

Parental perceptions and childhood overweight/obesity: A population-based study among school children in Japan

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ABSTRACT

The lifestyle of children is primarily controlled by their parents, and that childhood obesity is related to family variables. The aim of this study was to investigate the relationship between parental perceptions on childhood obesity and their child's overweight/obesity in Japan. The study subjects were 3168 school children (aged 9 or 10 years) and their parents in the town of Ina, Saitama Prefecture, Japan, between 2002 and 2009. Information regarding parental perceptions about childhood obesity and the lifestyle factors of their children was collected using self-administered questionnaires completed by the participants and their parents. Childhood overweight was defined according to the International Obesity Task Force cutoffs. Parental perceptions on childhood obesity were significantly associated with their child's overweight status. Specifically, low perceptions regarding childhood obesity significantly increased the odds ratio (OR) for the child's overweight status (OR: 1.86, 95% CI: 1.32 - 2.62). However, when the analysis was limited to children with both parents being overweight, there was no statistically significant difference between levels of parental perceptions and the overweight status of their children. Accordingly, the present study suggests that, when both parents are obese, not only is raising parental awareness important, but also encouraging parents to prevent themselves from becoming overweight, leads to improvements in the lifestyle habits of children, which may contribute to the prevention of childhood overweight.

Keywords: Children; Childhood Obesity; Parental Perceptions; Parental Obesity; Japan

1. INTRODUCTION

The prevalence of childhood obesity and overweight has been increasing worldwide [1]. In Japan, the prevalence of obese boys and girls increased from 6.1% and 7.1%, respectively, between 1976 and 1980 to 11.1% and 10.2%, respectively, between 1996 and 2000 [2]. Obesity is associated with the risk factors and indicators of cardiovascular disease and metabolic syndrome [3]. Moreover, some studies have shown that these indicators may be persistent from childhood and adolescence to young adulthood [4,5]. Therefore, it is very important to prevent childhood obesity and overweight.

The causes of overweight and obesity among children can be divided into genetic [6] and lifestyle factors, which include physical activity and eating habits [7,8]. Several studies have shown that the lifestyle of children is primarily controlled by their parents, and that childhood obesity is related to family variables [9-17].

Among the family variables, parental perceptions and attitudes regarding childhood obesity have been reported to be associated with their child's overweight or obesity [12,18-20]. A previous study reported that parents of overweight children do not recognize their child as overweight and are not aware of their overweight status [18]. Thus, low parental perceptions of their child's overweight or obesity are unlikely to provide a healthy lifestyle or environment for their children [12]. Although some studies have been conducted on parental perceptions of their child's body types or weight [19,20], little is known about the relationship between parental perceptions on childhood obesity and their child's overweight or obese status. If associations between parental percep-

tions on childhood obesity and the child's overweight/obesity status are revealed, this evidence may help in the prevention of childhood overweight/obesity. Therefore, it is important to assess the levels of parental perceptions on childhood obesity and evaluate the association between parental perceptions and their child's overweight status.

Accordingly, the aim of the present study was to investigate the relationship between parental perceptions on childhood obesity and childhood overweight in a population-based study among Japanese school children.

2. METHODS

In addition to the annual national health check-ups performed in accordance with the School Health Law of Japan, the town of Ina in the Saitama Prefecture, Japan, has been conducted a unique health promotion program for the prevention of childhood lifestyle-related diseases since 1994. The program consists of a questionnaire survey, as well as blood and physical examinations, of fourth and seventh graders. Several studies describing this program have been reported [21-24], and the present study was also conducted as part of the program.

2.1. Subjects

The study subjects were all fourth graders (aged 9 - 10 years) between 2002 and 2009 in the town of Ina. Written, informed consent was obtained from the parent or guardian of each subject. The study protocol was approved by the Medical Ethics Committee of Showa University School of Medicine.

2.2. Anthropometric Measurements

During the annual school health examination, all participants were asked to remove their shoes and socks, after which their height and body weight were measured in units of 0.1 cm and 0.1 kg, respectively, while they were wearing light clothing. Body mass index (BMI) was calculated as body weight (kg) divided by the square of the height (m²).

2.3. Questionnaire Survey

A self-administered questionnaire was distributed to each study participant and the parent (father or mother) or guardian by the class teachers one week before the annual school health examination. It was completed by the child and the parent or guardian at home, and was then collected on the day of the health examination.

The following information was collected from each participant: sex, age, exercise aside from physical education class (daily, sometimes, or none), eating of snacks after dinner (always, often, seldom, or none), eating

speed (fast, medium, slow), eating while doing something else (Yes or No), and chewing thoroughly (Yes or No).

