

# Associated Factors on the Prevalence of Overweight and Obesity on Secondary and High School Students in Ho Chi Minh City, Vietnam

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## ABSTRACT

**Background:** Obesity affects multiple organ systems and is associated with a variety of vascular and several nonvascular complications. BMI and WC are the commonly-used anthropometric measurements for obesity in Vietnam. The aims of study to determine the prevalence of overweight and obesity, explore associated factors among secondary and high school students in Ho Chi Minh City, Vietnam.

**Methods:** A cross-sectional survey was conducted in 12 schools located in Ho Chi Minh City, Vietnam between June 2018 and May 2019. Students were measured their height and weight and asked for demographical information. BMI-for-age-and-gender was used to categorize students into groups. Logistic regression with odd ratio was used to explore associated factors to obesity risk.

**Results:** The mean weight of them was 59.01±12.76 kilograms, the mean height was 168.73±23.79 centimeters and the mean BMI was 22.62±1.79 kg/m<sup>2</sup>. Students who lived in remote area and do sport activities were had

lower risk to be obese. Students who at the age of 13 to 15 and eat fatty food were had higher risk of overweight and obesity.

**Conclusion:** Training programs need to be designed to provide sufficient and balanced meals and to instill a desire for physical exercise.

**Keywords:** Body mass index, BMI, Obesity, Student, Vietnam.

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## INTRODUCTION

Anemia, malnutrition and mineral deficiencies such as zinc or iron which characterized by chronic shortages of nutrients is rapidly rising, posing a high prevalence worldwide.<sup>1-3</sup> Simultaneously, the prevalence of chronic nutrition-related diseases such as cardiovascular disease, obesity, diabetes and some types of cancer is growing increasingly.<sup>4</sup> These two trends are parallel, however, occur in different area. While stunting is commonly increasing in the Third World countries especially remote area, overweight is most concerned in industrialized and some low-income countries.<sup>5</sup>

An analysis of lay patterns in the number of childhood overweight or obese revealed that in most developed countries, and in many developing countries, particularly urban areas, prevalence has increased over the past decades.<sup>2,3</sup> When compared to males, the risk to be obese on females is higher due to differences in congenital endocrine.<sup>6</sup> Some studies found that in Europe, about the prevalence of school-age children who suffered from overweight or obesity was about one-fifth, and 5% of them are obese. Those figures in North America are 30% and 15%, respectively.<sup>7</sup> According to World Health Organization (WHO), there were an estimation of 155 million children who aged between 5 and 17 are overweight or obese.<sup>5</sup>

Although existing knowledge of the health effects of overweight and obesity is primarily focused on adult research, growing evidence shows that obesity in children has a variety

of immediate, intermediate and other health consequences in the further future.<sup>7</sup> Some studies indicated that all-cause mortality and morbidity are partly revealed from childhood obesity.<sup>8,9</sup> The majority of overweight and obese children do not get out of these trouble even till their maturation, which becomes the main reason of several health problems such as cardiovascular diseases and other nutritional-cause illness including cancers.<sup>10</sup>

Up to now, there is no consistent definition for overweight and obesity due to the effects of age, gender and other factors. However, most of the definitions gather into one point, which is the abundance of fatty components on the body. Also, there is no official frontiers between underweight, overweight and obesity.<sup>4</sup> Techniques such as BMI, waist circumference, and skin-fold thickening have been widely used in the clinical practice. Though these approaches are less reliable than the research methods, they are adequate to classify threats.<sup>4</sup>

There were many evidences support to the statement that the rise in obesity stems from a disparity in energy intake and spending, with an improvement in the positive energy balance closely linked to the lifestyle followed and dietary preferences. There is increasing studies, however, proved that the genetic background is associated factors to investigate the risk of obesity.<sup>4</sup>

Despite the severe long-term consequences, overweight and obesity are largely preventable by balanced diet and physical exercises. WHO therefore suggest to interpret the avoidance as social priority to obesity preventable.<sup>10</sup>

A broad understanding of the problem of childhood obesity can help guide prevention initiatives and establish appropriate population-based strategies and programs. This study was carried out in order to determine the prevalence of overweight and obesity as well as explore associated

factors among secondary and high school students in Ho Chi Minh City, Vietnam.

## METHODS

### Study design and Study site

This is a cross-sectional study conducted at Ho Chi Minh City, Vietnam from June 2018 to May 2019. Twelve secondary and high schools located in the city was chosen randomly from the listed graded by the authorities.

