*	2.54 (0.48– 13.41)	24.94 (3.61– 172.41)*
3. Has this (stigmatization) led you to consume unhealthy food, over consume food or partake in less exercise?	1	0.64 (0.10– 4.14)	2.46 (0.31– 19.68)	0.95 (0.13– 7.01)	3.23 (0.31– 34.31)
4. Has this (stigmatization) affected your overall confidence level and sense of self-worth?	1	0.38 (0.08– 1.84)	1.44 (0.29– 7.21)	0.46 (0.09– 2.37)	1.48 (0.27– 8.13)
5. Has this (stigmatization) caused you to have low mood or feel depressed?		0.35 (0.09– 1.35)	1.29 (0.46– 3.62)	0.34 (0.08– 1.37)	0.94 (0.31– 2.87)
6. Have you ever been blamed by others for your weight issues?					
Healthcare Domain	1	0.40 (0.11– 1.53)	0.34 (0.10– 1.17)	0.38 (0.10– 1.44)	0.32 (0.09– 1.15)
1. Have you discussed being overweight or losing weight with a healthcare provider over the last 5 years?	1	0.19 (0.02– 1.77)	0.18 (0.02– 1.51)	0.18 (0.02– 1.69)	0.24 (0.03– 2.10)
2. Do you feel comfortable discussing about your weight problems at the polyclinic?	1	0.63 (0.13– 3.13)	2.19 (0.63– 7.59)	0.65 (0.13– 3.27)	1.85 (0.49– 6.91)
3. Have you ever felt that you were not treated with dignity and respect by healthcare professionals, or discouraged to discuss about your weight problems?					
Workplace or Education Domain	1	1.77 (0.53– 5.92)	1.76 (0.59– 5.29)	1.88 (0.55– 6.40)	1.33 (0.41– 4.27)
1. Have you ever been bullied at school because of your weight?	1	3.14 (0.57– 17.35)	7.74 (1.62– 36.91)*	3.34 (0.60– 18.72)	5.73 (1.16– 28.47)*
2. Have you ever missed out on jobs, overlooked for job promotions, or retrenched because of your weight?					
¹ PRR = Prevalence Rate Ratios					
² CI = Confidence Intervals					

In the self-perception domain, on the unadjusted analysis, in contrast to class I obesity respondents, class II obesity respondents were less likely to report that an individual's weight was solely their own responsibility (PRR 0.25, 95% CI: 0.07–0.93, $p = 0.04$). However, this trend was not observed in class III obesity respondents (PRR 0.95, 95% CI: 0.26–3.55, $p = 0.94$). Similarly, this observation was noted in the propensity-score adjusted analysis as well, where class II obesity respondents were less likely to attribute an individual's weight as their own responsibility (PRR 0.23, 95% CI: 0.06–0.87, $p = 0.03$). There were no differences amongst weight categories for other questions within this domain.

In the social domain, there were no differences in the prevalence of stigmatization, criticism, or abuse amongst different weight categories. However, when evaluating the subgroups of patients who responded positively to being stigmatized, criticised, or abused because of their weight, class III obesity patients were more likely to report consuming unhealthy food or partaking in less exercise because of the stigmatization (PRR 10.80, 95% CI: 2.36–49.46, $p < 0.01$). A similar observation of a smaller magnitude was observed in class II obese patients as well (PRR 3.54, 95% CI: 0.78–16.03, $p = 0.10$), though it did not reach statistical significance. After accounting for social and demographic baseline differences, the perceived degree of stigmatization became more pronounced in class III obese patients (PRR 24.94, 95% CI: 3.61–172.41, $p < 0.01$). No other differences were noted amongst weight categories for the remaining questions involving the social domain.

In the healthcare setting, respondents reported no differences in the perceived prevalence of stigmatization across various weight categories, both in the unadjusted and adjusted analysis. A separate subgroup analysis was performed excluding all respondents working in the healthcare and pharmaceutical industry as well (data not shown), and similarly, no reported differences were noted amongst various obesity classes.

