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Original article

Body weight overestimation increases the risk of incident overweight among adolescents: Findings from a cohort study in Vietnam

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ABSTRACT

Background: Overweight and obesity pose significant global health concerns, particularly among children and adolescents. This study aimed to examine the association between body weight misperception and the risk of incident overweight among Vietnamese adolescents over the three-year period.
Methods: Data from the Hue Adolescents Cohort Study were used, including 353 secondary school students (mean age 11.60 ± 0.36 at baseline, 47.0 % girls), who completed questionnaires and anthropometric assessments. Based on the concordance between self-perceived and objectively measured body weight status, participants were categorized into three groups: underestimation, accurate perception, or overestimation. Logistic regression analysis, adjusted for socio-demographic characteristics and lifestyle behaviors, was conducted to assess the relationship between weight misperception and incident overweight.
Results: Approximately half of the students exhibited body weight misperceptions, with males more likely to underestimate and females more likely to overestimate their weight. The cumulative and annual rates of incident overweight were 16.2 % and 5.0 %, respectively. Over the three-year follow-up, students who overestimated their body weight had significantly higher odds of developing overweight compared to those who accurate self-perception (adjusted odds ratio [aOR] = 2.855, 95 % confidence interval [CI] 1.163, 7.009). In contrast, students who underestimated their weight had lower odds of developing overweight (aOR = 0.323, 95 % CI 0.133, 0.786).
Conclusions: This study highlights a notable incidence of overweight among Vietnamese adolescents and underscores the importance of addressing accurate body weight perceptions as part of strategies to prevent overweight.

1. Introduction

Childhood and adolescent obesity have become one of the world's major public health challenges.[1] According to the World Health Organization (WHO), over 390 million children and adolescents aged 5–19 years were overweight in 2022, including 160 million classified as living with obesity. Notably, 75 % of these individuals live in low- and middle-income countries (LMICs).[2] In most countries, obesity had already surpassed thinness as the predominant nutritional concern among school-aged children and adolescents.[3] Although various strategies have been implemented to address obesity, only limited and isolated successes have been achieved in terms of sustained and scalable population-level interventions. Consequently, the global prevalence of overweight and obesity continues to rise. In addition, adolescence obesity is associated with significant psychological risks, including depression, body dissatisfaction, binge eating, and engagement in unhealthy weight control behaviors. Children and adolescents with overweight or obesity are also more likely to carry excess weight into adulthood, substantially increasing the risk of developing non-communicable diseases (NCDs), including cardiovascular diseases

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and other chronic diseases.

Despite efforts to raise awareness of individual weight status, discrepancies between perceived and actual body weights remain prevalent.[4] Research has consistently shown that body weight misperception is associated with body image dissatisfaction, engagement in unhealthy weight control behaviors, depression, low self-esteem, and reduced health-related quality of life.[5–8] A cohort study conducted among US adolescents found that weight-based self-stigmatization was a strong predictor of incident overweight.[9] Similarly, a study from South Korea reported that individuals who underestimated their weight were more likely to consume fast foods and unhealthy snacks.[10] Despite these findings, limited attention has focused on the relationship between body weight misperception and the risk of incident overweight among children and adolescents, especially in LMICs. Addressing this research gap is crucial for developing effective interventions to reduce the risk of overweight among individuals with misperceived weight statuses.

In Vietnam, obesity has emerged as a growing public health concern. The prevalence of overweight and obesity among children aged 5–19 years increased from 8.5 % in 2010 to 19.0 % in 2020. Over the past decade, the annual growth rate of overweight and obesity in this age group has averaged 8.4 %. A prior study involving 2788 Vietnamese children aged 11–14 years found that approximately one-quarter of secondary students were overweight or obese.[11] Despite the increasing burden of childhood overweight and obesity in Vietnam, the issue has not received adequate attention from either the government or the broader community. Furthermore, a cross-sectional study of 367 university students aged 18–25 years in urban Vietnam reported that 55.7 % of those with overweight or obesity misperceived their body image.[12] However, limited evidence exists regarding the potential impact of body weight misperception on the risk of developing overweight or obesity among school-going adolescents in Vietnam. Understanding this association is essential for designing effective preventive strategies and interventions tailored to the needs of Vietnamese adolescents. Therefore, this cohort study aimed (1) to examine changes in students' body weight over a three-year follow-up period and (2) to investigate the association between body weight misperception and the risk of incident overweight among secondary school students in Vietnam.

