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Perceived rather than objective weight status is associated with suicidal behaviors among Chinese adolescents: a school-based study

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ABSTRACT

Background We aimed to explore the relationship between body mass index (BMI) and body weight perception (BWP) with suicidal behaviors among mainland Chinese adolescents.

Methods A nationally representative sample ($N = 10\ 110$) of Chinese adolescents was assessed in this study. Suicidal behaviors (ideation, plan and attempt) were evaluated by four self-reported questions. Generalized linear mixed model was used to estimate the adjusted odds ratios (ORs) for the association between BWP/BMI with suicidal behaviors.

Results The prevalence of suicidal ideation, suicidal plan and suicidal attempt was 12, 5 and 2.1%, respectively. After adjusting potential covariates, perceiving oneself as obese was significantly associated with increased risks of suicidal ideation (OR: 2.4, 95% confidence intervals, CI: 1.6–4.0, $P = 0.001$), suicidal plan (OR: 3.1, 95% CI: 1.5–6.3, $P = 0.002$) and suicidal attempt (OR: 3.7, 95% CI: 1.5–9.1, $P = 0.001$) compared with perceiving as normal weight among male adolescents; the effect attenuated to null among female adolescents. Perceiving oneself as underweight and overweight both exhibited significant adverse effect on suicidal behaviors (only suicidal ideation and suicidal plan) compared with perceiving oneself as normal weight among male adolescents, but not among female adolescents. The actual measured BMI was not significantly associated with suicidal behaviors among neither gender.

Conclusions Self-perception of their body image rather than actual measured weight may have a gender-specific adverse effect on suicidal behaviors among Chinese adolescents.

Keywords adolescents, body mass index, body weight perception, suicidal behavior

Introduction

Obesity is a chronic and progressive disease that affects ∼107.7 million children and adolescents worldwide and is associated with multiple coexisting conditions and complications.[1,2] Previous studies have showed that overweight or obesity had detrimental effects on mental health, including decreased well-being and increased depression, interpersonal functioning, substance use, self-harm and suicide in adult samples, and increased depression in children and adolescents samples.[3,4] Two recent meta-analyses showed that the prevalence of depression and anxiety symptoms in overweight/obese adolescents was significantly higher than that in those with normal weight (depression: 21.7% versus 18.0%; anxiety: 39.8% versus 14.0%).[5,6]

Many reviews and meta-analyses have indicated the associations between overweight or obesity and increased risk of suicidal behaviors, but these relationships were complex. A meta-analysis by Amiri *et al.*[7] showed an inverse association between overweight/obesity with suicidal plan and suicidal attempt, and a positive association with suicidal ideation in general population. Another meta-analysis showed that overweight/obesity was no longer associated with suicidality

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after adjusting perceived overweight, and adolescents who perceived themselves as overweight were at higher risk of suicidality.[8] This review also suggested that there might be a gender-specific effect of perceived overweight/obesity on mental health and suicidality, but the results were mixed.[8] However, this relationship may not be consistent across socioeconomic and ethnic subgroups. China has 56 nationalities, and most of the 56 minority nationalities have their own languages and culture; there were huge food cultural differences and ethnic differences. Disappointingly, the study based on Chinese adolescents was lacking. For example, a total of 10 studies regarding the association between perceived overweight and suicidality were included in a meta-analysis by Haynes *et al*.,[8] but there was no study in China. Given that there was some evidence of cultural differences in the stigma associated with obesity and the prevalence of overweight and obesity varies across geographical regions, it is absolutely necessary to perform a study to identify the relationship between BMI/BWP and suicidal behaviors using a nationally representative sample of Chinese adolescents.[9] In our present study, we aimed to explore the relationship between body mass index (BMI), body weight perception (BWP) and suicidal behaviors in a nationally representative sample (N = 10 110) of Chinese adolescents, and further explore the gender-specific adverse effects.