In the education and workplace domain, both in the unadjusted and adjusted analysis, there were no differences in perceived prevalence of stigmatization in schools amongst various obesity classes. However, a significantly higher number of respondents with class III obesity reported missing out on jobs, being overlooked for job promotions, or were retrenched as a direct result of their weight on the unadjusted analysis (PRR 7.74, 95% CI: 1.62–36.91, $p = 0.01$). This finding persisted even after adjusting for social and demographic parameters (PRR 5.73, 95% CI: 1.16–28.47, $p = 0.03$). The perceived prevalence of stigmatization appeared to be present amongst respondents with class II obesity as well albeit to a lesser magnitude, both in the unadjusted (PRR 3.14, 95% CI: 0.57–17.35, $p = 0.19$), and adjusted (PRR 3.34, 95% CI: 0.60–18.72, $p = 0.17$) analyses as well, though it did not reach statistical significance.

Discussion:

With increasing incidence obesity in Asia [9] and Singapore [16], the prevalence of obesity-related stigmatization is expected to increase, with psychological and physical ramifications for obese individuals, as well as important public health implications [7]. To our knowledge, this study was the first on the prevalence of perceived social stigma experienced by individuals in an Asian population. The current study reported a 60.4% prevalence of perceived stigmatization, which was remarkably like the 55.6–61.3% reported in Western literature [3], once again confirming the authors suspicion that weight-based discrimination is equally prevalent in Asia as well. Additionally, even though only 33.7% of respondents have been blamed by others for their weight issues, nearly double (60.4%) of respondents have felt stigmatized, criticised, or abused. The authors postulate that this discordance between actual discrimination and perceived stigmatization may reflect an overwhelmingly disproportionate attribution of self-blame or self-perception of stigmatization in respondents with obesity.

The study population represented a sample of patients attending a multidisciplinary weight management clinic in Singapore. Tan and Wong previously reported the results of patients attending a nonsurgical weight management clinic in Singapore [17]. In contrast to the group of patients reported by Tan and Wong in 2014 [17], the current study had a larger proportion of Malays (33.7% vs. 8.6%). The average BMI of patients was also higher in this study (39.3 vs. 35.7). The authors believe such a finding is likely a result of the higher prevalence of obesity in Malays in Singapore [15]. After all, the Malay ethnic group had the highest prevalence of obesity, followed by Indians and then the Chinese, even though Chinese make up the ethnical majority in Singapore [15]. The authors postulate that the increased proportion of Malay ethnical groups in this study, may suggest that there has been an increased access to weight management services by the Malay ethnical groups over the years. However, given that most respondents presenting to the clinic in this study are still Chinese, despite the prevalence of obesity being higher in Malay and Indian ethnical groups, additional public health efforts may still be necessary to raise awareness of obesity and its management options amongst these ethnic subgroups.

The study findings reported significant differences in obesity classes across various socioeconomic groups. Significantly, respondents from the lower income group were more likely to have a higher BMI. This parallels the trends seen in many other developed countries [2, 12]. One of the common explanations was the disparity in food prices, in particularly the decline in prices of calorie-dense foods and increase in prices of fresh produce [2], which leads to preferential spending on more inexpensive and unhealthy foods for those of a lower socioeconomic status [2]. While commonly reported in the West that a lower educational qualification was associated with a higher prevalence of obesity [18, 19],

such a finding was only true to a certain extent, as a significant proportion of respondents with class III obesity had attained at least secondary and post-secondary school education. These less consistent trends appear to be not dissimilar in Asian societies. In Japan and Korea, gender differences appear to account for the disparities in education level and obesity. For males, education level was proportionately related to obesity while the inverse was true for females [20, 21]. In the current study, even after accounting for gender, there were no significant differences in obesity patterns between gender groups (data not shown). The current study parallels that reported by Taiwan, where class III obesity appears to be most prevalent in patients who had received post-primary education and higher, but the prevalence declines again with tertiary education [22]. The exact explanation is uncertain, but it was likely due to the significant correlation between educational qualifications and income level. The authors postulate that a relative degree of poverty may exist amongst the subgroup of patients who have only attained primary school education qualifications, given that almost all of them (90.9%, 10/11) were in the low-income group, hence limiting the quantity of foods purchased and consumed. Hence, this might explain why there were as many class II and III obese respondents in those who attained primary school education, while most of those who have attained secondary or post-secondary school education were class III obese. But, in general, the trends do suggest that respondents with lower educational qualifications may have lower purchasing power, thus limiting their ability to access diet with good nutritional quality, leading to weight gain [23].

