

The Association Between Unhealthy Weight Loss Behaviours and Depressive Symptoms in Adolescents: a Cross-Sectional Study

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Abstract. Objective To analyse the relationship between unhealthy weight loss behaviours and depressive symptoms in adolescents through a cohort study to provide a reference for subsequent research.

METHODS: From June to December 2021, two secondary schools in urban and rural Zhuhai were sampled using a stratified whole-group sampling method, and the Unhealthy Weight Loss Behaviour Questionnaire and the Depression Scale (CES-D) were used to investigate the weight loss behaviour and depressive symptoms of students aged 12 to 18 years. A total of 2834 study participants were included, including 906 (31.97%) male students and 1928 (68.03%) female students. The χ^2 test was used to analyse the relationship between general demographic characteristics and depressive symptoms, and a dichotomous logistic regression model was used to analyse the relationship between unhealthy weight-loss behaviour and depressive symptoms.

Results: Of the 2834 study participants, 2307 (81.40%) were found to have unhealthy weight loss behaviours and 994 (35.74%) were found to have depressive symptoms. The results of the univariate analysis showed that different gender ($\chi^2=29.94, P<0.01$), school type ($\chi^2=3.82, P<0.01$), father's parenting style ($\chi^2=96.81, P<0.01$), mother's parenting style ($\chi^2=114.20, P<0.01$), academic stress ($\chi^2=189.42, P<0.01$), and number of friends ($\chi^2=162.81, P<0.01$) had different rates of detecting depressive symptoms in adolescents. Dichotomous logistic regression analysis showed that unhealthy weight loss behaviour was a risk factor for the detection of depressive symptoms in adolescents (OR=1.512, $p<0.01$), and unhealthy weight loss level was positively associated with the detection of depressive symptoms.

Conclusion Unhealthy weight loss behaviours were positively associated with depressive symptoms in Zhuhai adolescents.

Keywords: Teenagers; unhealthy weight loss behaviours; Depressive symptoms; Risk factors; Cohort studies

1. Introduction

Adolescents are at a critical stage in their developmental transition from childhood to adulthood and are faced with a wide range of physical and psychological changes.¹⁻² These adolescent changes can increase the susceptibility of adolescents to a variety of internalising problems and psychological risks³. Obesity and depression are increasingly likely to occur during this period and are now recognised as major public health problems worldwide. Studies have found a bidirectional association between the onset of depression in adolescence and increased susceptibility to obesity⁴, with adolescent depression likely to increase the prevalence of obesity⁵, which is accompanied by

an increase in the prevalence of depression⁶⁻⁷. At the same time, the increase in obesity rates has been accompanied by the emergence of a variety of unhealthy weight management practices among adolescents, such as restrictive diets, induced vomiting and the use of laxatives. Adolescent depression may also alter their eating patterns⁸⁻⁹. Studies have shown that depressive symptoms are associated with unhealthy weight loss behaviours in adolescents, and that unhealthy weight loss behaviours are a common risk factor for somatic, psychological and physical and mental subhealth in adolescents¹⁰⁻¹¹. Based on this, this study aims to investigate the relationship between unhealthy weight loss behaviours and depressive symptoms among adolescents in Zhuhai, and to provide informative suggestions for the development of prevention and control strategies for depressive symptoms among adolescents.

2. Patients and Methods

2.1 Study Population

From June to December 2021, using stratified whole-group sampling, two areas were selected as survey areas in each of the urban and rural areas of Zhuhai. Stratified by urban and rural areas, one secondary school was selected in each of the four regions and two classes were randomly selected in each secondary school. The inclusion criteria for the study population were students in the age range of 12-18 years old who were able to understand and complete the questionnaire independently. After excluding students who did not wish to participate in the study or who had difficulty understanding the questionnaire, the questionnaire was administered to all school students in the class selected on the day of the survey.

A total of 3106 people reported weight loss behaviour in this survey. After excluding questionnaires with logical errors or missing key content, 2834 valid questionnaires were obtained, with a validity rate of 91.24%. Among them, 906 (31.97%) were male and 1928 (68.03%) were female; age (14.35 ± 2.41).

Permission for this study was obtained from the Ethics Committee of Kunming University of Technology, permission number: KUST3415132. Informed consent was signed by the subjects and parents.

2.2 Survey Methodology

2.2.1 Questionnaire on the general situation of young people

The general adolescent questionnaire was developed by the project team, taking into account the factors associated with unhealthy weight-loss behaviour and depressive symptoms in adolescents, including: (1) basic personal characteristics (gender, age, region); (2) family-related factors (whether one child or not, self-assessed parenting style, self-assessed family economic conditions); (3) school-related factors (self-assessed academic stress, self-assessed number of close friends (3) school-related factors (self-rated academic stress, self-rated number of close friends, number of health education classes). Of these, family economic conditions and academic stress emphasise subjective judgements compared to those of their peers. Parenting styles were classified as democratic ("respectful, understanding, encouraging and supportive of the respondent's choices"), authoritarian ("harsh and overly restrictive"), coddling ("doting, meeting most of the respondent's demands"), and coddling ("doting, meeting most of the respondent's demands"). Most of the respondent's requests"), and indifferent ("often ignores the respondent's feelings").