Methods

Participator

We used data from a large school-based cohort of the National High Technology Research and Development Program of China to examine the association between BMI/BWP with the suicidal behavior. A representative sample of high school students was generated using the stratified randomized cluster-sampling method. A national sample from junior, senior and college students located in three areas of China, as follows: eastern (Beijing and Shaoxing in Zhejiang province and Guangzhou in Guangdong province); middle (Ezhou in Hubei province, Harbin in Heilong-jiang province and Taiyuan in Shanxi province) and western (Guiyang in Guizhou province and Chongqing). All the students were from grades 7 to 11, excluding grades 9 and 12 because of entrance examinations, indicating that students with diversified socioeconomic backgrounds were included. A total of 10 110 students from 38 schools were invited to join the survey, and the participators had a mean age of 15.1 years (SD = 2.1). Our survey was approved by the Ethical Committee of Anhui Medical University and the Local Education Committee. In advance of the data collection, written consent was obtained from the presidents of the schools, the teachers and all the students.

Data collection

We designed a standardized, validated and anonymous questionnaire to collect the data in the selected schools. The self-reported questionnaire was administered with a member of the research team present and completed by students at school in the class room. An introduction explained the anonymity and confidential nature of the data before the investigation. Completion of the questionnaire took 20–30 min. A teacher was always present in the classroom, but could not intervene in the procedures. After the self-reported questionnaires was completed, the teacher carefully checked the questionnaires one by one, and the missing data were required to supplement and the logically incorrect data were required to correct timely on-site.

Suicidal behavior

Suicidal behavior was evaluated by four self-reported questions, which were obtained from the Youth Risk Behavior Surveillance System.[10] This tool had been found to be reliable sources of primary data about suicidality.[11,12] Several prior papers have demonstrated that these self-reported questions have good face and construct validity.[13–15] Furthermore, the self-reported questions in our present study have a good reliability (Cronbach' Alpha = 0.7). They were 'Have you ever thought about killing yourself during the past 12 months?', 'Have you ever made a specific plan about how you would kill yourself during the past 12 months?', 'How many times have you deliberately tried to kill yourself during the past 12 months?' and 'If you attempted suicide during the past 12 months, what was the result of that attempt?' Participators were asked to answer the first three questions with 'No' (scored 0) or 'Yes' (scored 1). Suicide attempters needed to answer the last one with four options: be found and required medical care; be found and required no medical care; regretted and stop by yourself and unsuccessful due to other reasons. Depending on their answers, they would be considered categorically as suicidal ideation, plan and attempt for analysis.

BWP

Body weight perception was assessed through the question: 'What do you think about your own body weight?' for students. The response categories were: (i) very underweight; (ii) slightly underweight; (iii) about the right weight; (iv) slightly overweight and (v) very overweight. In the data analysis, 'very underweight' and 'slightly underweight' were combined into one category as 'underweight' because of the very small

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proportion. Thus these responses were recorded into four categories: perceiving as underweight, normal weight, overweight and obese.

BMI

Subjects were measured for height and weight by one examiner using standard techniques with the children standing without shoes and lightly clothed. Data were measured to the nearest 0.1 cm and 0.1 kg, respectively, using a portable stadiometer and a portable digital scale. Then, the 'Reference Norm for Screening Overweight and Obesity in Chinese Children and Adolescents', which was set up by the Working Group on Obesity in China was used to define overweight and obesity.[16]

Other risk factors

A wide range of social, family and school factors was included. These included gender, age, residential background (urban/suburban/rural), family structure (extended or nuclear family/step family/single-parent family/grandparent family/others), family status (one-child family/not one-child family), socioeconomic status (lower/middle/upper), father's and mother's education levels (illiterate to junior high school/high school/college), parents' expectations for children (low, medium and high), studying burden (low, medium and high), sleep problems (never, occasionally and frequently), weight-loss diet (never, occasionally and frequently), taking weight-loss pills, smoking (no and yes) and alcohol drinking (no/yes).