On the multivariate analysis, compared to class I obesity respondents, class II obesity respondents were significantly less likely to believe that their weight is their own responsibility, which may reflect a reduced motivation to lose weight. A subgroup analysis revealed that 82.6% (19/24) of class I obesity respondents who believed that weight is their sole responsibility have attempted weight loss, compared with only 58.3% (14/27) of respondents with class II obesity. However, it is precisely this group of respondents that weight loss efforts should be targeted to prevent them from progressing to class III obesity.

In the study, even after accounting for baseline socioeconomic differences, it was noted that respondents with a higher BMI, especially class III obese respondents, were more likely to report an increased consumption of unhealthy foods, overconsumption of food or partaking in less exercise in response to perceived stigma, putting this already at-risk group of respondents at further weight gain and obesity-related complications. This alteration in eating behaviour has been previously described [24, 25], and was postulated to be due to a dopamine-based reward mechanism to diminish the negative impact of such stigmatization [26, 27]. In addition to further weight gain, these maladaptive eating behaviours put obese individuals at increased risk of eating disorders including bulimia, binge eating episodes and overeating [28], as well as mental health conditions such as depression and low self-esteem [28, 29]. Such weight-related prejudice may also worsen body image disturbances [29], resulting in avoidance of exercise for fear of further stigmatization. Ultimately, this results in a triple detriment. The first being their original obesity, second being their maladaptive eating and exercise behaviours which compounds further weight gain, and thirdly the subsequent medical complications associated with further weight gain.

A commonly held misconception globally is that obesity is preventable, attributed to overeating and a sedentary lifestyle [30], often ignoring the significant genetic and epigenetic elements behind its pathogenesis [31]. Against this backdrop, the authors believe cultural differences also play a part in perceived weight-based stigmatization. Ran et al previously suggested that Western cultures value individualism, which tend to be more tolerant of diversity and deviation from societal norms, while many Asian cultures still value Confucianism and collectivist values [32]. Thus, on top of the health ramifications associated with obesity, there could be additional prejudice on obese individuals living in Asia. With conformist societal pressures, these individuals could be more likely viewed as not trying hard enough to lose weight or maintain a healthy lifestyle when compared to their non-obese counterparts. This problem might be further compounded by ideal body weight stereotypes perpetuated by the media since childhood [33]. This may account for the high perceived prevalence of low confidence and sense of self-worth (86.9%), low mood and depression (73.8%), as well as self-guilt (74.3%). Also, though the maladaptive eating behaviours in response to stigmatization were also described in Asian Americans [25], the foods consumed are largely determined culturally. In rice-consuming regions, carbohydrate-rich foods such as rice may be preferentially consumed over Western foods such as oil-rich fried chickens or hamburgers [34]. Also, there appeared to be a higher prevalence of the A1 allele of the D2 dopamine receptor gene (DRD2 A1), which was linked with food addiction, amongst Asian Americans compared to their Caucasian counterparts [35]. The above factors may also serve as barriers to weight loss in Asians, perpetuating weight-based stigmatization.

The study also found significant weight-based stigmatization at the workplace, particularly amongst class III obese individuals, even after accounting for socioeconomic differences. Since the 18th century, stereotypes of obese individuals being “lazy” have been ingrained and perpetuated [36]. In today’s workplace, an obese individual is continued to be perceived as lazy [37], incompetent [38], and were less likely to be hired [39]. Given that employment determines income level, and hence purchasing power, such prejudice may generate an obesity “poverty cycle”. Individuals faced with lower income levels because of workplace discrimination, will resort to the consumption of inexpensive calorie-dense foods, which will worsen weight gain, further fuelling employer stereotypes.

On a separate note, most respondents were comfortable discussing weight issues with their doctors, and that only a small proportion of respondents felt stigmatized by healthcare professionals. This contrasted with the results reported by the UK All-Party Parliamentary Group

on Obesity study, where up to 42% of respondents in that study did not feel comfortable discussing their obesity with their primary physician [40].