### Sampling and Data collection

Interviewers went to chosen schools and chose students randomly from the list of students graded by the director board. Students were measured their height and weight and asked for other demographical information such as age, sport activities and fatty food consumption. The total sample size was 384.

### Data analysis

Data was then entered into Microsoft Excel for Window 2010 for management. BMI was then calculated and BMI-for-age was used to assess the students' condition. Students had been categorized as underweight, normal, overweight and obese if their BMI were at <5<sup>th</sup>, 5<sup>th</sup> - 85<sup>th</sup>, 85<sup>th</sup> - 95<sup>th</sup>, and ≥95<sup>th</sup>, respectively on the percentile graph. Data analysis was performed by SPSS software version 23.0 (SPSS Inc., Chicago, IL, USA). Categorized variables were presented as frequency and percentage. Continuous variables were presented as mean, standard deviation (SD), median and quartile. Logistic regression was performed. Overweight-and-obesity combination versus underweight-and-normal combination was set as discrete depend variable. Independent variables were age groups, gender, living area, sport activities, meals per day, and fatty food consumption.

### Ethical consideration

The research complied with ethical standards by obtaining informed consent, ensuring respondent autonomy, and guaranteeing anonymity and confidentiality. Explanations provided to the respondents included information regarding the voluntary nature and safety of participation in the study. The participants were informed of their right to refuse participation or withdraw from the survey at any time without consequences. No details that could point to the participants' identities were reflected on the questionnaires, and only members of the research team were authorized to collect information on the participants.

## RESULTS

Table 1 shows the demographical and clinical characteristics of 384 included students. The mean age was 14.08±2.16 and equally distributed among age groups. The majority lives in urban area, do sports activities at least 180 minutes a week, and consumed at least two meals of fatty food per week. The mean weight of them was 59.01±12.76 kilograms, the mean height was 168.73±23.79 centimeters and the mean BMI was 22.62±1.79 kg/m<sup>2</sup>.

Table 1. Characteristics of included students (N=384)

Characteristics	n
Age	
Mean±SD	14.08±2.16
Median (Q1-Q3)	13 (11-16)
Age group	
10-12	125 (32.6)
13-15	138 (35.9)
16-18	121 (31.5)
Gender	
Female	204 (53.1)
Male	180 (46.9)
Residence	
Urban	175 (45.6)
Rural	157 (40.9)
Remote	52 (13.5)
Sport activities	
Yes*	201 (52.3)
No	183 (47.7)
Meals per day	
Mean±SD	3.01±0.09
Median (Q1-Q3)	3 (2-3)
≤3	304 (79.2)
>3	80 (20.8)
Fatty food consumption	
Yes#	298 (77.6)
No	86 (22.4)
Weight (kg)	
Mean±SD	59.01±12.76
Median (Q1-Q3)	56 (52-64)
Min-Max	32-81
Height (cm)	
Mean±SD	168.73±23.79
Median (Q1-Q3)	166 (161-172)
Min-Max	153-184
BMI (kg/m <sup>2</sup> )	
Mean±SD	22.62±1.79
Median (Q1-Q3)	22 (21-24)
Min-Max	18-32

Note: Data were presented as n (%) unless state otherwise;

\*180 minutes per week or greater; #Two meals per week or greater.

Acronyms: BMI, body mass index; SD, standard deviation; Q1, 25<sup>th</sup> quartile; Q3, 75<sup>th</sup> quartile.

The distribution of BMI-for-age percentile was demonstrated in Figure 1. The vast majority of students were at the normal area, ranging from 22 male 16-to-18-year-old students to 53 female 13-to-15-year-old students. Female at the age from 13 to 15 was the group with the highest rate of overweight. Male at the age of 16 to 18 was the group with the highest rate of obese.

Logistic regression result was showed in the Table 2. As can be seen, students at the age of 16 to 18 had the significant risk to be overweight 1.72 times higher than the reference group (13 to 15 years old). Students live in remote area had the risks to be overweight 0.33 times lower than those lived in urban area. Obviously, sports activities posed an

important role to decrease the risks of overweight ( $p=0.007$ ) while consuming fatty food pushed the risk three times higher than reference group (0.032). Gender and meals per day was no significantly associated with the risk of overweight among students.