Data analysis

All analyses were conducted with SPSS software (version 10.01 SPSS, Inc., Chicago, IL, USA). The Cronbach alpha was used to test the internal consistency reliability of self-reported suicidal behavior questions, and the Kappa value was used to test the consistency of BMI and BWP. The significant associations between risk factors and suicidal ideation, suicidal plan participators and suicidal attempt were evaluated with a Pearson χ^2 test. Considering the study adopted a cluster-sampling methodology, thus we adopted generalized linear mixed regression models (multilevel logistic regression) to explore the associations between suicidal behaviors with BMI and BWP, in which school was incorporated as a random effect. The effect estimates were expressed as odds ratios (ORs) with their 95% confidence intervals (CI). The exposure defined as perceiving oneself as obese, underweight and overweight. Two exposures were defined: (i) perceiving oneself as abnormal weight (obese, underweight and overweight), (ii) actual measured abnormal weight (obese, underweight and overweight). Three outcomes were defined: (i) suicidal ideation, (ii) suicidal plan and (iii) suicidal attempt. The risk factor with a P value<0.05 was considered as a potential confounder; in the last, the confounders including grade (junior high school, senior high school and university), gender (male and female), family status (one-child family and not one-child family), socioeconomic status (lower, Middle and Upper) and residential background (urban and suburban).

A total of six multivariable models were performed in our present study. In the multivariable models, all potential confounders and BMI (normal weight was treated as the reference category)/BWP (perceiving as normal was treated as the reference category) were simultaneously added to the mode as the independent variables and the suicidal ideation/suicidal plan/suicidal attempt was treated as dependent variable individually. The model fitting was assessed by the -2log (likelihood), the mode with the smallest -2log (likelihood) was considered as the best-fitting model. We also performed subgroup analyses of the above six multivariable models by gender.

Results

The demographic features of the participators are shown in Table 1. Among 10 110 adolescents, 78.7% had normal weight, 9.9% was overweight, 7.1% was underweight and 4.3% was obese. Although, only 49.6% perceiving themselves as normal weight, 27.6% perceiving themselves as underweight, 20.2% perceiving themselves as overweight and 2.6% perceiving themselves as obese. The distribution of covariates for female and for male adolescents was significantly different. The male adolescents had a higher proportion of studying in junior high school, living in one-child family, living in suburb and living in family with lower socioeconomic status compared with the female adolescents (Table 1). Among 10 110 participators, 5756 (56.9%) incorrectly perceived their body image. There was no significant association between BMI and BWP ($\chi^2 = 6.9$, $P = 0.649$), with a very low internal consistency (Kappa $= 0$, $P = 0.97$; Table 2).

The prevalence of suicidal ideation, suicidal plan and suicidal attempt was 12, 5 and 2.1%, respectively. The comparisons of the prevalence of suicidal ideation, plan and attempt between different confounder are presented in Table 3. The prevalence of suicidal ideation, plan and attempt was significantly higher among female students compared with male students. The prevalence of suicidal ideation, plan and attempt was significantly higher among junior and senior high school students compared with university students. The students living in the urban had higher prevalence of suicidal ideation, plan and attempt than those living in the suburbs, and the

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Table 1 Sociodemographic features of the participators ($n = 10\ 110$)

Covariates	*Male*		*Female*		χ^2	*P*
	n	%	*n*	%		
Grade					120.504	<0.001
Junior high school	2261	46.5	2172	41.4		
Senior high school	2059	42.4	2088	39.8		
University	539	11.1	991	18.9		
One-child family					75.096	<0.001
Yes	2723	56	2490	47.4		
No	2136	44	2761	52.6		
Residential background					10.315	0.001
Urban	2550	52.5	2923	55.7		
Suburban	2309	47.5	2328	44.3		
Perceived socioeconomic status					38.185	<0.001
Lower	818	16.8	709	13.5		
Middle	3169	65.2	3720	70.8		
Upper	872	17.9	822	15.7		
BMI					93.303	<0.001
Underweight	415	8.5	296	5.6		
Normal weight	3657	75.3	4298	81.9		
Overweight	591	12.2	413	7.9		
Obese	196	4	244	4.6		
BWP					434.272	<0.001
Perceiving oneself as underweight	1787	36.8	1010	19.2		
Perceiving oneself as normal weight	2233	46	2777	52.9		
Perceiving oneself as being overweight	727	15	1312	25		
Perceiving oneself as obese	112	2.3	152	2.9		