2.2.2 Unhealthy Weight Loss Behaviour Questionnaire

The questionnaire was developed by the subject group. The study participants were asked whether they had adopted the following behaviours in the past 30 days in order to lose weight: (1) exercising; (2) not eating meat; (3) reducing the amount of food and energy intake (dieting); (4) not eating for 24 h or more (fasting); (5) relying on vomiting or diarrhoea to lose weight (emetics); (6) taking diet pills or drinking diet tea without doctor's instruction (taking medication without

permission). If the study participants adopted any one or more of the above (1) to (6) unhealthy weight loss behaviours, they were judged to have unhealthy weight loss behaviours.

2.2.3 The Depression Scale (CES-D)

This study used the CES-D depression scale developed by the Chinese General Chamber of Psychological Research. This 20-item scale assesses the frequency of symptoms of depression over a 1-week period. The scale is scored on a 4-point scale. The Cronbach's α coefficient for this study was 0.97, which is highly reliable.

2.3 Quality control

The reliability of all the scales used in this study was examined and it was determined that the Cronbach's α coefficients of the scales used in this study were all above 0.95 and that the questionnaire reliability was reliable. Uniform and standardised training was conducted for the questionnaire respondents before the formal survey to ensure that the respondents mastered the questionnaire methodology and precautions. After respondents completed the questionnaires, the surveyors checked and verified them one by one, and the questionnaire entry members were uniformly trained by the subject team members before starting the questionnaire entry. After the entry is completed, the data is cleaned and checked to ensure that the data quality is up to standard.

2.4 Statistical analysis

Statistical analysis was performed using SAS 9.3. dichotomous logistic regression model was developed to investigate the relationship between unhealthy weight loss level and depressive symptoms, using unhealthy weight loss level as the independent variable and the presence of depressive symptoms as the dependent variable, controlling for confounding factors such as gender, school type and parenting style. The test level was $\alpha=0.05$.

3. Results

3.1 Baseline Situation

As shown in Table 1, a total of 2834 subjects were included in this survey, including 1521 (53.67%) students in urban schools and 1313 (46.33%) students in rural schools.

Variables	Number of people	Composition ratio (%)
Sex		
Male	906	31.97%
Female	1928	68.03%
Age		0.00%
12	325	11.47%
13	398	14.04%
14	407	14.36%
15	494	17.43%
16	405	14.29%
17	362	12.77%
18	443	15.63%
Unhealthy weight loss behaviours		
Yes	2307	81.40%
No	527	18.60%
Area		0.00%
City	1521	53.67%
Countryside	1313	46.33%
Only child		0.00%
Yes	1862	65.70%
No	972	34.30%
Study pressure		0.00%
High	1305	46.05%
Medium	1228	43.33%
Small	301	10.62%
Father's parenting style		0.00%
Autocratic	529	18.67%
Democratic	1305	46.05%
spoil	394	13.90%
Indifference	606	21.38%
Mother's parenting style		0.00%
Autocratic	417	14.71%
Democratic	1582	55.82%
spoil	406	14.33%
Indifference	429	15.14%
Number of friends		0.00%
0	275	9.70%
1-2	1355	47.81%
3-5	1106	39.03%
≥6	98	3.46%
Depressive symptoms		
Yes	907	35.74%
No	1840	64.26%

Table 1. Demographic Characteristics of Respondents

3.2 Unhealthy Weight Loss Behaviours and Depressive Symptoms Reported

Of the 2834 study participants, the number of unhealthy weight loss behaviours detected was 2307 (81.40) and 907 respondents reported depressive symptoms, representing 35.74%. The results of univariate analysis showed that gender ($\chi^2=29.94, P<0.01$), school type ($\chi^2=3.82, P<0.01$), father's parenting style ($\chi^2=96.81, P<0.01$), mother's parenting style ($\chi^2=114.20, P<0.01$), academic stress ($\chi^2=189.42, P<0.01$), and number of friends ($\chi^2=162.81, P<0.01$) differed in the detection rate of depressive symptoms among adolescents, and the differences were statistically significant.

3.3 Analysis of The Effects of Unhealthy Weight Loss Behaviours on Depressive Symptoms

As Shown in Table 2, after controlling for confounding factors such as gender, school type and parenting style, it was found that unhealthy weight loss behaviour was positively associated with depressive symptoms in adolescents (OR=1.512, $p<0.01$), and parenting style and academic stress could have an impact on the development of depressive symptoms in adolescents.

