

The prevalence of overweight/obesity and some risk factors in high schoolers at Le Quy Don high school of Haiphong City in 2019

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ABSTRACT

The study aimed to determine the prevalence of overweight/obesity and describe some risk factors among high schoolers of Le Quy Don in Hai An County, Hai Phong City in 2019. Studied subjects included 1381 high schoolers aged from 15 to 17 years old. Method was a cross-sectional study. The prevalence of overweight was 13.5% and obesity was 10.5% (overweight/obesity was 24.0%). The prevalence of overweight/obesity in male high schoolers was 30.9% higher than that of female high schoolers 18.7%. The prevalence of overweight/obesity in level 10 was 22.4%, level 11 was 23.9%, and level 12 was 26.1%. There were 3 risk factors relating to overweight/obesity on the final model of Multinomial Logistic Regression analysis such as sex (OR=1.99), having an overweight/obesity person in the family (OR=1.83), and less physical activities (OR=0.53). Overweight/obesity affected nearly a quarter of high schoolers of Le Quy Don, mainly in male high schoolers. Sex, having an overweight/obesity person in the family, and less physical activities were risk factors of overweight/obesity.

Keywords: Overweight, obesity, high school, Hai Phong, Vietnam

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Received: March 10, 2023

Reviewed: March 12, 2023

Accepted: May 10, 2023

INTRODUCTION

In Viet Nam recently, the prevalence of overweight/obesity (OWO) has increased rapidly. According to research results done in Ho Chi Minh city on high schoolers (HS) showed that OWO was 11.7% (overweight was 9.4% and obesity was 2.3%) [1]. Currently, Viet Nam is facing a double burden of nutrition. That is, the prevalence of malnourished children has decreased but remains high compared to the world, while the prevalence of OWO and nutrition-related chronic diseases are increasing.

Worldwide, OWO is rapidly increasing among adolescents and becoming a public health problem. In the US, the prevalence of OWO has increased rapidly over the years,

in the period 1988-1994, the prevalence of OWO among HS was 11%, then in the 2005-2008 period, this prevalence of OWO increased to 17.9% [2].

OWO is one of the causes of increasing chronic non-communicable diseases such as dyslipidemia, cardiovascular risks such as atherosclerosis, myocardial infarction, cerebrovascular accident, diabetes, and hypertension. Next is the risk of digestive cancer related to eating, infertility in both men and women [3].

Le Quy Don high school is located in Hai An district where economic growth is rapid. We wonder if this economic condition will influence the physical development of HS here. So we conducted this study with the following objectives:

1. To estimate the prevalence of overweight and obesity in high schooler in Le Quy Don High school in 2020.

2. To analyze some factors relating to overweight and obesity in these high schooler.

MATERIALS AND METHODS

Research design

A cross-sectional study was performed.

Studied subjects

Studied subjects included 1381 HS of Le Quy Don, Ngo Quyen, Hai Phong in 2019. HS were selected for the study by the convenient method. The study was done from 01/10/2019 to 19/6/2020.

Inclusion and exclusion criteria

High schoolers who consented to participate in the study were included. HS who were absent on the day of the study, HS with congenital, chronic diseases, and morphological abnormalities affecting anthropometry were excluded from the study. All HS who wanted to Quyt the study can stop at any time.

Sample Size and Sampling process

All HS met inclusion criteria was enrolled in the study. Sampling process was a convenient method.

Information collection

Common information and risk factors

High schoolers were interviewed about some common information including sexes, class order, and some risk factors (RF) such as the number of child in the family, having OWO in the family, daily physical activity, habit of eating late over 20 pm, eating more than 2 times of sweet food a day in a month, drinking more than 2 times carbonated water/sweet beverage daily during a month, spending more than 2 hours for watching TV a day during a week, going to school by walking or bike a day during a week.

