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A Survey Study on the Status of Obesity among Adolescents Aged 15-18 and Its Influencing Factors in Supportive Environments

Tianfeng Ding

College of Physical Education, Shandong Sport University, Rizhao, China
1323387368@qq.com

Abstract. Objective: To understand the current prevalence of obesity among adolescents aged 15-18 and to investigate the impact of family assistance and school supportive environmental factors on their obesity. Methods: A stratified cluster cross-sectional survey design was employed, selecting 500 high school students. Physical measurement data and information on influencing factors at the family and school levels were collected. Descriptive analysis and chi-square tests were used for univariate analysis. Results: The obesity rate among the respondents was 12.8%, lower than the national average for high school students. In the family assistance dimension, factors such as consumption of sugary drinks, intake of fried foods, insufficient out-of-school exercise, excessive screen time, and inadequate sleep were significantly associated with obesity ($P<0.05$); in the school support dimension, insufficient number of physical education classes, low frequency of on-campus exercise, prolonged sedentary time, and lack of health education courses were significantly associated with obesity ($P<0.05$). Students' level of knowledge about health was not significantly related to obesity status ($P>0.05$), but the standardized implementation of courses had a significant effect. Conclusion: Adolescent obesity is influenced by multiple interacting factors from family and school supportive environments. Intervention strategies should establish a comprehensive support system that coordinates both family and school efforts.

Keywords: Adolescent obesity, supportive environment, family assistance, school support, influencing factors

1. Research background

In recent years, with the rapid development of social economy and the improvement of residents' living standards, profound changes have occurred in the nutritional intake structure of adolescents, leading to a continuous increase in the number of overweight and obese individuals [1]. Obesity in children and adolescents has become one of the most common pediatric chronic diseases globally, posing a severe epidemic situation and constituting a major public health issue. In 2020, the global population of overweight and obese individuals aged 5-19 reached 430 million, accounting for 22% of the total population in this age group; it is predicted that by 2035, this proportion will rise to 39%,

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involving approximately 770 million people [2]. China attaches great importance to this issue. In 2024, the National Health Commission of China and other departments issued the "Implementation Plan for the 'Weight Management Year' Activity." At the beginning of 2025, the Central Committee of the Communist Party of China and the State Council released the "Outline for the Construction of a Strong Education Country (2024-2035)," fully reflecting China's policy orientation towards weight management and obesity prevention and control. Obesity is closely related to the development of cardiovascular diseases, digestive system diseases, osteoarticular diseases, fatty liver, diabetes, and various malignant tumors [3-10]. The clinical field has gradually defined it as a chronic disease state, as it not only affects the maintenance of organ function but also impairs daily mobility and quality of life [11]. Adolescents aged 15-18 are in the high school stage, with a significant increase in food intake, but some students have weak awareness of physical exercise [12], coupled with limited autonomy in decision-making, their behaviors such as diet, daily routine, and activities rely more on family assistance and school environmental support. However, existing research mostly focuses on childhood and early adolescence, and specialized research on the later stage of adolescence is relatively insufficient [13]. Moreover, systematic evidence on how supportive environmental factors such as family diet arrangements, academic load, sleep status, screen use, school physical education classes, frequency of sports activities, and health education courses affect obesity in this age group is still insufficient [14]. Therefore, this study systematically describes the current epidemic status of obesity in adolescents aged 15-18 through a stratified cluster cross-sectional survey, and analyzes the role of multidimensional supportive environmental factors, aiming to provide empirical evidence for education and health departments to develop targeted intervention strategies.

2. Research methodology

2.1. Research type and design

This study adopts a stratified cluster cross-sectional survey design.

2.2. Screening conditions of research objects

Taking high school students aged 15-18 as the overall population, 1-2 schools are randomly selected based on the research location. Research subjects are cluster-sampled from classes in the first, second, and third grades of each school, with a sample size of 500 individuals included.

2.3. Methods and contents of data collection

2.3.1. Questionnaire selection and collection methods

Using the "Student Health Status and Influencing Factors Survey Questionnaire", it was distributed through the Wen juan xing platform. Students completed the electronic questionnaire independently and anonymously, in their respective class units, under a unified instruction. The response time was approximately 5 minutes.

2.3.2. Standards and methods of physical measurement

In classes, students are to proceed to the designated measurement points on campus in order, where investigators will measure their height and weight according to the requirements of GB/T 26343-

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2010 "Technical Specifications for Student Health Examination". The People's Republic of China's health industry standard WS/T 586-2018 "Screening for Overweight and Obesity in School-Age Children and Adolescents" serves as the basis for determining adolescent obesity.