2. Methods

2.1. Study population

The Hue Healthy Adolescent Cohort Study was a three-year, school-based cohort study conducted among secondary school students in an urban area of Vietnam. Participants were recruited through the Department of Education and Training in Hue City. The baseline survey was conducted in 2018, and a follow-up survey was carried out three - years later.

Hue City, the study site, covers an area of 266 square kilometers and has approximately 20,000 secondary-school students. A multistage stratified cluster random sampling method was employed to ensure a representative sample across different schools and class sizes. The baseline sample size was calculated using Epi Info 7 software, based on the population size in the target area, with an expected true prevalence of 27.1 % (derived from a previous national study on childhood overweight or obesity),[11] a 5 % margin of error, a 95 % confidence level, five clusters, and a design effect of 2 to account for the sampling design. Based on these inputs, the minimum of 619 participants was required.

Fig. 1 presents the multistage sampling procedure and participant flow for both baseline and follow-up surveys. In 2018, five secondary schools were randomly selected from a total of 23 public schools in the study area. Second, depending on the school size, four to five sixth-grade classes (comprising 11-year-old students) were randomly chosen from each school, resulting in 648 selected students. At the 2021 follow-up, when students were 14 years old, one school withdrew from the study due to disruptions from the COVID-19 pandemic. Consequently, 479 students from the remaining four schools completed both anthropometric measurements and the questionnaire, representing 92.7 % of the original 517 students enrolled at baseline. Among them, 126 students were excluded due to missing anthropometric data at follow-up. There were no significant differences in the distribution of body weight misperceptions between students from the three follow-up schools and those from schools that only participated at baseline. Ultimately, data from 353 students were included in the cohort analysis.

2.2. Measures

Students participated in interview sessions during which they completed a questionnaire developed by the Department of Global Health Entrepreneurship at Tokyo Medical and Dental University. This questionnaire was adapted from the Global School-Based Student Health Survey (GSHS) and was administered through face-to-face interviews conducted by trained staff. The GSHS is typically implemented among students aged 13–17 years and employs a standardized scientific sampling approach, a uniform school-based methodology, and a self-administered questionnaire format. The structured questionnaire was designed to collect information on student demographics, daily activities, lifestyle behaviors, and other relevant factors. Initially developed in English, the questionnaire was translated into Vietnamese and then back-translated into English to endure accuracy and validity. Only students who obtained parental consent and provided assent were included in the interviews, which were conducted in a designated survey area.

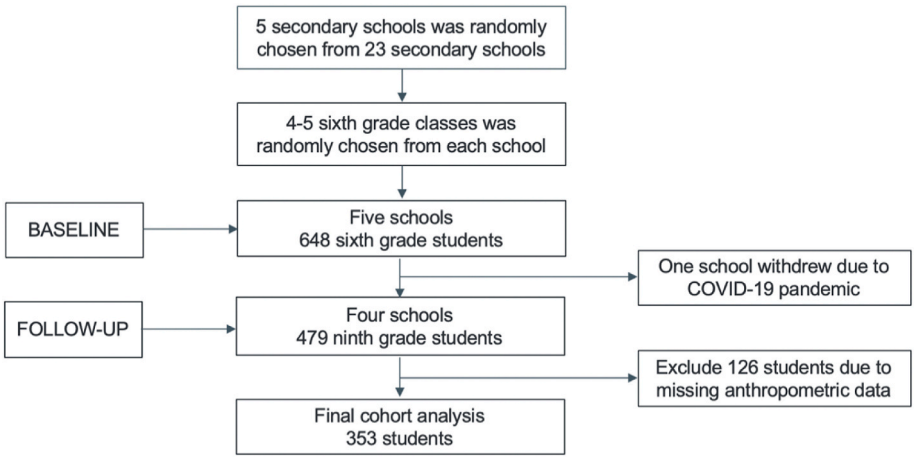

Fig. 1. Flow chart depicting the selection of study participants.

Furthermore, all enrolled students underwent anthropometric assessments conducted by trained staff to evaluate body height and weight. Weight was measured to the nearest 0.1 kg, with students wearing light clothing and no shoes. Height was measured to the nearest 0.1 cm under similar conditions.