The parent or guardian of each participant was asked to answer the following questions regarding the participant: birth weight, frequency of eating breakfast (daily, sometimes, or none), dinnertime (regular or irregular), bedtime (regular or irregular), and wake-up time (regular or irregular). He or she was also asked to provide the following information regarding the family: "whether the child was the only child", "the age, height, weight, and employment of the parents", and "parental perceptions on childhood obesity". The birth weights of the participants were categorized into five groups: <2000 g, 2000 - 2499 g, 2500 - 2999 g, 3000 - 3499 g, and ≥3500 g. The frequency of eating snacks after dinner was categorized into two groups: Yes (always or often) and No (seldom or none). The frequency of eating breakfast was categorized into two groups: skipping breakfast (sometimes or none) and not skipping breakfast (daily). Information regarding parental perceptions on childhood obesity was obtained from five answer options: "I think of childhood obesity as a serious problem", "I think of it as a problem", "I cannot say whether childhood obesity is a problem or not", "I don't think of it as a serious problem", and "I don't think of it as a problem". Those who thought that childhood obesity was a serious problem or a problem were regarded as those whose perceptions were high or moderate, respectively. Respondents that chose "I cannot say whether childhood obesity is a problem or not", "I don't think of it as a serious problem", or "I don't think of it as a problem" were grouped as those whose perceptions were low, as the numbers in these three categories were small.

2.4. Definition of Overweight

Childhood overweight (including obesity) was determined according to the age- and sex-specific cutoff points proposed by the International Obesity Task Force [25]. Obesity in parents was regarded as a BMI ≥ 25 kg/m², according to the World Health Organization criteria [26].

2.5. Statistics

The chi-square test or unpaired t-test was used to compare various characteristics between the overweight and non-overweight groups. The relationship between parental perceptions on childhood obesity and the child's overweight status was investigated using a logistic regression model. Crude odds ratios (ORs) for overweight and the 95% confidence interval (95% CI) were initially calculated, and then adjusted for potential confounders. Variables that were different between the overweight and non-overweight groups with a *P* value < 0.05 were con-

sidered potential confounders. A P value < 0.05 was considered as statistically significant. Data analyses were performed using the SPSS 16.0J (IBM, Chicago, IL, USA).

3. RESULTS

Of the 3179 subjects, 11 were excluded from the analysis due to refusal to take part in the study or school absence. Thus, data from a total of 3168 subjects (1645 boys and 1523 girls) were analyzed (participation rate: 99.7%). The characteristics of parents (fathers and mothers) by the overweight status of their children are shown in **Table 1**. Parents with overweight children had significantly higher BMI than those with non-overweight children ($P < 0.001$). Children with one or both parents being overweight were more likely to be in the overweight group ($P < 0.001$). The employment status of the parents (fathers and mothers) was not related to the child's overweight. There was a statistically significant difference between parental perceptions on childhood obesity and the child's overweight status ($P < 0.001$).

Table 2 shows the characteristics of overweight and non-overweight children. The proportion of boys was significantly higher in the overweight group than in the non-overweight group. There was a statistically significant difference between the overweight and non-overweight children groups with respect to birth weight. Only children were more likely to be in the overweight group. Children who did not exercise, ate quickly, or did not chew thoroughly were more likely in the overweight group. The crude and adjusted ORs of parental obesity or perceptions on childhood obesity for their child's overweight status were calculated (**Table 3**).

The results showed that when one (OR: 1.83, 95% CI: 1.43 - 2.34) or both (5.54, 3.51 - 8.73) parents are obese, the ORs for childhood overweight significantly increased compared to when both parents were non-obese. Moreover, moderate (1.52, 1.21 - 1.90) and low (1.86, 1.32 - 2.62) perceptions regarding childhood obesity resulted in significantly increased ORs for childhood overweight, compared to high perceptions.

Additionally, adjusted ORs of parental perceptions on childhood obesity for their child's overweight status were calculated according to the obesity status of the parents (**Table 4**). When one or both parents were non-obese, moderate or low perceptions regarding childhood obesity significantly increased the ORs for childhood overweight, when compared to high perceptions regarding childhood obesity. However, there was no statistically significant difference between parental perceptions on childhood obesity and their child's overweight when both parents were obese.

4. DISCUSSIONS

In the present study, the association between parental

perceptions on childhood obesity and the overweight status of their children was examined. It was found that childhood overweight status was significantly associated with parental perceptions on childhood obesity. In particular, low or moderate perceptions regarding childhood obesity significantly increased the OR for their child's overweight status.