2.4. Data statistics tools and analysis methods

A database was established using Excel, and SPSS 27.0 was used for descriptive statistics and one-way chi-square analysis. $P<0.05$ was considered statistically significant for differences. Factors significantly related to obesity in the two dimensions of family assistance and school support were screened.

3. Data analysis

3.1. Brief description of body type distribution

A total of 500 high school students aged 15-18 were included, of whom 67 (13.4%) were underweight, 268 (53.6%) were of normal weight, 101 (20.2%) were overweight, and 64 (12.8%) were obese. The obesity rate was 12.8%, which was lower than the national average for high school students (13.1%) [15].

3.2. Analysis of basic demographic characteristics

Except for age, all other factors were significantly correlated with obesity ($P<0.05$), as shown in Table 1.

Table 1. Demographic characteristics

Factor	Group	Number of people	Percentage	χ2	P
Age	15	120	24.0%	0.656	0.884
	16	121	24.2%		
	17	129	25.8%		
	18	130	26.0%		
Gender	Male	226	45.2%	4.608	0.032
	Female	274	54.8%		
Ethnicity	Han	216	43.2%	486.848	<0.001
	Other	284	56.8%		
Family size	≤2	179	35.8%	67.360	<0.001
	3	167	33.4%		
	≥4	154	30.8%		

3.3. Factors related to the family assistance dimension

3.3.1. Analysis of dietary habit factors

The frequency of intake of sugary beverages, the frequency of consumption of fried foods, the frequency of intake of fruits, the frequency of intake of vegetables, the number of days consuming

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dairy products, the number of days having breakfast, dieting behavior, and the habit of snacking after meals were all significantly correlated with obesity (P<0.05), as shown in Table 2.

Table 2. Dietary habit factors

Factor	Group	Number of people	Percentage	χ2	P
The Frequency of drinking sugary beverages	0-2	107	21.4%	122.632	<0.001
	3-6	265	53.0%		
	≥7	128	25.6%		
The Frequency of consuming fried foods	0-2	99	19.8%	166.312	<0.001
	3-6	278	55.6%		
	≥7	123	24.6%		
The frequency of consuming fruits	0-2	131	26.2%	126.448	<0.001
	3-6	271	54.2%		
	≥7	98	19.6%		
The frequency of consuming vegetables	0-2	49	9.8%	260.728	<0.001
	3-6	299	59.8%		
	≥7	152	30.4%		
Number of days dairy products are referenced	0	58	11.6%	80.540	<0.001
	1-4	264	52.8%		
	≥5	178	35.6%		
Number of days with breakfast	0	26	5.2%	170.860	<0.001
	1-4	148	29.6%		
	≥5	326	65.2%		
Dieting behavior	Yes, but didn't stick to it	162	32.4%	17.524	<0.001
	Thought about it, but didn't implement it	207	41.4%		
	Never thought about it	131	26.2%		
Snacks	Don't eat	79	15.8%	119.092	<0.001

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Table 2. (continued)

Snacks	occasionally eat	275	55.0%
	often eat	146	29.2%

3.3.2. Off campus exercise frequency

The number of days of weekend exercise and the average duration of activity are significantly correlated with obesity (P<0.05), as shown in Table 3.

Table 3. Factors affecting the frequency of extracurricular sports

Factor	Group	Number of people	Percentage	χ2	P
Number of days for weekend sports	0	203	40.6%	110.164	<0.001
	1	239	47.8%		
	2	58	11.6%		
Activity duration	<2h	396	79.2%	392.060	<0.001
	≥2h	98	19.6%		
	hear nothing of	6	1.2%		

3.3.3. Usage time of electronic screen

The time spent watching TV, using computers, using mobile electronic devices and whether parents limit screen time were significantly correlated with obesity (P<0.05), as shown in Table 4.

Table 4. Screen time factors

Factor	Group	Number of people	Percentage	χ2	P
Television	No	139	27.8%	127.888	<0.001
	<3h	296	59.2%		
	≥3h	65	13.0%		
Computer	No	112	22.4%	180.352	<0.001
	<3h	323	64.6%		
	≥3h	65	13.0%		
Mobile electronics	No	27	5.4%	285.712	<0.001
	<3h	418	83.6%		
	≥3h	55	11.0%		
Whether parents limit screen time	Yes	324	64.8%	43.808	<0.001

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Table 4. (continued)

	No	176	35.2%		

3.3.4. Sedentary time outside school

The average sitting time on weekends, the way to participate in extracurricular classes and the frequency of parents' reducing exercise time were significantly related to obesity (P<0.05), as shown in Table 5.