Variables	OR value(95%CI)	P value
unhealthy weight loss behaviours		
No	1	
Yes	1. 512 (1. 192~1. 647)	<0.001
Sex		
Male	1	
Female	1. 501 (1. 198~1. 762)	<0.001
Area		
City	1	
Countryside	1. 206 (1.125~1. 407)	<0.001
Father's parenting style		<0.001
Democratic	1	
Autocratic	1. 691(1. 271~2. 019)	<0.001
spoil	1. 503 (1. 292~2. 031)	<0.001
Indifference	1. 982 (1. 806~2. 513)	<0.001
Mother's parenting style		<0. 001
Democratic	1	
Autocratic	1. 661 (1. 582~2. 043)	<0.001
spoil	1. 279 (1.102 ~1. 351)	0. 613
Indifference	1. 948 (1. 503~2. 625)	<0.001
Study pressure		<0.001
Small	1	
High	1. 814 (1. 352~1. 906)	<0.001
Medium	0. 731 (0. 533~0.852)	0. 880
Number of friends		<0.001
≥ 6	1	
0	7. 358 (5. 162~16. 712)	<0.001
1~2	1. 552 (1. 314~1. 928)	<0.001
3~5	1. 412 (1. 325~1. 785)	0.002

Table 2. Logistic regression analysis of factors influencing respondents' depressive symptoms

3.4 Relationship Between Different Levels Of Unhealthy Weight Loss Behaviour and Depressive Symptoms

As shown in Table 3, based on the model fit data and the interpretability of the categories, the best-fit model for the unhealthy weight loss class was category 3, which had lower BIC and aBIC values ($p<0.05$). Based on the distribution of the number of unhealthy weight loss practices in the 3 categories, category 1 was named as the high risk group, category 2 as the medium risk group and category 3 as the low risk group. Results of the binary logistic regression model constructed with unhealthy weight loss class as the independent variable

Group	<i>B</i>	<i>SE</i>	<i>OR</i> value (95% <i>CI</i>)	<i>P</i> value
Low risk group	/	/	1.00	
Medium Risk Group	0.592	0.081	1.769(1.572~2.226)	<0.001
High Risk Group	1.309	0.304	4.028(2.680~5.839)	<0.001

Table 3. Fitting statistics for the latent category analysis model of respondents' unhealthy weight loss behaviour

Variables	<i>OR</i> value(95% <i>CI</i>)	<i>P</i> value
unhealthy weight loss behaviours		
No	1	
Yes	1.512 (1.192~1.647)	<0.001
Sex		
Male	1	
Female	1.501 (1.198~1.762)	<0.001
Area		
City	1	
Countryside	1.206 (1.125~1.407)	<0.001
Father's parenting style		<0.001
Democratic	1	
Autocratic	1.691(1.271~2.019)	<0.001
spoill	1.503 (1.292~2.031)	<0.001
Indifference	1.982 (1.806~2.513)	<0.001
Mother's parenting style		<0.001
Democratic	1	
Autocratic	1.661 (1.582~2.043)	<0.001
spoill	1.279 (1.102 ~1.351)	0.613
Indifference	1.948 (1.503~2.625)	<0.001
Study pressure		<0.001
Small	1	
High	1.814 (1.352~1.906)	<0.001
Medium	0.731 (0.533~0.852)	0.880
Number of friends		<0.001
≥6	1	
0	7.358 (5.162~16.712)	<0.001
1~2	1.552 (1.314~1.928)	<0.001
3~5	1.412 (1.325~1.785)	0.002

Table 4. Relationship between respondents' unhealthy weight loss rating and depressive symptoms

As shown in Table 4, unhealthy weight loss grade was positively associated with depressive symptoms in adolescents, with the risk of detecting depressive symptoms being 4.028 and 1.796 times higher in the high-risk and medium-risk groups, respectively, than in the low-risk group ($p<0.01$).

4. Discussion

The mental health and quality of life of adolescents is a widespread concern in contemporary society. Unhealthy weight loss behaviour, as one of the health risk behaviours¹²⁻¹³, is a risk factor for adolescents' physical and mental health that cannot be ignored. In this study, the reported rate of unhealthy weight loss behaviours among adolescents was 81.40%, which means that about 4/5 of the adolescents who lost weight adopted at least one unhealthy weight loss method, suggesting a high incidence of unhealthy weight loss¹⁴⁻¹⁵. On the other hand, the study by Neumark D et al¹⁶. showed that the prevalence of depression in recent years has shown a significant trend towards a younger age group, with the number of adolescents suffering from depression increasing each year¹⁷, and that adolescent depression has a negative impact on health in the short and long term. The strengths of this study are that it has a large sample size and takes into account urban-rural differences, which can provide a reference for subsequent studies. At the same time, this study has some limitations, as it is a cross-sectional study, and given that the onset and development of depressive symptoms need to be accumulated over a certain period of time, this study may underestimate the relationship between the two.

5. Conclusions

This study found that unhealthy weight loss behaviours among adolescents were positively associated with depressive symptoms, and that depressive symptoms were more frequently detected in adolescents who were female, had fewer friends and were under greater academic pressure. Schools, communities and parents should play a good role in guiding adolescents to improve their health literacy and curb the development of unhealthy weight loss and other health risk behaviours by enhancing education on healthy weight loss knowledge and lifestyle, thereby reducing the detection rate of depressive symptoms among adolescents.

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