2.3. Variables

In this study, all participants underwent anthropometric measurements, including assessments of body height and weight. Each student's objective weight status was determined using sex- and age-specific body mass index (BMI, kg/m^2) cut-off points, as recommended by the WHO 2007 Z-score.[13] Although recent literature suggests that the waist circumference-to-height ratio (WHtR) is a better adiposity surrogate measure, BMI remains a widely accepted and cost-effective indicator that has been used for several decades.[14] According to BMI-for-age Z-score (BMIZ), students were classified as follows: overweight if BMIZ $> +1$ standard deviation (SD), normal weight if BMIZ ranged from ≥ -2 SD to $\leq +1$ SD, and underweight if BMIZ < -2 SD, based on the WHO Growth Reference median. The prevalence of underweight and overweight students was calculated at both baseline and follow-up. Additionally, incident overweight was defined as newly identified overweight status at follow-up among students who were classified as not overweight at baseline.

Body weight misperception, defined as the discrepancy between an individual's actual and perceived weight status, is a growing concern.[10,15,16] Students' self-perceived weight status was assessed through a question asking how they described their own weight, with response options ranging from "very underweight" to "very overweight." These responses were then consolidated into three categories: underweight, normal weight, and overweight. Body weight misperception was determined by comparing students' self-perceived weight status with their objective weight status, as measured by BMIZ. The agreement between self-perceived body weight status and the objective body weight status based on anthropometric measurement data was examined, and it was classified into three categories: underestimate, accurate, and overestimate. Those who were categorized in underestimate and overestimate were regarded as having body weight misperception. Students were classified as having an underestimated perception if they saw themselves as underweight despite having a normal weight, or as normal weight while actually being overweight. In contrast, students who viewed themselves as overweight despite having a normal weight, or as normal while being underweight, were categorized as having an overestimated perception. Those whose self-perceived weight status matched their actual weight status were considered to have an accurate perception.

Engaging in multiple unhealthy lifestyle behaviors, such as poor dietary habits and lack of physical activity, has been associated with an increased risk of overweight and obesity among adolescents.[17,18] In this study, students were classified as "physically inactive" if they did not achieve an average of at least 60 min of physical activity per day over the past week.[19] Fruit and vegetable consumption was assessed through questions on the frequency of daily intake. Students who consumed fruits and vegetables fewer than twice per day were categorized as having low fruit and vegetable intake.[20] The frequency of fast food and carbonated soft drink consumption was also evaluated. Students were considered fast food consumers if they had eaten fast food at least once in the past week, and soft drink consumers if they reported drinking carbonated beverages daily over the past month.[21] Sedentary behavior was assessed by asking about the amount of time spent watching television or playing video/computer games each day over the past week. Students were classified as sedentary if they reported more than 2 h per day engaged in these screen-based activities.[22]

Other variables included in the analysis were age at baseline, sex (male/female), and parental cohabitation status (yes/no). Food insecurity was evaluated by asking participants, "How often did you experience going to bed hungry due to insufficient food at home in the past 30 days?" Responses were condensed into two categories: (1) yes (comprising "always," "most of the time," and "sometimes"), and (2) no (encompassing "rarely" and "never"). The frequency of experiencing hunger served as a proxy for household socioeconomic status (SES) since the survey did not directly assess household SES.

2.4. Data analysis

In the descriptive analysis, categorical variables were summarized using frequencies and percentages, while continuous variables were presented as means with standard deviations (SD), stratified by sex. Sex differences in baseline characteristics were assessed using the Chi-squared test for categorical variables and the *t*-test for continuous variables. Changes in students' objective weight status between the baseline and follow-up surveys were examined using the McNemar test. Subsequently, univariable and multivariable logistic regression analyses were performed to investigate associations between baseline student characteristics, including the accuracy of body weight perception, and the risk of newly diagnosed overweight at follow-up. Only students who were not overweight at baseline were included in the regression analyses ($n = 266$). All variables included in the univariable model were retained for inclusion in the multivariable model to ensure comprehensive results and account for potential confounding factors. The multivariable model was adjusted for age at baseline, sex, parental cohabitation, food insecurity, and lifestyle behaviors, using the enter method for variable inclusion. Adjusted odds ratios (OR) and 95 % confidence intervals (CI) were calculated. Data were analyzed using SPSS software (SPSS Inc., IBM Corp., Armonk, New York, NY, USA), with statistical significance set at $p < 0.05$.