Anthropometric measurement:

Weight and height were measured by using an electronic scale with height meter

(Radwag model WPT 60/150 OW, Poland, accurate to 0.1cm and 0.1kg). High schoolers were asked not to wear shoes or any heavy clothing during the measurements. They were instructed to stand straight on the scale with their feet together on the horizontal plane and both hands hanging freely by their sides. Measurements were done by well-trained medical students under the supervision of medical doctors. Data were then averaged to the nearest 0.1cm and 0.1kg. BMI was calculated as weight divided by height squared (kg/m^2).

Some definitions

- OWO was defined as the BMI (kg/m^2) more than 30.0 [4].
- A small family is one with 1 child compared with ≥ 2 child.
- In the past 7 days, physical activity of a HS less than 60 minutes/day was low physical activity.
- The habit of eating late is to have dinner after 20 pm.
- Spending more than 2 hours/day for watching TV in the past 7 days was considered spending more time for watching TV.
- The habit of eating sweets is eating from 2 times of sweet food for 30 days.
- The habit of drinking bicarbonate or sweet drinks is considered to consume from 2 times of these beverages a day for 30 days.
- The habit of going to school by bike or walking is considered to go to school by bike or walking every day in a week.

Data analysis

Data were entered and analyzed by using a SPSS software version 22.0 (SPSS Inc, Chicago, IL, USA).

- Percentages were calculated and compared by using a Chi-square test or a Fisher exact test. The difference between them was statistically significant when a p-value was less than 0.05.

Comparison of 2 or 3 means were performed by independence-t test or

ANOVA. The difference was statistically significant when p value was less than 0.05.

- A Univariate Logistic Regression and Multinomial one were performed to find out some RF and eliminated some confounding factors of the OWO.

- If OR was equal to 1: there would be no relation, if OR was less than 1, there would be an inverse relation, and if OR was more

than 1 there would be a positive relation between OWO and RF.

Ethical considerations

The protocol was accepted by the Scientific Research Ethics Committee of Haiphong University of Medicine and Pharmacy. Parents or legal guardians of the patients gave their informed consent after having received a full explanation of the objectives of the study.

RESULTS

The prevalence of overweight/obesity among studied subjects

Some information about studied subjects

Table 1. Some common information about research subjects

Demographic features	Number (n)	Percentage (%)	p
Sexes			
Males	606	43.9	
Females	775	56.1	
Class order			
10	477	34.5	
11	502	36.4	
12	402	29.1	
BMI (kg/m ²)			
Underweight	293	21.2	
Normal	756	54.8	
Overweight	187	13.5	
Obesity	145	10.5	
Mean weight/sexes*	Mean	SD	p
Males	60.56	11.64	<0.05
Females	50.48	7.86	

Demographic features	Number (n)	Percentage (%)	p
Mean weight/class order (Kg)**			
10	54.00	11.22	>0.05
11	55.19	10.69	
12	55.61	10.78	
Mean height/sexes (cm)*			
Males	167.51	6.08	<0.05
Females	156.41	5.27	
Mean height/class (cm)**			
10	160.65	7.74	>0.05
11	161.56	7.98	
12	161.69	7.88	

* Independence t-test

** One way ANOVA

Table 1 shows that among 1381 HS participating to the study, female HS represented 56.1%, class 10 HS were 34.5%, class 11 HS were 36.4%, and class 12 HS were 29.1%. According to BMI, malnourished HS accounted for 21.2%, overweight was 13.5%, and obese HS were 10.5% (OWO accounted for 24%). Mean weight of male HS was 60.56 kg that was significantly higher than that of female HS that was 50.48 kg ($p < 0.05$). Mean weight of HS in 3 classes order were 54.00 kg, 55.19 kg and 55.61 kg that were not significantly different ($p < 0.005$). Mean height of male HS was 167.51 cm significantly higher than that of female HS (156.41 cm), with $p < 0.05$. Mean high of HS was not significantly different from each others (160.65 cm, 161.56 cm and 161.69 cm with $p > 0.05$).

