

Characteristic Lifestyles in 6-year-old Children with Obese Parents: Results of the Toyama Birth Cohort Study

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Abstract

Objectives: The aim of this study was to identify characteristic lifestyles in children with obese parents.

Methods: 8,030 children (4,072 males and 3,958 females) aged 6 to 7 years were investigated. A questionnaire relating to the lifestyles of children was distributed through elementary schools for completion by parents. The heights and weights of parents were self-reported. A parent with a body mass index (weight in kilograms divided by the square of height in meters) greater than the 90th percentile for gender (26.7 kg/m² for fathers and 24.3 kg/m² for mothers) was defined as an obese parent. A chi-square test for each trend was applied to evaluate an increasing trend in the frequency or level of each lifestyle in children with obese parents.

Results: Children with obese parents were significantly associated with increasing trends in the proportions categorized by irregular intake of breakfast, faster eating, longer TV watching, and shorter sleeping hours.

Conclusions: These lifestyles are considered to be possible risk factors for the development of obesity. These characteristic lifestyles observed in children with obese parents could strengthen the relationship between child and parental body compositions, in addition to the genetic predisposition to obesity in children with obese parents. These findings indicate that education with lifestyle modification for obese parents will be required to prevent further weight gain in children with obese parents.

Key words: obesity, parent, children, lifestyle, the Toyama Study

Introduction

The increase in childhood obesity is a major public health concern in developed countries^{1,2}. The prevalence rate of obesity in school children has increased to 10 percent in Japan². Many previous studies have shown that the causes for the development of obesity may be divided into genetic factors, including parental obesity³ and environmental factors such as long TV watching and physical inactivity^{1,4}.

Although approximately 50–70% of obesity in subjects with

obese parents could be explained by genetic predisposition to obesity⁵, other causes of obesity in those with parental obesity are unclear, except for physical inactivity and fat intake. As for physical inactivity, a previous study showed that parental physical inactivity was a predictor of physical inactivity in children⁶, while another study gave conflicting results⁷. One previous study showed that maternal obesity was linked to increased fat intake in their children⁸. Therefore, children with obese parents could have different characteristics, leading to the development of obesity, in comparison with those with non-obese parents.

As for family-based treatment of childhood obesity, children aged 3 through 9 years are considered to be ideal candidates for treatment because parents still have the opportunity to influence their children's activity and diet³. Therefore, it is important to identify lifestyle characteristics in children aged 3 through 9 years with obese parents with consideration of efficient interventions for children with obese parents.

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Therefore, in this study, we evaluated the association between parental obesity and lifestyles in their children aged 6 to 7 years.

Subjects and Methods

The Toyama Birth Cohort Study is an ongoing follow-up study in Toyama prefecture. Detailed information about this study has been published elsewhere⁹⁻¹¹. In summary, this survey is focusing on the effects of environmental and lifestyle factors on child health. All subjects included in this study were born in a 1 year period between 2nd April, 1989 and 1st April, 1990. The initial questionnaire survey and anthropometric measurements (phase I) were conducted between 1992 and 1994. Findings obtained from phase II of the survey, conducted between June and July 1996, were used in the present analysis. The total population of the phase II survey consisted of 10,400 children. All subjects were 6 or 7 years old and belonged to the 1st grade in elementary school. The questionnaire was distributed through elementary schools; 10,175 children (97.8%) responded to the questionnaire. The following respondents were excluded from the analysis: those whose parental anthropometric findings were not obtained (835 subjects); those who did not answer one or more questions concerning TV watching, physical activity, eating habits, and sleeping habits (1,310 subjects). The remaining 8,030 children (4,072 males and 3,958 females, 77.2% of the total population) were the present study subjects.

Questionnaire and parental body mass

The distributed questionnaire was filled in by parents and consisted of the following items. Eating habits (frequency of taking breakfast, snacks and night snacks) were categorized into 4 groups on the basis of the frequency of intake. Speed of eating was evaluated as 1 of 4 levels: much faster than, faster than, similar to, or slower than peers. Physical activity compared to peers was evaluated as 1 of 4 levels: much less than, less than, more than, much more than peers. Preference for physical activity was categorized into 4 groups ranging from like very much to dislike. TV watching reported as average hours per school day in the evening was categorized into 4 groups ranging from less than 1 hour to 3 hours or more. Sleeping habits included wakeup time, bedtime, and sleeping hours and were categorized into 4 groups. Wakeup time: before 6 am, 6 to 7 am, 7 to 8 am, and after 8 am. Bedtime: before 9 pm, 9 to 10 pm, 10 to 11 pm, and after 11 pm. Sleeping hours: less than 8, 8 to 9, 9 to 10, and 10 hours or more. However, because the number of subjects who wake up after 8 am was too small (2 for male and 0 for female), these subjects were combined into the earlier categories in the analysis.