3. Results

3.1. The baseline characteristics of the students

Table 1 presents the baseline characteristics of male and female students. The age at baseline was 11.60 ± 0.36 (mean ± SD), and the majority of participants (89.5 %) lived with both parents. Food insecurity was reported by 8.0 % of male students and 12.7 % of female students. More than 40 % of students had a low intake of fruits and vegetables, and nearly 20 % reported consuming fast food or carbonated soft drinks. Physical inactivity was highly prevalent, affecting nearly 90 % of students. Female students were significantly more likely to be physical inactivity than their male counterparts ($p < 0.05$). In addition, over two-thirds of students engaged in sedentary behavior - 69.5 % among males and 63.9 % among females. Regarding body weight perception, one-third of the 353 students reported perceiving their weight as normal, while 39.9 % considered themselves underweight and 26.6 % perceived themselves as overweight. Notably, approximately half of the students' self-perceived weight status did not align with their objectively measured status: 38.5 % underestimated and 9.3 % overestimated their body weight status. Male students were more likely to underestimate their weight status compared to females but were less likely to overestimate it.

3.2. Prevalence and incidence of overweight at baseline and follow-up surveys

Table 2 presents the distribution of objectively measured weight status among participants in both baseline and follow-up. At baseline, 8.5 % of students were classified as underweight, 24.6 % as overweight, and 66.9 % as having normal weight. While the prevalence of underweight was similar between male and female students, overweight was significantly more common among males (35.8 %) than females (12.1 %) – nearly a threefold difference. A statistically significant difference in weight status between male and female students was observed over the

Table 1
Baseline socio-demographic characteristics, lifestyle behaviors, and body weight perception of participants, stratified by sex (n = 353).

Baseline characteristics	Total (n = 353) n (%)	Male (n = 187) n (%)	Female (n = 166) n (%)	p
Age at baseline, mean ± SD	11.60 ± 0.36	11.62 ± 0.37	11.59 ± 0.34	0.426
Live with both parents				0.605
No	37 (10.5)	18 (9.6)	19 (11.4)	
Yes	316 (89.5)	169 (90.4)	147 (88.6)	
Food insecure				0.163
No	317 (89.8)	172 (92.0)	145 (87.3)	
Yes	36 (10.2)	15 (8.0)	21 (12.7)	
Low fruit and vegetable intake				0.084
No	206 (58.4)	101 (54.0)	105 (63.3)	
Yes	147 (41.6)	86 (46.0)	61 (36.7)	
Fast food and carbonated soft drink intake				0.682
No	287 (81.3)	154 (82.4)	133 (80.1)	
Yes	66 (18.7)	33 (17.6)	33 (19.9)	
Physical inactivity				0.009
No	32 (9.1)	24 (12.8)	8 (4.8)	
Yes	321 (90.9)	163 (87.2)	158 (95.2)	
Sedentary behavior				0.308
No	117 (33.1)	57 (30.5)	60 (36.1)	
Yes	236 (66.9)	130 (69.5)	106 (63.9)	
Self-perceived body weight status				0.128
Underweight	141 (39.9)	72 (38.5)	69 (41.6)	
Normal	118 (33.4)	57 (30.5)	61 (36.7)	
Overweight	94 (26.6)	58 (31.0)	36 (21.7)	
Accuracy of body weight perception[1)]				0.195
Accurate	184 (52.1)	92 (49.2)	92 (55.4)	
Underestimate	136 (38.5)	80 (42.8)	56 (33.7)	
Overestimate	33 (9.3)	15 (8.0)	18 (10.8)	

SD: standard deviation; p: p-value for comparing male and female groups by *t*-test for age at baseline and by chi-square test for other variables.
[1)] Accuracy of body weight perception was assessed based on the agreement between self-perceived weight status and objectively measured weight status (classified as underweight, normal weight, or overweight according to anthropometric data).

three-year study period. At follow-up, 34.8 % of students (40.6 % of males and 28.3 % of females) were categorized as overweight, whereas only four students were categorized as underweight. Among the 266 students who were not overweight at baseline, 43 became overweight during the follow-up period. This corresponds to a cumulative incidence of overweight of 16.2 % and an annual incidence rate of 5.0 %.