Our results indicated that there was a statistically significant difference in some baseline characteristics, such as birth weight and the number of siblings, between the overweight and non-overweight children. For example, children without siblings were more likely to be overweight. These observations were consistent with the results of previous studies [27,28]. Moreover, many studies have reported that lifestyle factors, such as physical inactivity and eating habits, are associated with childhood and adolescent obesity [8,12,17,29]. Therefore, we adjusted for these factors, which were significantly associated with children's overweight status in the analysis, to evaluate the relationship between parental perceptions on childhood obesity and their child's overweight status.

In the present study, parental obesity significantly increased the ORs for overweight in their children, which was consistent with previous studies [30-32]. Furthermore, in our study, low perceptions regarding childhood obesity significantly increased the OR for the child's overweight status. Low parental perceptions regarding childhood obesity may be due to a lower awareness of what constitutes a healthy lifestyle [33], which in turn, may be a risk factor for childhood overweight. Thus, an effective measure against childhood overweight may be an implementation of health education programs that aim to increase the knowledge of parents with low perceptions regarding childhood obesity.

Additionally, low parental perceptions regarding childhood obesity significantly increased the ORs for their child's overweight status, particularly when one or both parents are non-obese. These results suggest that parental perceptions regarding childhood obesity affect the overweight status of their children when neither or one parent was obese. Conversely, there were no significant increases in OR found when both parents were obese, suggesting that the levels of parental perceptions may not have a substantial effect on the overweight status of their children when both parents are obese. Both BMI and the health behaviors of children were reported to be associated with family variables, such as parental overweight or obesity, which also indicated a greater risk of obesity in offspring and should be recognized as a marker of families that are at risk [31]. A previous study showed that, when both parents were obese, parental attempts to improve their own lifestyle habits affected the living environment of their children, and resulted in an improvement in their child's overweight status [21]. Accordingly,

Table 1. Parental characteristics according to the overweight status of study participants.

	Non-overweight (n = 2683)	Overweight (n = 485)	P ^b
Father			
Age (years)	40.6 ± 5.2	40.9 ± 5.4	0.217
Height (cm)	171.3 ± 5.4	170.9 ± 6.2	0.201
Weight (kg)	68.8 ± 9.7	72.4 ± 11.5	<0.001
BMI (kg/m ²)	23.4 ± 2.9	24.8 ± 3.4	<0.001
BMI percentile			
<50th	52.4	38.0	<0.001
50 - 74th	24.9	24.3	
75 - 84th	9.5	13.0	
85 - 94th	9.2	13.9	
≥95th	4.0	10.8	
Mother			
Age (years)	38.2 ± 4.2	38.3 ± 4.6	0.739
Height (cm)	158.0 ± 5.2	158.2 ± 5.3	0.357
Weight (kg)	52.4 ± 7.3	57.1 ± 9.8	<0.001
BMI (kg/m ²)	21.0 ± 2.7	22.8 ± 3.5	<0.001
BMI percentile			
<50th	53.3	31.5	<0.001
50 - 74th	24.9	25.3	
75 - 84th	9.5	14.4	
85 - 94th	8.7	16.2	
≥95th	3.6	12.6	
Parental obesity (%) ^a			
Non-obese	67.7	47.1	<0.001
Either parent obese	29.5	41.5	
Both parents obese	2.8	11.5	
Parental employment (%)			
Father	99.4	98.8	0.198
Mother	54.3	58.7	0.100
Parental perceptions on childhood obesity (%)			
High	45.4	33.4	<0.001
Moderate	44.9	52.4	
Low	9.6	14.2	

Except where indicated by the percentage (%), values are expressed as means ± standard deviation; BMI: Body mass index; ^aParental obesity: father's BMI ≥ 25 kg/m² and/or mother's BMI ≥ 25 kg/m²; ^bUnpaired t-test or chi-squared test.

Table 2. Characteristics of non-overweight and overweight study participants.

