



RESEARCH ARTICLE

Association of Eating Behavior and Parental Body Mass Index with Obesity of Primary School Children: A Case Study in Hai Phong City, Vietnam

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Abstract

Background: Obesity in children has adverse effects on both health and psychology. Obesity is known to be influenced by environmental factors and genetic factors, as well as the interaction between genes and environment. Hai Phong city located in the northern part of Vietnam has rapid economic growth and urbanization. Along with the development, the percentage of obese children has increased. To date, there have been no studies on the relationship between risky factors and obesity in children in this city. The present study aimed to explore the association of eating behavior and parental BMI with obesity of Hai Phong primary school children.

Methods: Anthropometric indices (height, weight and BMI) of total 4014 children from 6 to 10 years of age in 19 primary schools in Hai Phong city were measured. Obese children and normal weight children were classified using the criteria of BMI cut-off points proposed by the International Obesity Task Force. Then, 175 normal weight children and 169 obese children were studied to evaluate the association of eating behaviors and their parental BMI with obesity.

Results: Eating behaviors that increased the risk of obesity included: Gluttonous characteristic (OR = 14.2), no extra-meal (OR = 2.9), no desired eating (OR = 2.3) and preference for fatty foods (OR = 3.3). The BMI of father and/or mother ≥ 23 kg/m² significantly increased the risk of obesity in primary school children (OR = 2.9 and OR = 5.5).

Conclusions: There was high association of eating behaviors and parental BMI with obesity of primary school children in Hai Phong city. Eating behaviors that increased

the risk of obesity included gluttonous characteristic, no extra-meal, no desired eating and preference of fatty foods. High father and/or mother BMI also increased the risk of obesity in children.

Keywords

Eating behavior, Parental BMI, Obesity, Primary school children, Hai Phong city

Introduction

Obesity in children has adverse effects on both health and psychology, such as an increased risk of metabolic disorders (high plasma and liver lipid levels, hypertension, blood sugar disorders), early puberty, inferiority complex and poor performances of learning abilities [1]. It has been reported that obesity is influenced by environmental factors and genetic factors, as well as the interaction between genes and environment. Among environmental factors, high energy diets, fast and gluttonous eating behaviors have been considered to highly induce obesity [2]. Childhood adiposity is greatly influenced by inappropriate eating behavior pattern, where by excessive energy intake exceeds energy expenditure [3]. Moreover, it has been known that obese children exhibit unique eating behaviors and are more sensitive to food cues, such as the smell of food, and suffer more binge eat-

ing episodes compared with normal weight children after exposure to food cues [4]. In addition, children who were overweight and obese were found to be less responsive to satiety, commonly fast and over-eating and coped with negative emotions [5-7].

Apart from eating behaviors, parental body mass index (BMI) has also been reported to relate to obesity in children. Numerous studies have reported the strong relationship between parental BMI and children BMI [8,9], and children whose parents had a healthy BMI exhibited healthier behaviors such as improved dietary patterns and regular physical activity compared with children whose parents had higher BMI [10]. Higher maternal BMI is related to higher child's BMI, sedentary behaviors, less fruit consumption and more television viewing [11-14]. These results suggest that parental BMI reflects parents' healthy behaviors which influence their child's healthy behaviors and ultimately weight status.

The prevalence of obesity in children has increased to an alarming level in developing countries including Vietnam. The prevalence of obesity in children in these countries is known to be associated with economic development and urbanization [15-17]. Hai Phong is a big city in the northern part of Vietnam. This city has rapid economic growth and urbanization associated with changes in lifestyle and nutritional characteristics of residents including children. These changes could be risky factors inducing obesity in children. To date, there have been no studies on the relationship between risky factors and obesity in children in this city. Therefore, the aim of the present study was to explore the association of eating behaviors and parental BMI with obesity of primary school children in Hai Phong city, Vietnam.

Materials and Methods

Participants and procedure

A total of 4014 children from 6 to 10 years of age in 19 primary schools in Hai Phong city was participated in this study. Anthropometric indices (height and weight) of these children were measured to calculate BMI. Then, obese children and normal weight children were classified using the criteria of age- and sex-specific BMI cut-off points proposed by the International Obesity Task Force (IOTF, 2000) [18]. In this study, obese children due to medical reasons or Cush-

ing's syndrome and normal weight children with any diseases were excluded. At the end of the first step, there was a total of 344 children who met requirements of the study. At the second step, a total of 344 children were divided into two groups: Control group including 175 with normal weight children and obese group consisting of 169 obese children. Then, parents of all these children were invited to participate the study and their BMI were measured. The parents were also required to provide all information of eating behaviors of their children in questionnaires.