The prevalence of overweight/obesity among high schoolers

Table 2. The overall prevalence of overweight/obesity and the prevalence of overweight/obesity regarding sex, and class order

	Number (n)	Prevalence (%)	p
Overweight/obesity			
OWO	332	24.0	
No	1049	76.0	
OWO/sexes*			
Males (n=606)	187	30.9	<0.05

	Number (n)	Prevalence (%)	p
Females(n=775)	145	18.7	
Class order			
10 (n=477)	107	22.4	
11(n=502)	120	23.9	>0.05
12(n=402)	105	26.1	

* *Chi square test*

Table 2 figures that the prevalence of OWO among HS was 24.0%, the male rate was 30.9% significantly higher than that in females 18.7% ($p < 0.05$). The prevalence of OWO among HS in 3 classes did not differ from each others. These rates were 22.4%, 23.9%, and 26.1% respectively, and $p > 0.05$.

Some risk factors of overweight/obesity

Table 3. Some risk factors with overweight/obesity

Risk factors	OWO	No	OR, 95%CI and p of Univariate Logistic Regression	OR, 95%CI, and p of Multinomial Logistic Regression
Sexes				
Males	187	419	1.9 (1.51-2.49)*	1.99(1.54-2.57)
Females	145	630	<0.05	<0.05
Number of child				
1	85	210	1.3(1.03-1.84)	1.29(0.96-1.74)
≥ 2	247	839	<0.05	>0.05
Having an overweight/obesity person in the family				
Yes	160	343	1.91(1.49-2.46)*	1.83(1.42-2.37)
No	172	706	<0.05	<0.05
Regular weight check				
No	172	560	0.94(0.73-1.20)	
Yes	160	489	>0.05	
Late eating habit				
Yes	191	566	1.16(0.90-1.48)	
No	141	483	>0.05	

Risk factors	OWO	No	OR, 95%CI and p of Univariate Logistic Regression	OR, 95%CI, and p of Multinomial Logistic Regression
Drink carbonated water/sweet beverage/30 days				
≥ 2 times/day	72	192	1.24(0.91-1.68)	
<2 times/day	260	857	>0.05	
Sweet food				
≥ 2 times/day/30 days	65	197	1.05(0.77-1.44)	
<2 times/day/30 days	267	852	>0.05	
Physical activities				
≥ 60 m/day/week	31	154	0.59(0.39-0.89)*	0.53(0.35-0.81)
<60 m/day/week	301	895	<0.05	<0.05
How to go to school				
Bike, walking	205	623	1.10(0.85-1.42)	
Other means	127	426	>0.05	
Watching TV >2 h/day/week				
Yes	165	541	0.93(0.72-1.19)	
No	167	508	>0.05	

**Significant risk factors relating to OWO*

Table 3 shows that 4 RF relating to OWO were sex (OR=1.9), number of child in the family (OR=1.3), having an OWO person in the family (OR=1.91), and less daily physical activity (OR=0.53). In the final Multinomial Logistic Regression model, the number of child in the family was eliminated from the model.

DISCUSSIONS

The prevalence of overweight/obesity

Some information about studied subjects

Among 1381 HS participating in the study, female HS accounted for 56.1% (table 1). In Viet Nam, the proportion of male HS is usually higher than that of female HS due to the influence of gender imbalance.

The average weight of male HS was 60.56 kg significantly higher than that of female HS (50.48 kg) with $p < 0.05$. The average weight

of class 10, 11, and 12 were 54.00 kg, 55.19 kg, and 55.61 kg respectively. The average weight was changed over the year from class 10 to class 12 with $p > 0.05$. Thus, there was a delay in weight growth in older ages. This result was contrast to that of Nguyen Van Tam which found that the weight difference between male and female HS aged 18 and 15 years old was 7.96 kg and 2.48 kg [5].