Table 2 The association between BMI and BWP

BMI	*BWP*			
	Perceiving oneself as underweight	*Perceiving oneself as normal weight*	*Perceiving oneself as overweight*	*Perceiving oneself as obese*
Underweight	213(30)	337(47.4)	141(19.8)	20(2.8)
Normal weight	2174(27.3)	3947(49.6)	1620(20.4)	214(2.7)
Overweight	291(29)	505(50.3)	186(18.5)	22(2.2)
Obese	119(27)	221(50.2)	92(20.9)	8(1.8)
χ^2	6.887			
P	0.649			
Kappa (SE)	0(0.006)			

difference was statistically significant ($P < 0.05$). The students living in a one-child family had higher prevalence of suicidal ideation than the control group, with a significant difference ($\chi^2 = 7.1$, $P < 0.05$). Interestingly, the association between BMI and the prevalence of suicidal ideation, plan and attempt was not significant. The students perceiving themselves as normal weight, underweight, overweight and obesity had 11, 12.5, 13.1 and 16.3% of suicidal ideation, and the difference was statistically significant ($\chi^2 = 12.8$, $P < 0.05$). The students perceiving themselves as normal weight, underweight, overweight and obesity had 4.3, 5.6, 5.5 and 9.5% of suicidal plan respectively, and the difference was statistically significant

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($\chi^2 = 19.5$, $P < 0.05$). The students perceiving themselves as normal weight, underweight, overweight and obesity had 1.9, 2, 2.3 and 4.5% of suicidal attempt, respectively, and the difference was statistically significant ($\chi^2 = 8.9$, $P < 0.05$).

After adjusting potential covariates, perceiving oneself as obese was significantly associated with increased risks of suicidal ideation (OR: 1.5, 95% CI: 1.1–2.1, $P = 0.025$), suicidal plan (OR: 2.3, 95% CI: 1.5–3.5, $P < 0.001$) and suicidal attempt (OR: 2.4, 95% CI: 1.3–4.5, $P = 0.007$) compared with perceiving as normal; while, perceiving oneself as underweight also was significantly associated with increased risks of suicidal ideation (OR: 1.2, 95% CI: 1–1.4, $P = 0.021$) and suicidal plan (OR: 1.4, 95% CI: 1.1–1.7, $P = 0.003$) compared with perceiving as normal. Interestingly, the actual measured BMI was not significantly associated with suicidal ideation, suicidal plan and suicidal attempt among adolescents (Table 4).

Subgroup analyses by gender yielded an interesting result. The adverse effect induced by BWP attenuated to null among female students but intensified among male students. Among male adolescents, perceiving oneself as obese had a stronger effect on suicidal ideation (OR: 2.4, 95% CI: 1.4–4, $P = 0.001$), suicidal plan (OR: 3.1, 95% CI: 1.5–6.3, $P = 0.002$) and suicidal attempt (OR: 3.7, 95% CI: 1.5–9.1, $P = 0.001$); whereas, the effect attenuated to null among female adolescents (Table 4). Furthermore, perceiving oneself as underweight and perceiving oneself as overweight both exhibited stronger effect on suicidal behaviors (only suicidal ideation and suicidal plan) among male adolescents, but not female adolescents.

Discussion

We firstly examined the associations of perceived oneself as overweight/obesity and suicidal behaviors in a nationally representative sample of Chinese adolescents. We found that perceiving oneself as obese was significantly associated with increased risks of suicidal ideation, suicidal plan and suicidal attempt compared with perceiving oneself as normal weight among male adolescents, but not among female adolescents, whereas the actual measured BMI was not significantly associated with suicidal behaviors among neither gender. Our findings indicated that perceived oneself as overweight/obesity rather than actual weight status may be an important risk factor for suicidality among male adolescents.