The limitations of the study include responder bias, as it was performed on a sample of patients attending obesity follow-up in the hospital. Also, being a survey of respondents presenting to a weight management clinic, the motivation level to lose weight, the awareness of obesity as a disease entity and the physical characteristics of the study population may not be representative of the general populace, hence representing selection bias. Lastly, being a questionnaire, it was prone to recall bias. Yet, even with these limitations, the study findings were still valuable. The authors believe it provides a glimpse into the prevalence of obesity stigmatization in Asia. A subsequent qualitative study should be conducted via focused group interviews to gain a more in-depth understanding into the causes, with a focus on any cultural-specific factors, for such perceived weight-based stigmas amongst individuals with obesity, to spur public education efforts on the pathophysiology and knowledge of obesity as a disease entity.

In conclusion, the study findings suggest that obesity stigmatization remain ubiquitous, and is equally prevalent in Asia. Individuals with a higher BMI were more likely to report perceived workplace stigmatization as well as negative adaptive responses to diet and exercise in response to weight-based discrimination, independent of socioeconomic status.

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Conflict of Interest

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Not applicable as no identifying information was collected.

Consent to participate:

Informed consent was obtained from all respondents before administering the questionnaire

Authors' contributions:

Koy Min CHUE: conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation, writing – original draft, writing – review & editing, visualisation, project administration; **Mang Yik FOO:** methodology, software, formal analysis, investigation, resources, data curation, writing – review & editing, visualisation; **Cheryl Min En CHUA:** methodology, validation, investigation, resources, data curation, writing – review & editing, visualisation, project administration; **Bin Chet TOH:** resources, writing – review & editing, visualisation, project administration; **Lester Wei Lin ONG:** resources, writing – review & editing, visualisation, project administration; **Chin Hong LIM:** resources, writing – review & editing, visualisation, project administration; **Jeremy Tian Hui TAN:** resources, writing – review & editing, visualisation, project administration; **Marvin Wei Jie CHUA:** resources, writing – review & editing, visualisation, project administration; **Wai Ching Deanna LEE:** resources, writing – review & editing, visualisation, project administration; **Wai Keong WONG:** resources, writing – review & editing, visualisation, supervision, project administration; **Baldwin Po Man YEUNG:** conceptualization, methodology, formal analysis, resources, writing – original draft, writing – review & editing, visualisation, supervision, project administration

References

1. Andreyeva, T., Puhl, R. M., & Brownell, K. D. (2008 May). Changes in perceived weight discrimination among Americans, 1995–1996 through 2004–2006. *Obesity (Silver Spring)*, 16(5), 1129–1134
2. Forse, R. A., Betancourt-Garcia, M. M., & Kisse, M. C. (2020). Epidemiology and Discrimination in Obesity. In: Nguyen NT, Brethauer SA, Morton JM, Ponce J, Rosenthal RJ (Eds), *The ASMBS Textbook of Bariatric Surgery (2nd edition)*. Springer Nature Switzerland AG, pp. 3–14
3. Puhl, R. M., Lessard, L. M., Pearl, R. L., Himmelstein, M. S., & Foster, G. D. (2021 Sep). International comparisons of weight stigma: addressing a void in the field. *Int J Obes (Lond)*, 45(9), 1976–1985