Table 5. Factors of prolonged sitting outside school

Factor	Group	Number of people	Percentage	χ2	P
After school study time	<2h	175	35.0%	326.056	<0.001
	≥2h	308	61.6%		
	Hear nothing of	5	1.0%		
	No job	12	2.4%		
Average sitting time per day on weekends	<6h	86	17.2%	195.952	<0.001
	6-12h	314	62.8%		
	>12h	100	20.0%		
Extracurricular class	Offline	175	35.0%	32.448	<0.001
	Online	127	25.4%		
	Both	109	21.8%		
	Uncommitted	89	17.8%		
Whether parents reduce exercise time	Often	141	28.2%	51.316	<0.001
	Sometimes	241	48.2%		
	No	118	23.6%		

3.3.5. Analysis of sleep status factors

The effects of sleep time, wake-up time, sleep duration and sleep state on obesity were statistically significant (P<0.05), as shown in Table 6.

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Table 6. Sleep condition factors

Factor	Group	Number of people	Percentage	χ2	P
sack time	Before 10 o'clock	59	11.8%	209.936	<0.001
	10-12 o'clock	314	62.8%		
	After 12:00	127	25.4%		
Wake up time	Before 6:00	275	55.0%	217.372	<0.001
	6-8 o'clock	209	41.8%		
	After 8:00	16	3.2%		
Sleep duration	<6h	167	33.4%	149.188	<0.001
	6-8h	278	55.6%		
	>8h	55	11.0%		
Sleeping state	Good	181	36.2%	47.236	<0.001
	Commonly	221	44.2%		
	Poor	98	19.6%		

3.3.6. Analysis on the factors of weight health cognition

In the attributional cognition of obesity, gluttony, staying up late and lack of exercise were not statistically significant (P>0.05), while long sitting time was statistically significant (P<0.05); In the diet habit of avoiding obesity, the reason of only eating less fried food was not statistically significant (P>0.05), and other reasons were statistically significant (P<0.05); The factors of whether obesity has an impact on health were also statistically significant (P<0.05), and the family as a channel of health knowledge acquisition was significant (P<0.05). as shown in Table 7.

Table 7. Cognitive factors related to weight health

Factor	Group	Yes/No	Number of people	Percentage	χ2	P
Causes of obesity	Gluttony	Yes	256	51.2%	0.288	0.592
		No	244	48.8%		
	Stay up late	Yes	234	46.8%	2.048	0.152
		No	266	53.2%		
	Prolonged sitting	Yes	217	43.4%	8.712	0.003

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Table 7. (continued)

		No	283	56.6%		
	Lack of exercise	Yes	250	50.0%	0.000	1.000
		No	250	50.0%		
	Eat less fried food	Yes	255	51.0%	0.200	0.655
		No	245	49.0%		
	Drink less carbonated drinks	Yes	224	44.8%	5.408	0.020
		No	276	55.2%		
Avoid obese eating habits	Eat less sweets	Yes	212	42.4%	11.552	<0.001
		No	288	57.6%		
	Do not overeat staple foods	Yes	192	38.4%	26.912	<0.001
		No	308	61.6%		
	Eat less snacks	Yes	215	43.0%	9.800	0.002
		No	285	57.0%		
	Eat more fruit	Yes	208	41.6%	14.112	<0.001
		No	292	58.4%		
Access to health knowledge	Family aspect	Yes	220	44.0%	7.200	0.007
		No	280	56.0%		
Effects of obesity on health	Huge impact		344	68.8%	327.676	<0.001
	Slight impact		139	27.8%		
	No impact		17	3.4%		

3.4. Related factors of school support dimension

3.4.1. Analysis on the factors of school sports frequency

Factors such as the number of days of exercise from Monday to Friday and the number of physical education classes per week were significantly correlated with obesity (P<0.05), as shown in Table

Table 8. Factors of intra-school sports frequency

Factor	Group	Number of people	Percentage	χ2	P
Days of exercise from Monday to Friday	0	160	32.0%	233.608	<0.001
	1	146	29.2%		
	2	101	20.2%		

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Table 8. (continued)

	3	58	11.6%		
	4	22	4.4%		
	5	13	2.6%		
	≤1	274	54.8%		
Number of physical education classes	2-4	223	44.6%	535.840	<0.001
	≥5	3	0.6%		

3.4.2. Sedentary time in school

The daily sitting time from Monday to Friday was statistically significant (P<0.05), as shown in Table 9.

Table 9. Factors of sedentary time on campus

Factor	Group	Number of people	Percentage	χ2	P
	<6h	28	5.6%		
Sitting time from Monday to Friday	6-12h	307	61.4%	233.548	<0.001
	>12h	165	33.0%		

3.4.3. Popularization of health knowledge

In the cognition of obesity related diseases, only bone and joint diseases (bone hyperplasia, etc.) were significantly correlated (P<0.05), but the cognition of other diseases was not statistically significant (P>0.05); The school channel of acquiring health knowledge was not significant (P>0.05); However, whether schools carry out health education courses is significantly correlated with obesity (P<0.05), as shown in Table 10.