The adverse of perceived oneself as overweight/obesity rather than measured overweight/obesity on the increased risk of suicidal behaviors was observed among a representative sample of Chinese adolescents. China has 56 nationalities, and most of the 56 minority nationalities have their own languages and culture, there were huge food cultural differences and ethnic differences. Therefore, we selected eight major cities from eight representative provinces (including Beijing, Zhejiang province, Guangdong province, Hubei province, Heilongjiang province, Shanxi province, Guizhou province and Chongqing), which covered the most important cultural characteristics of China. Given the hierarchical nature of the data, we used a multilevel model (generalized linear mixed models) to control the disturbance of clustering within group on the main results. Therefore, the results of our present study are stable and reliable. Our results are consistent with a meta-analysis and some recent studies conducted in USA.[8,17,18] A national survey of 115 180 adolescents in the USA showed that the risk of suicidality associated with perceived overweight increased from 5.7 percentage points in 1999–2001 to 10.1 points in 2015–2017, suggesting a long-term growth trend of the risks of suicidality associated with perceived oneself as overweight.[17] Therefore, exploring the explanations for the direct relationship between perceived oneself as weight and predisposition to suicide have important implication for the control of suicide.

One potential explanation for the direct relationship between perceived oneself as weight and predisposition to suicide is that overweight/obesity is widely stigmatized. Weight-based discrimination is an ubiquitary phenomenon, which is now becoming a global challenge due to the growing rates of obesity.[19,20] Some countries (for example USA) have enacted antiweight discrimination law to control the trend of increasing weight discrimination.[21] As such, people who identify as overweight recognize that they possess a characteristic that is stigmatized and may anticipate being devalued or denigrated because of their weight. In a context where the stigmatization of overweight/obesity has become increasingly ubiquitous and socially acceptable those personally identifying as overweight/obesity may be particularly likely to internalize this stigma and to fear negative social evaluation from others. These adverse psychological effects may trigger distress, suicidal ideation and even induce suicide plans or attempts.[22] Another explanation is that perceived oneself as obese may also in itself be an indicator of other underlying mental health problems, which could also lead to suicidal thoughts. Our prior study has found a significant association of perceived oneself as overweight rather than objective weight status with higher behavioral symptoms, more social adaptation problems and poorer psychological well-being.[23] A meta-analysis by Haynes *et al*.[8] showed that identifying as overweight rather than objective weight status was associated with significantly higher odds of depressive symptoms. A recent prospective cohort study

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Table 3 Reported prevalence of suicidal ideation, plan and attempt among students ($n = 10\ 110$)

Characteristic	*Suicidal ideation*		*Suicidal plan*		*Suicidal attempt*	
	N	%	*N*	%	*N*	%
Gender						
Male	509	10.5	213	4.4	75	1.5
Female	702	13.4	296	5.6	135	2.6
χ^2	20.0**		8.3**		13.1**	
Grade						
Junior high school	562	12.7	266	6	111	2.5
Senior high school	578	13.9	215	5.2	84	2
University	71	4.6	28	1.8	15	1
χ^2	95.3**		41.7**		13.1**	
One-child family						
Yes	668	12.8	279	5.4	122	2.3
No	543	11.1	230	4.7	88	1.8
χ^2	7.1**		2.3		3.7	
Residential background						
Urban	720	13.2	305	5.6	130	2.4
Suburban	491	10.6	204	4.4	80	1.7
χ^2	15.7**		7.2**		5.2*	
Perceived socioeconomic status						
Lower	223	14.6	93	6.1	42	2.8
Middle	777	11.3	315	4.6	129	1.9
Upper	211	12.5	101	6	39	2.3
χ^2	13.5**		9.7**		5.2*	
BMI						
Underweight	74	10.4	29	4.1	9	1.3
Normal weight	962	12.1	406	5.1	170	2.1
Overweight	122	12.2	53	5.3	24	2.4
Obese	53	12	21	4.8	7	1.6
χ^2	1.8		1.6		3.4	
BWP						
Perceiving oneself as underweight	350	12.5	157	5.6	56	2
Perceiving oneself as normal weight	550	11	215	4.3	96	1.9
Perceiving oneself as overweight	268	13.1	112	5.5	46	2.3
Perceiving oneself as obese	43	16.3	25	9.5	12	4.5
χ^2	12.8**		19.5**		8.9**	
Total	1211	12	509	5	210	2.1