	Non-overweight (n = 2683)	Overweight (n = 485)	P ^a
Boys (%)	50.5	59.6	<0.001
Age (years)	9.4 ± 0.5	9.3 ± 0.5	0.534
Birth weight (g)	3053.8 ± 436.6	3146.8 ± 455.2	<0.001
<2000 (g) (%)	1.3	1.5	<0.001
2000 - 2499	6.9	4.1	
2500 - 2999	35.6	28.4	
3000 - 3499	41.8	47.0	
3500+	14.4	19.0	
Only child (%)	10.2	14.0	0.016
Exercise habit (%)			
Daily	54.3	45.9	0.004
Sometimes	26.7	31.3	
None	19.0	22.7	
Eating snacks after dinner (%)	47.4	51.6	0.101
Eating speed (%)			
Fast	15.0	32.7	<0.001
Medium	56.3	56.3	
Slow	28.7	11.0	
Eating while doing something else (%)	41.0	43.2	0.391
Chewing thoroughly (%)	66.6	53.2	<0.001
Skipping breakfast (%)	3.7	2.5	0.328
Dinner time (%)			
Regular	96.2	96.0	0.796
Irregular	3.8	4.0	
Bedtime (%)			
Regular	97.1	95.6	0.117
Irregular	2.9	4.4	
Wake-up time (%)			
Regular	99.7	99.0	0.050
Irregular	0.3	1.0	

Except where indicated by the percentage (%), values are expressed as means ± standard deviation; BMI: Body mass index; ^aUnpaired t-test or chi-squared test.

our study suggested that, when both parents are obese, not only did raising parental awareness regarding childhood obesity, but also encouraging parents to take ac-

tions to reduce their own weight, led to improvements in the lifestyle habits of children. Consequently, such measures could contribute to the prevention of childhood

Table 3. Associations between parental obesity or parental perceptions on childhood obesity and their child's overweight.

	Crude		Adjusted ^b	
	OR	95% CI	OR	95% CI
Parental obesity ^a				
Non-obese	1.00		1.00	
Either parent obese	2.02	1.61 - 2.54	1.83	1.43 - 2.34
Both parents obese	5.78	3.83 - 8.73	5.54	3.51 - 8.73
Parental perceptions on childhood obesity				
High	1.00		1.00	
Moderate	1.59	1.28 - 1.96	1.52	1.21 - 1.90
Low	2.00	1.46 - 2.74	1.86	1.32 - 2.62

OR: odds ratio; 95% CI: 95% confidence interval; ^aParental obesity: father's BMI ≥ 25 kg/m² and/or mother's BMI ≥ 25 kg/m²; ^bAdjusted for child's sex, birth weight, existence of siblings, exercise habit, eating speed, and chewing thoroughly.

Table 4. Associations between parental perceptions on childhood obesity and their child's overweight, according to parental obesity status.

	Parental obesity ^a					
	Non-obese		Either parent obese		Both parents obese	
	OR	95% CI	OR	95% CI	OR	95% CI
Parental perceptions on childhood obesity						
High	1.00		1.00		1.00	
Moderate	1.49	1.05 - 2.11	1.19	0.79 - 1.80	2.17	0.71 - 6.59
Low	1.93	1.13 - 3.28	1.88	1.02 - 3.48	1.40	0.20 - 9.57

OR: odds ratio; 95% CI: 95% confidence interval; ^aParental obesity: father's BMI ≥ 25 kg/m² and/or mother's BMI ≥ 25 kg/m²; ORs were adjusted for child's sex, birth weight, existence of siblings, exercise habit, eating speed, and chewing thoroughly.

overweight.

A limitation of the present study is that the respondent of the questionnaire was not considered. The influence of a perception about childhood obesity on overweight/obesity, health, and lifestyle of their children may differ according to the respondent (*i.e.* father, mother, or other guardians). In fact, the mother's influence on the overweight of her children has been previously shown to be particularly strong [15,34,35], while the father's, but not mother's, parenting behaviors and styles were associated with an increased risk of childhood overweight/obesity [36]. In future studies, the respondents to the questionnaire should be taken into consideration. Another limitation of this study was that parental height and weight was self-reported in our study. A previous study showed that self-reported weight was lower than measured weight [37]. Consequently, parental BMI in this study may have been underestimated. As a result, the sample size of the obese fathers and mothers in our study could have been decreased, and result in loss of statistical power as shown

by the wide confidence interval in the stratified analysis when both parents were obese (**Table 4**). Lastly, in the present study, the causal relationship could not be determined, as this was a cross-sectional study.

Since the prevalence of childhood overweight and obesity in Japan as well as in the world has been increasing, it is very important to investigate the risk factor of childhood obesity. The present study indicated that childhood overweight status was significantly associated with parental low or moderate perceptions regarding childhood obesity. However, when both parents are obese, the levels of parental perceptions regarding childhood obesity may not have a substantial effect on the overweight status of their children. Therefore, it is suggested that, when both parents are obese, not only is raising parental awareness important, but also encouraging parents to take actions to improve and prevent their own overweight status. This may lead to improvements in the lifestyle habits of children, and in turn, contribute to the prevention of childhood overweight.

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