4. Puhl, R. M., & Heuer, C. A. (2009 May). The stigma of obesity: a review and update. *Obesity (Silver Spring)*, 17(5), 941–964
5. Ng, S. (Mar 2019). Fat shaming in Asia has to stop – it's time parents and teachers changed their attitudes towards weight. *South China Morning Post*. 1 <https://www.scmp.com/lifestyle/health-wellness/article/2188019/fat-shaming-asia-has-stop-its-time-parents-teachers>. Accessed 3rd October 2021
6. Roehling, M. V., Roehling, P. V., & Pichler, S. (2007 Oct). The relationship between body weight and perceived weight-related employment discrimination: The role of sex and race. *Journal of Vocational Behaviour*, 71(2), 300–318
7. Puhl, R. M., & Heuer, C. A. (2010 Jun). Obesity stigma: important considerations for public health. *Am J Public Health*, 100(6), 1019–1028
8. Sutin, A. R., Stephan, Y., & Terracciano, A. (2015 Nov). Weight Discrimination and Risk of Mortality. *Psychol Sci*, 26(11), 1803–1811
9. Fan, J. G., Kim, S. U., & Wong, V. W. (2017 Oct). New trends on obesity and NAFLD in Asia. *J Hepatol*, 67(4), 862–873
10. All-Party Parliamentary Group (APPG) on Obesity (October 2021). The current landscape of obesity services: a report from the All-Party Parliamentary Group on Obesity. 22 May 2018. <https://obesityappg.com/s/APPG-on-Obesity-Report-2018.pdf>. Accessed 3rd
11. Ministry of Manpower. Labour Market Statistics and Publications, Statistical Table: Income. 28 Jan 2021
12. https://stats.mom.gov.sg/iMAS_Tables1/Time-Series-Table/mrsd_43_FT_Res_income_28Jan2021.xlsx. Accessed 3rd
13. Ball, K., & Crawford, D. (2005 May). Socioeconomic status and weight change in adults: a review. *Soc Sci Med*, 60(9), 1987–2010
14. Loman, T., Lallukka, T., Laaksonen, M., Rahkonen, O., & Lahelma, E. (2013 Mar). Multiple socioeconomic determinants of weight gain: the Helsinki Health Study. *BMC Public Health*, 22, 13:259
15. WHO Expert Consultation. (2004 Jan). Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet*, 10(9403), 157–163
16. Lee, Y. S., Biddle, S., Chan, M. F., Cheng, A., Cheong, M., Chong, Y. S. ... Wang, J. (2016 Jun). Health Promotion Board-Ministry of Health Clinical Practice Guidelines: Obesity. *Singapore Med J*, 57(6), 292–300
17. Foo, L. L., Vijaya, K., Sloan, R. A., & Ling, A. (2013 Nov). Obesity prevention and management: Singapore's experience. *Obes Rev*, 14(Suppl 2), 106–113
18. Tan, W. J., & Wong, T. K. (2014 Mar). Demographic profile, clinical characteristics, motivations and weight loss outcomes of patients in a nonsurgical weight management programme. *Singapore Med J*, 55(3), 150–154
19. Hales, C. M., Fryar, C. D., Carroll, M. D., Freedman, D. S., Aoki, Y., & Ogden, C. L. (2018 Jun). Differences in Obesity Prevalence by Demographic Characteristics and Urbanization Level Among Adults in the United States, 2013–2016. *JAMA*, 19(23), 2419–2429
20. Ogden, C. L., Fakhouri, T. H., Carroll, M. D., Hales, C. M., Fryar, C. D., Li, X., & Freedman, D. S. (2017 Dec). Prevalence of Obesity Among Adults, by Household Income and Education - United States, 2011–2014. *MMWR Morb Mortal Wkly Rep*, 22(50), 1369–1373
21. Chung, W., Lim, S. J., Lee, S., Kim, R., & Kim, J. (2017 Dec). Gender-specific interactions between education and income in relation to obesity: a cross-sectional analysis of the Fifth Korea National Health and Nutrition Examination Survey (KNHANES V). *BMJ Open*, 28(12), e014276
22. Nakamura, T., Nakamura, Y., Saitoh, S., Okamura, T., Yanagita, M., Yoshita, K. ... Miura, K. (2018). Relationship Between Socioeconomic Status and the Prevalence of Underweight, Overweight or Obesity in a General Japanese Population: NIPPON DATA2010. *J Epidemiol*, 28(Suppl 3), S10–S16
23. Chang, H. C., Yang, H. C., Chang, H. Y., Yeh, C. J., Chen, H. H., Huang, K. C., & Pan, W. H. (2017). Morbid obesity in Taiwan: Prevalence, trends, associated social demographics, and lifestyle factors. *PLoS One*. Feb 2;12(2):e0169577
24. French, S. A., Tangney, C. C., Crane, M. M., Wang, Y., & Appelhans, B. M. (2019 Feb). Nutrition quality of food purchases varies by household income: the SHoPPER study. *BMC Public Health*, 26(1), 231
25. Schvey, N. A., Puhl, R. M., & Brownell, K. D. (2011 Oct). The impact of weight stigma on caloric consumption. *Obesity (Silver Spring)*, 19(10), 1957–1962
26. Wu, Y. K., Berry, D. C., & Schwartz, T. A. (2020 Jun). Weight Stigmatization and Binge Eating in Asian Americans with Overweight and Obesity. *Int J Environ Res Public Health*, 17(12), 4319
27. Kessler, R. M., Hutson, P. H., Herman, B. K., & Potenza, M. N. (2016 Apr). The neurobiological basis of binge-eating disorder. *Neurosci Biobehav Rev*, 63, 223–238
28. Weltens, N., Zhao, D., & Van Oudenhove, L. (2014 Mar). Where is the comfort in comfort foods? Mechanisms linking fat signaling, reward, and emotion. *Neurogastroenterol Motil*, 26(3), 303–315
29. Durso, L. E., Latner, J. D., & Hayashi, K. (2012). Perceived discrimination is associated with binge eating in a community sample of non-overweight, overweight, and obese adults. *Obes Facts*, 5(6), 869–880