Questionnaire information on the height and weight of parents was self-reported. Parental obesity was defined as a parent with a body-mass index (BMI: weight in kilograms divided by square of height in meters) above the 90th percentile for gender (26.7 kg/m² for fathers and 24.3 kg/m² for mothers) in our population. In this study, children whose father, mother, or both were obese were defined as children with obese parents.

Statistical analysis

An unpaired t test was used to evaluate the difference in mean age between children with non-obese parents and those with obese parents. A chi-squared test for each trend¹² was applied to clarify an increasing or decreasing trend in the frequency or level of lifestyles of children with obese parents. All the statistical analyses were performed separately by gender using SPSS (7.5.1J) for Windows. A two-tailed p-value of less than 0.05 was considered significant.

Results

There was no significant difference in mean age of the children between the 2 groups (Table 1). The mean ages of mothers in male children and fathers in both male and female children with obese parent were significantly higher than in those with non-obese parents, although the differences were small (Table 1). As for taking breakfast, children with obese parents were significantly associated with an increasing trend in the proportion categorized by irregular intake of breakfast (Table 2). There was no significant difference in the proportions of children with non-obese parents and those with obese parents in the categories of the frequency of taking snacks and night snacks. In the speed of eating, children with obese parents were significantly linked with a higher proportion in the faster eating category. There was no significant difference between the proportions of children with non-obese parents and those with obese parents in the categories of the frequency and preference for physical activity compared to peers (Table 3). As for TV watching, children with obese parents were significantly associated with an increasing trend in the proportion categorized by long TV watching, compared with those with non-obese parents (Table 3). Regarding sleeping habits, male children with obese parents tended to get up earlier than those with non-obese parents (Table 4). For bedtime, female children with obese parents were significantly associated with an increasing trend in the proportion categorized by late bedtime. For sleeping hours, there was a significant increasing trend in the proportion categorized by short sleeping hours in both male and female children with obese parents.

Table 1 Differences in the mean ages of the two study groups

	male children (n=4,072)			female children (n=3,958)		
	non-obese parents n=3,347 mean±SD	obese parents n=725 mean±SD	p value	non-obese parents n=3,224 mean±SD	obese parents n=734 mean±SD	p value
children	6.54±0.29	6.55±0.29	ns	6.53±0.29	6.53±0.29	ns
father	37.0±4.44	38.2±4.68	p<0.001	37.3±4.48	37.9±4.78	p<0.005
mother	34.2±3.65	34.7±4.17	p<0.001	34.3±3.70	34.5±4.00	ns

Table 2 Eating habits in children with obese parents

	male children (n=4,072)		p value	female children (n=3,958)		p value
	non-obese parents n=3,347 n (%)	obese parents n=725 n (%)		non-obese parents n=3,224 n (%)	obese parents n=734 n (%)	
Breakfast						
daily	3,109 (92.9)	656 (90.5)		2,988 (92.7)	652 (88.8)	
almost daily	194 (5.8)	52 (7.2)		187 (5.8)	60 (8.2)	
sometimes	32 (1.0)	13 (1.8)		42 (1.3)	18 (2.5)	
almost never	12 (0.4)	4 (0.6)	p<0.05	7 (0.2)	4 (0.5)	p<0.001
Snack						
2 or more/day	451 (13.5)	103 (14.2)		415 (12.9)	108 (14.7)	
1/day	2,653 (79.3)	560 (77.2)		2,624 (81.4)	575 (78.3)	
1-2/week	172 (5.1)	44 (6.1)		135 (4.2)	37 (5.0)	
almost never	71 (2.1)	18 (2.5)	ns	50 (1.6)	14 (1.9)	ns
Night snack						
daily	161 (4.8)	47 (6.5)		146 (4.5)	33 (4.5)	
1/2-3 days	61 (1.8)	13 (1.8)		44 (1.4)	14 (1.9)	
1-2/week	143 (4.3)	35 (4.8)		121 (3.8)	38 (5.2)	
almost never	2,982 (89.1)	630 (86.9)	p<0.1	2,913 (90.4)	649 (88.4)	ns
Eating speed						
much faster	105 (3.1)	35 (4.8)		27 (0.8)	12 (1.6)	
faster	501 (15.0)	120 (16.6)		202 (6.3)	72 (9.8)	
similar to	1,631 (48.7)	367 (50.6)		1,608 (49.9)	336 (45.8)	
slower than	1,110 (33.2)	203 (28.0)	p<0.005	1,387 (43.0)	314 (42.8)	p<0.05