3.3. Association between body weight misperception and incident overweight

Table 3 reveals the results of the logistic regression analysis examining the relationship between body weight perception and incident overweight. Both univariable and multivariable models indicated a significant relationship between body weight misperception and incident overweight. After adjusting for age at baseline, sex, parental cohabitation, food insecurity, and lifestyle behaviors, students who overestimated their body weight were nearly three times more likely to became overweight over the three-year follow-up period compared to those with accurate weight perception (adjusted odds ratio [aOR] = 2.855, 95 % confidence interval [CI] 1.163, 7.009). In contrast, students who underestimated their body weight had significantly lower odds of developing overweight than those with accurate perceptions (aOR = 0.323, 95 % CI 0.133–0.786). Among students in the underestimated group, the cumulative and annual incidence rates of overweight were 7.1 % and 2.2 %, respectively.

Table 2
Distribution of participants by BMI-for-age Z-score (BMIZ) – defined weight status (underweight, normal weight, overweight) at baseline and follow-up, stratified by sex (n = 353).

Weight status categories based on baseline anthropometric measurements		Weight status categories based on follow-up anthropometric measurements			p
		Underweight[1)]	Normal weight[2)]	Overweight[3)]	
Male and Female					<0.001
Underweight[1)]	30	2	28	0	
Normal weight[2)]	236	2	191	43	
Overweight[3)]	87	0	7	80	
Total	353	4	226	123	
Male					<0.001
Underweight[1)]	15	1	14	0	
Normal weight[2)]	105	2	89	14	
Overweight[3)]	67	0	5	62	
Total	187	3	108	76	
Female					<0.001
Underweight[1)]	15	1	14	0	
Normal weight[2)]	131	0	102	29	
Overweight[3)]	20	0	2	18	
Total	166	1	118	47	

p: p-values for comparing weight status categories at baseline and follow-up surveys by McNemar test.
[1)] body mass index (BMI) for age Z-score less than −2 standard deviation (SD) from the WHO Growth Reference median, adjusted for age and sex.
[2)] BMI-for-age Z-score between −2 SD and +1 SD, inclusive, relative to the sex- and age-specific WHO Growth Reference median.
[3)] BMI-for-age Z-score greater than +1 SD above the WHO Growth Reference median, adjusted for age and sex.

4. Discussion

To our knowledge, this is the first longitudinal cohort study to examine the association between body weight misperception and the risk of developing overweight among adolescents in Vietnam. The study highlights a concerning prevalence and incidence of overweight among urban Vietnamese secondary school students. Findings from the logistic regression analysis further emphasized a significant relationship between body weight misperception and incident overweight. Specifically, adolescents who overestimated their body weight status had increased odds of becoming overweight over the three-year follow-up period, whereas those who underestimated their weight status had reduced odds compared to peers with accurate weight perception.

The present study observed an increase in the prevalence of overweight among adolescents from 24.6 % at baseline to 34.8 % at follow-up. The three-year cumulative and annual rates of incident overweight were 16.2 % and 5.0 %, respectively. These findings are consistent with prior studies and national data. The most recent national survey in Vietnam reported a 27.1 % prevalence of overweight and an annual growth rate of 8.4 % among children and adolescents aged 5–19 years.[11] Similarly, another study involving 2788 Vietnamese adolescents aged 11–14 year, based on WHO Z-score criteria, found an overweight or obesity prevalence of 32.2 % for urban areas.[23] Other research has documented comparable patterns, with studies from South Asia reporting relatively high rates of childhood obesity.[24,25] Studies conducted in Sub-Saharan Africa have also reported both a high prevalence and rising incidence of overweight among children.[26,27] In contrast, some European studies have observed a stabilization or even a decline in childhood overweight prevalence.[28,29]

The increasing trend in overweight prevalence in Vietnam and across Asia may be attributed to rapid lifestyle changes among urban adolescents, including a shift towards Western dietary patterns, higher intake of sugar-sweetened beverages, and reduced physical activity.[21,23] Furthermore, the follow-up period in this study coincided with the COVID-19 pandemic, which likely exacerbated weight gain due to

Table 3
Association between baseline characteristics - including accuracy of body weight perception - and risk of incident overweight[1)] over a three-year period among students who were non-overweight at baseline (n = 266).