30. Friedman, K. E., Reichmann, S. K., Costanzo, P. R., Zelli, A., Ashmore, J. A., & Musante, G. J. (2005 May). Weight stigmatization and ideological beliefs: relation to psychological functioning in obese adults. *Obes Res*, 13(5), 907–916
31. O'Keeffe, M., Flint, S. W., Watts, K., & Rubino, F. (2020 May). Knowledge gaps and weight stigma shape attitudes toward obesity. *Lancet Diabetes Endocrinol*, 8(5), 363–365
32. Crowley, V. E. (2008 May). Overview of human obesity and central mechanisms regulating energy homeostasis. *Ann Clin Biochem*, 45(Pt 3), 245–255
33. Ran, M. S., Hall, B. J., Su, T. T., Prawira, B., Breth-Petersen, M., Li, X. H., & Zhang, T. M.. Stigma of mental illness and cultural factors in Pacific Rim region: a systematic review. *BMC Psychiatry*. 2021 Jan 7;21(1):8. doi: 10.1186/s12888-020-02991-5. PMID: 33413195; PMCID: PMC7789475
34. Spiel, E. C., Paxton, S. J., & Yager, Z. (2012 Sep). Weight attitudes in 3- to 5-year-old children: age differences and cross-sectional predictors. *Body Image*, 9(4), 524–527
35. Komatsu, S.. Rice and sushi cravings: a preliminary study of food craving among Japanese females. *Appetite*. 2008 Mar-May;50(2–3):353–8
36. Yeh, J., Trang, A., Henning, S. M., Wilhalme, H., Carpenter, C., Heber, D., & Li, Z. (2016). Food cravings, food addiction, and a dopamine-resistant (DRD2 A1) receptor polymorphism in Asian American college students. *Asia Pac J Clin Nutr*, 25(2), 424–429
37. Sawbridge, D. T., & Fitzgerald, R. (2009 Dec). 'Lazy, slothful and indolent': medical and social perceptions of obesity in Europe to the eighteenth century. *Vesalius*, 15(2), 59–70
38. Puhl, R. M., Moss-Racusin, C. A., Schwartz, M. B., & Brownell, K. D. (2008 Apr). Weight stigmatization and bias reduction: perspectives of overweight and obese adults. *Health Educ Res*, 23(2), 347–358
39. Levine, E. E., & Schweitzer, M. E. (2015 Mar). The affective and interpersonal consequences of obesity. *Organ Behav Hum Decis Process*, 127, 66–84
40. Flint, S. W., Čadek, M., Codreanu, S. C., Ivić, V., Zomer, C., & Gomoiu, A. (2016 May). Obesity Discrimination in the Recruitment Process: "You're Not Hired!". *Front Psychol*, 3, 7:647
41. All-Party Parliamentary Group (APPG) on Obesity. *The future of obesity services – a policy paper produced by the All-Party Parliamentary Group on Obesity*. 25 (Nov 2020).
<https://static1.squarespace.com/static/5975e650be6594496c79e2fb/t/5fbc2a92e18c5c478ec569a0/1606298265632/Obesity+APPG+-+The+Future+of+Obesity+Services.pdf>. Accessed 3rd October 2021