Measurements and Data collection

Body weight was measured to the nearest 0.1 kg with a digital weighing scale (SECA model 803, Germany). Height was measured using a portable stadiometer (SECA model 213, Germany) to the nearest 0.1 cm. BMI (kg/m^2) was calculated by dividing weight (kg) by the square of height (m). The criteria of age- and sex-specific BMI cut-off points proposed by the International Obesity Task Force (IOTF, 2000) [18] was used to classify the obese children and normal weight children. Height, weight and BMI of the parents of these children were measured using the same protocol. Questionnaires were designed as described by Tuyet, et al. [19] to collect necessary information of children eating behaviors including gluttony, breakfast, extra-meal, desired eating, favourite foods.

Statistical analysis

Data were analyzed using one-way analysis of variance (ANOVA). All calculations were performed using SPSS version 16.0 (SPSS, Chicago, USA). Statistical differences between control and obese groups were assessed using Turkey-Kramer test and Chi-square test, and significance was based on a 5% level of probability.

Results

Table 1 presents the characteristics of primary school children in control and obese groups in Hai Phong. There were no statistical differences in sex ratio and age of children between control and obese groups ($P > 0.05$). However, the height, weight and BMI were significantly higher in obese children compared to those of normal children ($P < 0.0001$).

Association of eating behaviors with obesity of primary school children in Hai Phong city are shown in Table 2. Eating behaviors that increased the risk

Table 1: Characteristics of primary school children in control and obese groups in Hai Phong city.

Characteristics	Control group (n = 175)	Obese group (n = 169)	P
Boy (%)	65.2	70.2	0.084
Age (year)	8.6 ± 1.8	8.5 ± 1.6	0.337
Height (cm)	126.5 ± 8.7	129.0 ± 8.9	< 0.0001
Weight (kg)	24.2 ± 3.2	39.1 ± 4.1	< 0.0001
BMI (kg/m^2)	15.4 ± 1.8	23.8 ± 2.0	< 0.0001

Table 2: Association of eating behaviors with obesity of primary school children in Hai Phong city.

Eating Behaviors		OR	P
Gluttony	Normal	1	
	Gluttonous	14.2	< 0.0001
	In appetent	0.3	< 0.0001
Breakfast	≥ 5 times/week	1	
	< 5 times/week	3.5	0.456
Extra-meal	With extra-meal	1	
	No extra-meal	2.9	0.004
Desired eating	Desired eating	1	
	No desired eating	2.3	0.015
Favourite foods			
Sweet foods	No	1	
	Yes	1.6	0.536
Fatty foods	No	1	
	Yes	3.2	< 0.0001
Lean	No	1	
	Yes	1.9	0.268
Egg	No	1	
	Yes	1.5	0.856
Sea foods	No	1	
	Yes	1.3	0.390
Vegetables	No	1	
	Yes	1.8	0.673
Fruits	No	1	
	Yes	2.3	0.426

Table 3: Association of parental BMI with obesity of primary school children in Hai Phong city.

Parental BMI	OR	P
BMI of both father and mother < 23	1	
BMI of either father or mother ≥ 23	2.5	< 0.0001
BMI of both father and mother ≥ 23	5.5	< 0.0001

of obesity included: gluttonous characteristic (OR = 14.2; $P < 0.0001$), no extra-meal (OR = 2.9; $P = 0.004$), no desired eating (OR = 2.3; $P = 0.015$) and preference of fatty foods (OR = 3.3; $P < 0.0001$). In contrast, in appetent characteristic is a factor that reduced the risk of obesity in children (OR = 0.3; $P < 0.0001$). In the present study, we found that there was no correlation between the number of breakfasts per week and favourite foods such as: Sweet foods, lean, egg, seafood's, vegetables and fruits and obesity risk ($P > 0.05$).