*P<0.05, **P<0.01

among Australian adolescents added evidence to the theory that perceived oneself as overweight may be a greater predictor for symptoms of major depression than actual weight.[24] Given the stronger indicator of suicide risk among adolescents, depression might be an important mediating factor between perceived oneself as weight and predisposition to suicide. Our findings have public health implications for youth mental health screening and illness prevention.[25] In the last, distorted perception of one's body image might play a certain role in the direct relationship between perceived oneself as weight and predisposition to suicide. In our present study, 56.9% of adolescents incorrectly perceived their body image, which indicated that a substantial proportion of Chinese adolescent with overweight or obesity failed to accurately identify their weight status. Some recent studies in USA also reported a high prevalence of discordance between their actual and perceived weight among adolescents.[26,27] A failure to accurately self-identify as overweight has traditionally been

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Table 4 Adjusted ORs for the associations between BWP and BMI with suicidal ideation, suicidal plan and suicidal attempt

Variables	*Suicidal ideation*		*Suicidal plan*		*Suicidal attempt*	
	OR (95% CI)	*P*	*OR (95% CI)*	*P*	*OR (95% CI)*	*P*
• All students						
BMI[a]						
Normal weight	1		1		1	
Underweight	1(0.7, 1.25)	0.782	1(0.7, 1.5)	0.983	0.8(0.4, 1.7)	0.626
Overweight	1(0.8, 1.3)	0.808	1(0.8, 1.4)	0.926	1.1(0.7, 1.8)	0.597
Obese	0.9(0.7, 1.3)	0.717	0.9(0.5, 1.3)	0.496	0.7(0.3, 1.6)	0.4
BWP[b]						
Perceiving oneself as normal	1		1		1	
Perceiving oneself as underweight	1.2(1, 1.4)	0.021	1.4(1.1, 1.7)	0.003	1.1(0.8, 1.6)	0.521
Perceiving oneself as overweight	1.1(1, 1.3)	0.088	1.2(1, 1.6)	0.073	1.1(0.8, 1.6)	0.626
Perceiving oneself as obese	1.5(1.1, 2.1)	0.025	2.3(1.5, 3.5)	<0.001	2.4(1.3, 4.5)	0.007
• Male students						
BMI[a]						
Normal weight	1		1		1	
Underweight	0.8(0.5, 1.2)	0.23	0.6(0.3, 1.2)	0.15	0.9(0.8, 1.6)	0.688
Overweight	1.1(0.8, 1.4)	0.545	1.2(0.8, 1.7)	0.467	1.2(0.8, 1.8)	0.438
Obese	0.7(0.4, 1.2)	0.151	0.8(0.3, 1.7)	0.485	0.9(0.4, 2)	0.773
BWP[b]						
Perceiving oneself as normal	1		1		1	
Perceiving oneself as underweight	1.4(1.1, 1.7)	0.002	1.8(1.3, 2.4)	<0.001	1(0.7, 1.4)	0.872
Perceiving oneself as overweight	1.4(1.1, 1.9)	0.013	1.6(1, 2.4)	0.038	1(0.6, 1.6)	0.948
Perceiving oneself as obese	2.4(1.4, 4)	0.001	3.1(1.5, 6.3)	0.002	3.7(1.5, 9.1)	0.001
• Female students						
BMI[a]						
Normal weight	1		1		1	
Underweight	0.9(0.7, 1.3)	0.512	0.7(0.4, 1.2)	0.205	0.9(0.4, 2.1)	0.868
Overweight	1(0.8, 1.4)	0.783	1.2(0.7, 1.9)	0.518	1.5(0.7, 3)	0.306
Obese	0.9(0.6, 1.3)	0.526	1.1(0.6, 2)	0.728	1.4(0.6, 3.5)	0.482
BWP[b]						
Perceiving oneself as normal	1		1		1	
Perceiving oneself as underweight	1(0.8, 1.2)	0.796	0.9(0.7, 1.2)	0.478	0.9(0.6, 1.4)	0.668
Perceiving oneself as overweight	1(0.8, 1.2)	0.735	0.9(0.7, 1.2)	0.488	0.9(0.6, 1.3)	0.53
Perceiving oneself as obese	0.9(0.6, 1.5)	0.733	1.9(1.1, 3.3)	0.019	0.6(0.2, 1.4)	0.212