Table 10. Factors of health knowledge popularization

Factor	Group	Yes/No	Number of people	Percentage	χ2	P
Obesity related diseases	Respiratory diseases (snoring, etc.)	Yes	248	49.6%	0.032	0.858
		No	252	50.4%		
	Cardiovascular disease (hypertension, etc.)	Yes	265	53.0%	1.800	0.180
		No	235	47.0%		
	Bone and joint diseases (bone hyperplasia, etc.)	Yes	206	41.2%	15.488	<0.001
		No	294	58.8%		
	Others (fatty liver, diabetes, etc.)	Yes	261	52.2%	0.968	0.325
		No	239	47.8%		

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Table 10. (continued)

Access to health knowledge	School	Yes	265	53.0%	1.800	0.180
		No	235	47.0%		
Health education courses		Yes	393	78.6%	163.592	<0.001
		No	107	21.4%		

4. Conclusion

This study systematically revealed the current epidemic status of obesity among adolescents aged 15-18 and its supportive environmental influencing factors through a stratified cluster cross-sectional survey. The obesity rate among the sample group was 12.8%, which is lower than the national average obesity rate of 13.1% among high school students [15]. But it is still at a relatively high level.

From the perspective of demographic characteristics, factors such as gender, ethnicity, and family structure are significantly correlated with obesity ($P<0.05$), which is consistent with previous studies and may reflect differences in genetics, culture, and family socioeconomic status. In addition, the age factor did not reach significance, possibly due to the narrow age range of the sample and the tendency for growth rates to level off in late adolescence.

In the family assistance dimension, this study confirms that unhealthy dietary behaviors (high-frequency intake of sugary drinks, fried foods, snacks, and missing breakfast), insufficient extracurricular exercise, excessive screen time and sedentary behavior, insufficient sleep, and irregular work and rest schedules are significantly correlated with obesity ($P<0.05$). These findings align with multiple research conclusions both domestically and internationally: high-energy-density foods and sugary drinks stimulate feeding neurons, leading to overeating; insufficient sleep time results in an imbalance in the secretion of hormones such as ghrelin and leptin, which increases appetite and reduces energy consumption; sedentary behavior directly reduces basal metabolic energy consumption; insufficient physical activity time can also lead to obesity [2, 16]. However, there was no significant correlation between students' cognition of some obesity-inducing factors (such as "overeating" and "staying up late") and their obesity status ($P>0.05$), indicating a barrier in the transformation between cognition and behavior. Pure knowledge transfer is insufficient to change behavioral patterns.

In the dimension of school support, the insufficient number of physical education classes, low frequency of on-campus sports, and long periods of sedentary behavior are significantly correlated with obesity ($P<0.05$). This highlights the structural influence of schools as the primary venues for students' daily activities. It is particularly crucial to note that students' level of knowledge about health is not significantly correlated with obesity ($P>0.05$), but the institutionalization of health education courses is significantly correlated with obesity ($P<0.05$). This difference suggests that sporadic information acquisition (such as lectures and bulletin boards) is difficult to induce sustained behavioral changes, whereas standardized and normalized health education incorporated into the curriculum can more effectively promote the development of healthy behaviors among students through systematic knowledge impartation, skill training, and atmosphere creation. Furthermore, among students' cognition of obesity-related diseases, only osteoarticular diseases reach a significant correlation ($P<0.05$). This may be due to the more intuitive symptoms of osteoarticular diseases, while the perception of long-term complications such as cardiovascular and

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metabolic diseases is weaker, reflecting that the depth and breadth of health education still need to be strengthened.

In summary, obesity among adolescents aged 15-18 is the result of the interaction between multiple factors in the family-assisted environment and school-supported environment. Diet structure, activity arrangement, and routine management at the family level, as well as physical education class guarantees, health education curriculum design, and sedentary control at the school level, all constitute key supportive environmental variables that affect adolescents' weight. The results of this study suggest that future obesity intervention strategies should break through the limitations of a single level and construct a comprehensive intervention model of "home-school collaboration, cognition-behavior-environment trinity": on the one hand, it is necessary to improve the health literacy of parents and students, strengthen family healthy diet and activity management; on the other hand, it is necessary to improve the institutionalization of school health education curriculum, guarantee physical education class time, reduce sedentary behavior within schools, and create a positive sports atmosphere. Follow-up studies can adopt a longitudinal tracking design to deeply explore the interactive effects of family and school environmental factors and their long-term impact mechanisms on adolescent obesity, providing more sufficient evidence for precise prevention and control of adolescent obesity.

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