Characteristics	Univariable model[2)]		Multivariable model[3)]	
	Odds ratio OR (95 % CI)	p	Adjusted odds ratio aOR (95 % CI)	p
Age at baseline	0.939 (0.394, 2.234)	0.886	0.658 (0.252, 1.723)	0.394
Sex				
Female	1		1	
Male	0.533 (0.267, 1.062)	0.074	0.693 (0.326, 1.473)	0.341
Live with both parents				
No	1		1	
Yes	0.675 (0.256, 1.778)	0.426	0.752 (0.266, 2.126)	0.591
Food insecure				
No	1		1	
Yes	2.199 (0.903, 5.353)	0.083	2.796 (1.015, 7.701)	0.047
Low fruit and vegetable intake				
No	1		1	
Yes	0.770 (0.393, 1.508)	0.446	0.844 (0.411, 1.735)	0.645
Fast food and carbonated soft drink intake				
No	1		1	
Yes	1.077 (0.481, 2.409)	0.857	1.423 (0.591, 3.426)	0.431
Physical inactivity				
No	1		1	
Yes	1.314 (0.373, 4.631)	0.671	2.180 (0.515, 9.230)	0.290
Sedentary behavior				
No	1		1	
Yes	0.690 (0.354, 1.344)	0.275	0.761 (0.370, 1.564)	0.457
Accuracy of body weight perception[4] rowhead[)]				
Accurate	1		1	
Underestimate	0.321 (0.137, 0.752)	0.009	0.323 (0.133, 0.786)	0.013
Overestimate	2.410 (1.038, 5.596)	0.041	2.855 (1.163, 7.009)	0.022

95 % CI, 95 % confidence interval.

[1)] Incident overweight was defined as newly identified overweight status at follow-up among students who were classified as not overweight at baseline.

[2)] ORs were estimated using univariate logistic regression analyses, with incident overweight at follow-up as the dependent variable and baseline characteristics as the independent variables. For each independent variable, the category assigned a value of 1 served as the reference group.

[3)] aORs was derived from the multivariable logistic regression analysis with incident overweight at follow-up as the dependent variable. All baseline characteristics was included as independent variables, including sex, living with both parents, food insecurity, low fruit and vegetable intake, fast food and carbonated soft drink intake, physical inactivity, sedentary behavior, and accuracy of body weight perception. For each independent variable, the category coded as 1 was used as the reference group.

[4)] Accuracy of body weight perception was assessed based on the agreement between self-perceived weight status and objectively measured weight status (classified as underweight, normal weight, or overweight according to anthropometric data).

school closures, mobility restrictions, increased screen time, unhealthy dietary habits, and psychological stress during prolonged home confinement.[30,31] Addressing overweight and obesity is crucial not only for enhancing the immediate health and well-being of children and adolescents but also for promoting better population health outcomes in the future.

Our study found that nearly half of the students misperceived their body weight status, with 38.5 % underestimating and 9.3 % overestimating their body weight. A cross-sectional study conducted in urban Vietnam reported a slightly higher misperception rate, with 55.7 % of students inaccurately perceiving their body image.[12] Similar patterns of body weight misperception have been observed among adolescents in other countries. In Asia, the rate identified in our study is comparable to that reported in South Korea (50.2 %),[10] and slightly lower than the 56.6 % reported among Chinese adolescents aged 13–18 years.[6] In other regions, the body weight misperception rates was 46 % among American students and 45 % across six different Central-Eastern European countries.[32,33] Despite some variations across studies, likely due to differing social norms and cultural backgrounds, there is a consistently high prevalence of body weight misperception among adolescents worldwide. Research has highlighted several behavioral and psychological factors contributing to these misperceptions, including stress, dissatisfaction with body image, and restrictive eating habits.[34,35] Such factors are often linked to unhealthy behaviors such as emotional eating or decreased physical activity and impede successful weight management.[36]