BMI, body mass index; BWP, body weight perception; CI, confidence interval; OR, odds ratio

[a]Model 1 (without BWP) indicated the association between BMI and suicidal behavior (ideation, plan and attempt) with control of covariates including grade, gender, family status, socioeconomic status and residential background.

[b]Model 2 (without BMI) indicated the association between BWP and suicidal behavior (ideation, plan and attempt) with control of covariates including grade, gender, family status, socioeconomic status and residential background.

viewed as problematic, which might result in physiological stress (anxiety and fear about their weight) and impair self-regulation of weight-related behaviors such as eating disorder behaviors and physical activity.[27] A recent study showed that restrictive eating could significantly predict suicidal ideation in youth with low-weight eating disorders, which suggested that distorted perception of one's body image might induce suicidal behaviors by improving eating disorder behaviors.[28] A very interesting finding in our study was that the distribution of perceived body weight was very uniform across different BMI groups, roughly 30% considered themselves underweight, 50% normal weight and 20% overweight across all BMI groups with little variation. Considering the distorted perception of one's body image might frequently induce eating disorder behaviors, and eating disorder behaviors might seriously damage the physical and mental health of the individuals among adolescents with underweight or normal weight. Therefore, this result has practical implication

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for performing health promoting school program among adolescents with underweight or normal weight.

Furthermore, our finding is consistent with a similar study conducted in Columbia with a nationally representative sample of 9th through 12th grade students, which found that students who perceive their weight as being above or below normal both have an increased risk for considered suicide and attempted suicide. Therefore, parents and teachers should be mindful if a child is mentioning dissatisfaction with his or her weight and image, regardless of their actual weight.[29]

Gender might influence the relationship between weight perception and suicidal behaviors, which was showed in our present study. Subgroup analyses by gender yielded an interesting result that the adverse effect induced by perceived overweight/obesity attenuated to null among females but intensified among males. Our result is inconsistent with the prospective and cross-sectional studies conducted in USA[18,30,31] and Finnish,[32] which showed a noted effect in girls but not in boys. The underlying cause of geographical differences may relate to the different sociocultural norms and attitudes on body image between Chinese and Western countries. Studies have shown that there were significant ethnic and gender differences on body image satisfaction across Chinese, Indo-Asian and European-descent students, which indicated that that one cannot generalize across Asian populations, as there may be significant differences between various ethnic minority groups.[33] However, the exact mechanism of the adverse effect induced by perceived overweight/obesity was noted in male but not in female Chinese adolescent was unclear, which needed to be identified in more future studies in China.

Our present study was a large cross-sectional study with a nationally representative sample of Chinese adolescents, which could provide robust evidence for the association of perceived overweight/obese and suicidal behaviors. Our study had several limitations. At first, we did not include the mental health problems associated with perceived overweight/obese in our present study, therefore we could not explore the etiological mechanism of developmental course of suicide. Second, the suicidality items used in our present study were based on a self-reported questionnaire, which could be subject to under-reporting. More importantly, the teacher got to review all questionnaires to make sure they are complete, that might have caused some students to underreport if they knew all answers will be reviewed.

Conclusions

A robust association of perceived overweight/obesity and suicidal behaviors among Chinese adolescents was identified in our present study. We also found the gender-specific effect of perceived overweight/obese on suicidal behaviors, with significant effect in male not in female adolescents. Our findings have important implications for the design of public health programs to prevent adolescent suicide, especially among male adolescents. Furthermore, our finding also will contribute to the consideration of the potential mental health costs of interventions promoting awareness of personal weight status.

Conflict of interest

None declared.

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