Table 3 shows the association of parental BMI with obesity of primary school children in Hai Phong city. The high BMI of parents was a factor that significantly increased the risk of obesity in primary school children. When either father or mother with BMI equal or higher than 23 kg/m², their children had 2.5 times higher in the risk of obesity than those who had pa-

rental BMI lower than 23 kg/m². Moreover, if both father and mother with BMI equal or higher than 23 kg/m², their children had 5.5 times higher in the risk of obesity than those who had parental BMI lower than 23 kg/m² ($P < 0.0001$).

Discussion

The current study is one of the first of its kind to explore the association of eating behaviors and parental BMI with obesity in primary school children in Hai Phong city, Vietnam. Based on BMI of total 4014 children from 19 primary schools, we classified and chose 175 normal weight and 169 obese children, as well as their parents to participate in a case-control study to find out relationship between eating behaviors, parental BMI and obesity status.

In the present study, we found that gluttonous characteristic, no extra-meal, no desired eating and preference of fatty foods were eating behaviors which induced a high risk of obesity in children in Hai Phong city. It has been reported that gluttonous children often have high amount of food intake, thus increasing the risk of obesity. In contrast, children who are in appetent normally have less food intake, hence reducing the risk of obesity [20]. In addition, children could no longer feel hungry when having extra-meal and, and this leads to a reduction in the amount of food intake at the main meal. Consequently, having extra-meal induces weight lost in children [21,22]. The relationship between preference of food types and obesity has been reported, especially the preference of fatty foods [23]. Fatty foods have a good appetite and children often prefer to eat these kinds of foods. Fatty foods have high energy, therefore, eating fatty foods increases the risk of obesity [24]. In fact, underweight and normal weight children are often required to eat high nutrients and high energy foods by parents even though they have no desire to consume such food types, consequently, these children are under a risk of obesity. In the present study, children who were gluttonous, had no extra-meal, had no desired eating and preferred for fatty foods were in 14.2, 2.9, 2.3 and 3.2 times higher in the risk of obesity compared to those who had no such eating behaviors, respectively. These findings suggest that eating behavior is an important factor leading to obesity and it is necessary to adjust eating behaviors in order to prevent obesity in children.

Overweight parents are considered as risk factors for overweight/obesity of their children [1,25]. The association between overweight children and parental excess weight represents both gene and environment interactions [26]. Thus, the increasing risk of childhood obesity with obese parents might be due to their genetics or their living in the same environment. Obese individuals often have more risky alleles for obesity and

these alleles can be inherited for the next generation, hence, children born by parents with high BMI will be at the high risk of obesity [27]. Furthermore, children usually imitate their parents. Therefore, eating habits and family lifestyle could have an influence on children eating behaviors. Unfavorable parental eating patterns and a sedentary lifestyle such as low physical activity and prolonged television and computer spending time might increase the risk of obesity in both parents and their children [28]. In the current study, we found that the high BMI of parents was a factor that significantly increased the risk of obesity in primary school children. Especially, children increased 5.5 times in the risk of obesity if both their parents had BMI higher than 23 kg/m² compared to children whose parents had BMI lower than 23 kg/m². The high risk of obesity in children with high parental BMI in Hai Phong city could be due to both genetic and lifestyle factors including eating behaviors in the family.

Conclusions

Results of the present study showed that there was high association of eating behaviors and parental BMI with obesity of primary school children in Hai Phong city. Eating behaviors that increased the risk of obesity included gluttonous characteristic, no extra-meal, no desired eating and preference of fatty foods. High father and/or mother BMI increased the risk of obesity in children.

Acknowledgments

The authors express sincere thanks to all participants in this study. We also wish to express our gratitude to managing board members of 19 primary schools in Hai Phong city for their significant supports.

Ethical Considerations

All procedures performed in this study involving human participants were in accordance with the ethical standards of the Ethical Evaluation Committee in Biomedical Research and the Council of Ethics in Biomedical Research, the Ministry of Health, Vietnam and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent

The contents of the study were explained to the participants in advance and written informed consent was obtained.

Conflict of Interests

There are no conflict of interests in this study.

Author Contributions

Khue Minh Pham designed the study, reviewed the

literature, dealt with ethical approval, analyzed and interpreted the data, and drafted the manuscript. Phuc Thanh Pham provided detailed explanations of the research to the participants and obtained their consent, collected the data. Cuong Nam Nguyen provided detailed explanations of the research to the participants, engaged in data collection, analyzed the data. Nam Quoc Nguyen contributed to the literature review, data interpretation, manuscript finalization.

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