Furthermore, our study found that overestimation of body weight was associated with a higher risk of incident overweight. This finding is consistent with evidence from studies—primarily conducted in high-income countries—exploring the relationship between perceived overweight status and future weight gain. For example, a longitudinal cohort study in the United States (US) reported that adolescents who misperceived themselves as being overweight had greater odds of becoming obese over the 12-year follow-up period than compared to those with accurate self-perception.[9] Similarly, research among adults in US and UK found that perceiving oneself as overweight was associated with increased weight gain.[37] A systematic review also concluded that while individuals who perceive themselves as overweight are more likely to attempt weight loss, they tend to gain more weight in the long term.[38] Our study extends these findings to a LMIC context. The results could be explained as adolescents who misperceive themselves as being overweight are more likely to engage in extreme dieting behaviors and unhealthy weight management practices, such as fasting, using diet pills, and taking laxatives.[9,39,40] These harmful behaviors can disrupt normal metabolism and lead to rebound weight gain, ultimately increasing the risk of becoming overweight despite efforts to manage weight.

Conversely, our findings revealed that underestimation of body weight status was associated with a reduced risk of incident overweight. While previous studies have primarily focused on weight underestimation among overweight and obese adolescents, our study included students across all weight categories. A cohort study in the US showed that underestimation of body weight was associated with less BMI gain among adolescents who were overweight and obese.[15] Similarly, a study in China showed that adolescents who perceived themselves as underweight were less likely to adopt low-calorie diets and were more physically active.[41] Although our study did not assess the specific psychological mechanisms underlying weight misperception, the results suggest that underestimation might offer some protective effects against future occurrences of overweight, regardless of their initial weight status. Another school-based study from the US shows that underestimating one's weight status among young adults with overweight or obesity may offer some protective effects against the development of disordered eating behaviors.[42] Thus, better understanding the psychological process that lead to overweight and obesity will enhance prevention efforts, helping adolescents maintain a healthy weight as they transition into adulthood.

Our study had a few limitations. First, the lifestyle behaviors analyzed were based on self-reported questionnaires, which may introduce information bias. Second, data on socioeconomic factors, such as parental education and household wealth, as well as the psychological conditions of the students, were not collected. These factors could potentially affect the relationship between body weight misperception and the incident overweight. Despite these limitations, the study's longitudinal cohort design stands out as a notable strength. Additionally, unlike other studies that relied on self-reported height and weight to calculate BMI, our study ensured accuracy by having these

measurements taken by physicians. The findings of this study have significant implications for enhancing a better understanding of body weight misperception and preventing subsequent occurrences of overweight and obesity in Vietnam, as well as other LMICs. Tailoring school interventions to help adolescents recognize their actual weight status, educate them on the health risks of overweight and obesity, and provide psychological support could encourage healthier perceptions and long-term behaviors. Thus, further research is needed to understand the mechanisms behind body weight misperception and its impact on weight gain and other health-related outcomes, especially among children and adolescents in LMICs.

5. Conclusions

This cohort study underscores a concerning increase in the incident overweight among Vietnamese adolescents over a three-year follow-up period. Adolescents who overestimated their body weight at baseline were more likely to develop overweight, whereas those who underestimated their weight had a lower risk compared to peers with accurate weight perception. These longitudinal findings suggest that early, school-based interventions aimed at promoting accurate body weight perception and healthy weight management behaviors could play a critical role in preventing the onset of overweight and obesity during adolescence.

Ethical considerations

This study was approved by the Institutional Review Board of the Medical School of Tokyo Medical and Dental University, Japan, and the Hue University of Medicine and Pharmacy, Hue University, Vietnam. Secondary school students were recruited from the Department of Education and Training in the Thua Thien Hue Province, Vietnam. All subjects enrolled in the study agreed to cooperate with the investigators after the purpose of the research were explained, and written informed consent and assent were obtained from the parents/guardians and study participants.

Author contributions

Conceptualisation and design: XMTT, KN and KS; Acquisition, analysis or interpretation of data: XMTT, HTLN, TVT, SA, and KN; Drafting of the manuscript: XMTT; Critical revision of the manuscript for important intellectual content: HTLN, TVT, SA, KN and KS; Supervision and guarantor: TVV, KN, and KS; Funding acquisition: KN.

Data accessibility

The generated dataset is available upon request from the corresponding author at the indicated contact address.

Source of funding

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Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Keiko Nakamura reports financial support was provided by Japanese Society for Promotion of Science Grant. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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