The average height of male HS was 167.51 cm significantly higher than that of female HS 156.41 cm with $p < 0.05$. The average height of HS in class 10 and 12 was

almost the same, or in other words, no growth. This result was similar to that of Tran Thi Minh Hanh in Ho Chi Minh City (2009) [6].

The height of male and female HS was quasi-no increase in age group 15-17. This result can be explained that HS in this age group were already in puberty. Besides that, the economic development lead to the early growth of height in early stage but slow growth in this age group.

The mean height of males in class 12 (mean age 17 years old) was 167.51 cm higher than that of male adults in 2009 (164.4cm) (mean height of 22-26 age group, nutritional survey in 2009-2010) and the mean height of females was 156.41 cm higher than that of female adults in the nutritional survey that was 153.4cm [7]. When comparing with the mean height of male HS in Ho Chi Minh City (2009) [6], we found that the mean height of age group 17 was higher than that of male HS in the same age in Le Quy Don 1 cm. Similarly, when comparing with the average height of HS in Ha Noi (2018) [8], It showed that the mean height of class 12 HS was also 1.5 cm higher than that of class 12 HS of Le Quy Don (mean age 17 years old).

The prevalence of overweight/obesity of high schoolers

The prevalence of OWO of HS was 24.00%, the prevalence in male HS was 30.9% higher than that of female HS 18.7% ($p < 0.05$). The prevalence of OWO in 3 class order did not differ from each others and they were 22.4%, 23.9%, and 26.1% respectively with $p > 0.05$. The prevalence of OWO had an increasing tendency by class order from 22.4% in class 10 to 26.1% in class 12 but the difference between them was not really clear.

Our prevalence was much higher than that of Ha Noi in 2016: 24.0% vs 16.27%, and in 2017: 24.0% vs 18.6% [9], [8]. However, if compared with results of past research, our prevalence of OWO was much higher. The 2009-2010 nutrition showed that the prevalence of overweight of children 5-19

years old nationwide was 11.7 census % [7]. In 2012, Tran Thi Minh Hanh et al studied the nutritional status of HS in Ho Chi Minh City and found that the prevalence of OWO was 11.7% [1]. In 2007, Vo Thi Dieu Hien did research of the nutritional status of children 11-15 years old in Hue and showed that the prevalence of overweight was 7.92%, and obesity was 0.38% [10]. From the above results, we found that there was a significant increase in the prevalence of OWO over time in children of high school age, which showed that OWO were increasing rapidly and becoming a major problem of the public health in the 21st century.

Our prevalence of OWO was 10.5%, 2.3% higher than that of Tran Thi Minh Hanh in Ho Chi Minh City [1], and 4.01% and 6.0% higher than those of studies in 2016 and 2017 respectively in Ha Noi [9], [8].

Our prevalence of OWO was approaching that of some developed countries in the world. In rich countries such as Macedonia, Argentina, Jordan, and Egypt had very high prevalence of overweight ranging from 14-17% and obesity ranging from 4-8% while in poor countries the prevalence of OWO was very low for example 4% overweight in Ghana, 3% overweight in Myanmar, and 3% overweight in Srilanka and less than 1% was obese [11], [12]. A number of studies by JA Amorim Cruz in southern European countries of adolescents showed the prevalence of OWO as high as 15-23% [12].

Some risk factors relating to overweight/obesity status

Gender

Male HS had higher risk of OWO than female HS with OR = 1.9 in the final model of Univariate analysis and 1.99 in the final model of Multinomial analysis (table 3). This research result was very similar to that of studies on HS in Ha Noi in 2016 and 2017. Female HS had lower risk of OWO than that of male HS [9], [8]. The national survey of OWO risk behaviors showed that a difference between men and women in the prevalence of overweight (8.4% (95%CI [5,0-12,2] and 3.6% (95%CI [2,4-4,8] respectively [13]. Our

prevalence was similar to those of Nguyen Ngoc Van Phuong, Tang Kim Hong et al in 2010 in which overweight in men was 22% and in women was 13% [14].