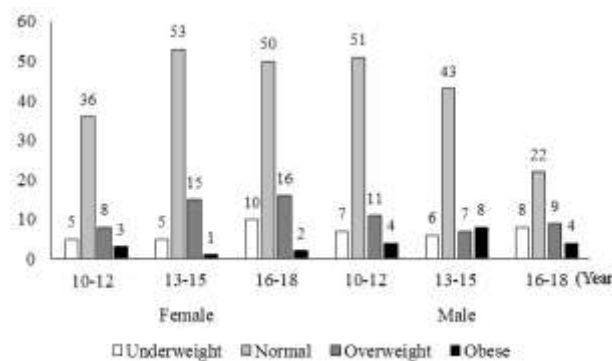


Figure 1. Body mass index-for-age-and-gender percentiles distribution on included students (N=384)

Table 2. Associated factors to overweight and obese students by logistic regression (N=384)

Variables	OR	95% CI	p-value
Age group			
10-12	0.12	0.01-0.32	0.037
13-15	1		
16-18	0.72	0.67-0.81	0.024
Gender			
Female	1		
Male	1.12	1.01-1.56	0.098
Residence			
Urban	1		
Rural	0.39	0.09-1.73	0.208
Remote	0.33	0.15-0.68	0.004
Sports activities			
Yes*	0.39	0.18-0.76	0.007
No	1		
Meals per day			
≤3	0.72	0.35-1.48	0.368
>3	1		
Fatty food consumption			
Yes <sup>#</sup>	3.29	1.09-4.85	0.032
No	1		

Note: \*180 minutes per week or greater; <sup>#</sup>Two meals per week or greater.

Acronyms: OR, odd ratio; CI, confidence interval

## DISCUSSION

The main objective of this study was to explore the prevalence of overweight or obesity in school-age children in Vietnam. We found some factors that associated with the risk of overweight/ obesity including female gender, age between 13 and 15, urban area, sport activities and fatty food consumption.

There are many studies conducted to determine the prevalence of childhood overweight and obesity, using various approach to determine the nutritional condition. A study on 3,320 5-to-18-year-old children categorized children as fat if their percentage of body fat was ≤25% for males and 30% for females, respectively.<sup>11</sup> BMI-for-age percentile was commonly used to defined overweight as well as other nutritional conditions, which approved by The Center for Disease Control and Prevention<sup>12,13</sup> and used by many European researchers.<sup>14</sup> Quartile BMI is ideal for differentiating people, it may not be as effective in children when they go into normal growth because of their changing body form. In fact, BMI does not differentiate between overweight and fat-free mass such as muscle and bone and can exaggerate obesity in children with large muscles. In fact, the trend of maturation varies from gender among different ethnic groups.<sup>4</sup> Research used BMI to classify overweight and obese kids based on the number of body fat found high accuracy (95–100 percent) but poor responsiveness for this classification system (36–66 percent).<sup>15</sup> Although health effects of obesity have to do with unnecessary fatness, the optimal diagnosis system should be based on actual fatness calculation. While approaches like densitometry is used in researches and clinical practices do not require.<sup>4</sup>

There is some recent evidence that fatty food consumption associated with childhood obesity. Rising instances of obesity were also correlated with family causes. The types of food that are accessible in the household and the family members' food preferences can affect the food that children eat. Most households, particularly those who have parents working outside the home, choose for these things because their kids always prefer them and they are both convenient and cheap.<sup>16</sup> A research has investigated the eating behavior of heavy teens in fast food restaurants,<sup>17</sup> and their findings was that they consumed more calories eating fast food than they would typically in a home setting.

A sedentary lifestyle is one of the causes most strongly linked to obesity. Increasing incremental television hour per day elevated obesity prevalence by two percent.<sup>18</sup> Throughout recent years, screen exposure has climbed significantly among youngsters.<sup>18,19</sup> The growing amount of time spent in sedentary behaviors has reduced the amount of physical exercise time spent. Research showing how many times kids spend watching television corresponds with their intake of the most marketed products, like cereals, cakes, sugary drinks and salty foods.<sup>20</sup> While challenges in empirically evaluating the media influence, other work addressed highlights that the impacts of ads should not be overlooked. The findings of this study were limited to Ho Chi Minh City in Vietnam only.

## CONCLUSION

Students who lived in remote area and do sport activities were had lower risk to be obese. Students who at the age of 13 to 15 and eat fatty food were had higher risk of overweight and obesity. Training programs need to be designed to provide sufficient and balanced meals and to instill a desire for physical exercise.

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## CONFLICT OF INTEREST

The authors have no conflicts of interests to declare.

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