This result can be explained that for girls, the sense of keeping in shape, beauty, or the habit of eating less, the habit of monitoring weight can be the reasons why female HS had lower risk of obesity than female HS. However, in order to better understand the role of gender factors in OWO, it is necessary to put in difference impact environments such as social environment, school environment or family environment to better understand the interactions between different factors on the gender factors.

Having an overweight/obesity in the family

The relationship of some family factors with OWO of HS has been elucidated by authors in the country and in the world: Research by Tran Thi Xuan Ngoc has shown that children whose fathers, brothers/sisters, and especially mothers were OWO, had risk of OWO ranging from 2.9 to 24.8 [15].

Research by Bui Thi Minh Thai in Ha Noi showed that HS in the family without OWO persons had lower risk of OWO than that of HS with OWO in the family (OR = 0,3; 95%CI [0,3-0,4]) [8]. Regarding the study in Korea from 2007 to 2010 [16] or the study of Pham Thi Phuong Thuy in Ha Noi [17], parents with OWO were the RF of OWO in their children. Results from the study of British Scientists at the University of Sussex showed that the influence of parents on BMI score was least in thin children, and most in obese ones. In the thinnest children, BMI was 10% from the mother, and 10% from the father. In obese children, BMI inherited from the father or the mother about 30% [18].

Our study had the same result. HS who had persons with OWO in the family were in higher risk of OWO than those without OWO in the family with OR = 1.91 and 1.83. This result showed that OWO in the family members was an obvious RF for HS. However, the limitation of our study was that it was not possible to find out if this association was really due to genetic factors

because families were often affected not only by genetic factors (genes) but also by other factors such as environment/society, habit/behavior, diet, physical activity, sleep, and stress...[19], [20].

Physical activity

Physical activity and malnutrition have been shown to be related. HS who were in physically active for ≥ 60 minutes per day, had 0.53-0.59 times reduction in risk of OWO compared to HS who were not physically active ≥ 60 minutes per day. This result was similar to that of Cao Thi Yen Thanh which found that children who did not participate in sport activities had a risk of being OWO 1.88 times higher than that of children who participated in sport activities [21].

The study of Al-Domi H.A et al on 977 schoolers aged from 7 - 18 years old in 3 big cities of Jordan showed that sedentary activities, less physical activity, doing exercise less than 60 minutes/day were the RF of OWO [22]. This was explained by the fact that children in urban areas live in neighborhoods, stepping outside is already alleys, busy roads, so it is difficult to find places to play, run, jump, and walk.

Besides, every day children are brought to school by their parents by car or motorbike, currently very few children walk to school, these are the indirect causes of OWO in children. However, in our study, we did not find an association between not walking or cycling to school and OWO of HS.

CONCLUSIONS

The prevalence of OWO in HS was 24.0%, OWO affected more male HS than female schoolers (30.9% vs 18.7% respectively). The prevalence of OWO of level 10 HS was 22.4%, level 11 was 23.9%, and level 12 was 26.1%.

Some RF statistically associated with OWO included male sex, having an OWO person in the family, and less physical activities.

RECOMMENDATION

The prevalence of OWO in HS of Le Quy Don high school was alarmingly high. The City health service Department and the District health Center of Hai An need to be aware of the huge consequences of OWO and have effective solutions to give HS the opportunity to increase physical activity, especially among HS with parents, or brothers/sisters having OWO.

DATA AVAILABILITY

The EXCEL/SPSS data used to support the findings of this study are available from the corresponding author upon request.

CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTION

Authors participated in different levels of the study such as study design, protocol development and performance, inspection, data analysis, and article writing.

ACKNOWLEDGMENTS

We are grateful to HS included in this study for their cooperation.

ABBREVIATIONS

HS: High Schoolers

OWO: Overweight/obesity

RF: Risk factors

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