Table 3 Sedentary behavior in children with obese parents

	male children (n=4,072)		p value	female children (n=3,958)		p value
	non-obese parents n=3,347 n (%)	obese parents n=725 n (%)		non-obese parents n=3,224 n (%)	obese parents n=734 n (%)	
Exercise						
like very much	1,869 (55.8)	408 (56.3)		1,828 (56.7)	394 (53.7)	
like	1,223 (36.5)	252 (34.8)		1,227 (38.1)	299 (40.7)	
doesn't like	247 (7.4)	65 (9.0)		164 (5.1)	41 (5.6)	
dislike	8 (0.2)	0 (0.0)	ns	5 (0.2)	0 (0.0)	ns
Exercise						
much more	1,115 (33.3)	240 (33.1)		1,072 (33.3)	224 (30.5)	
more	1,734 (51.8)	361 (49.8)		1,792 (55.6)	415 (56.5)	
less	484 (14.5)	122 (16.8)		349 (10.8)	93 (12.7)	
much less	14 (0.4)	2 (0.3)	ns	11 (0.3)	2 (0.3)	p<0.1
TV watching						
<1 hour	729 (21.8)	114 (15.7)		788 (24.4)	142 (19.3)	
1-2 hours	1,559 (46.6)	336 (46.3)		1,529 (47.4)	323 (44.0)	
2-3 hours	794 (23.7)	207 (28.6)		688 (21.3)	196 (26.7)	
3 hours≤	265 (7.9)	68 (9.4)	p<0.001	219 (6.8)	73 (9.9)	p<0.001

Discussion

In this study, there were increasing trends for proportional changes in the frequency or level of lifestyle in children with obese parents, including the categories of irregular intake of breakfast, fast eating, long TV watching, and short sleeping hours.

As for eating habits, irregular intake of breakfast was an independent risk factor for child obesity in our previous study¹⁰. Fast eating was also associated with the development of obesity¹¹.

In the present study, we found that children with obese par-

ents were associated with the habit of longer TV watching. Many studies have shown that recent increases in childhood obesity could be largely explained by sedentary behavior including physical inactivity and longer TV watching^{1,4}. TV watching could result in a decrease in metabolic rate leading to the development of obesity¹³.

A recent laboratory study on sleep debt showed that sleep restriction caused a significant increase in serum cortisol and cardiac sympathetic nerve activity, and a slow insulin secretion response following intravenous glucose injection¹⁴. These changes are

Table 4 Sleeping habits in children with obese parents

	male children (n=4,072)		p value	female children (n=3,958)		p value
	non-obese parents n=3,347 n (%)	obese parents n=725 n (%)		non-obese parents n=3,224 n (%)	obese parents n=734 n (%)	
Wakeup time						
before 6 a.m.	93 (2.8)	37 (5.1)		55 (1.7)	21 (2.9)	
6–7 a.m.	2,590 (77.4)	554 (76.4)		2,597 (80.6)	572 (77.9)	
after 7 a.m.	664 (19.8)	134 (18.5)	p<0.05	572 (17.7)	141 (19.2)	ns
Bedtime						
before 9 p.m.	578 (17.3)	116 (16.0)		638 (19.8)	133 (18.1)	
9–10 p.m.	2,429 (72.6)	516 (71.2)		2,259 (70.1)	506 (68.9)	
10–11 p.m.	328 (9.8)	91 (12.6)		321 (10.0)	89 (12.1)	
after 11 p.m.	12 (0.4)	2 (0.3)	p<0.1	6 (0.2)	6 (0.8)	p<0.05
Sleep hours						
<8 hours	39 (1.2)	11 (1.5)		43 (1.3)	15 (2.0)	
8–9 hours	739 (22.1)	196 (27.0)		725 (22.5)	193 (26.3)	
9–10 hours	2,380 (71.1)	487 (67.2)		2,262 (70.2)	486 (66.2)	
10 hours≤	189 (5.6)	31 (4.3)	p<0.005	194 (6.0)	40 (5.4)	p<0.05

closely related to the development of obesity¹⁵). In addition, growth hormone (GH) mainly secreted during the first half of the night is decreased in subjects with short sleeping hours¹⁶. GH plays an important role in maintaining lipolysis during the night¹⁷. So, a decrease in GH could theoretically lead to weight gain.

Therefore, all the observed characteristic lifestyles in children with obese parents could be risk factors for the development of obesity. These lifestyle factors could strengthen the relationship between obesity in children and their parents, in addition to the genetic predisposition of children with obese parents to obesity.

The present study has some limitations for the interpretation of the results. Firstly, the height and weight of parents were self-reported in the questionnaire. This could lead to misclassification of parental obesity. However, a previous study has shown that self-reported anthropometric data were highly associated with real measurements and acceptable for determining clinical obesity¹⁸, although others have demonstrated over-reporting in height and under-reporting in weight, leading to an underestimation of BMI^{19,20}. However, the relationship between parental obesity and lifestyles of their children would be stronger when accurate the anthropometric measurements are used in the analysis, because this underestimation may lead to a dilution of the relationship.

Secondly, overweight parents could be misclassified into obese because an increased BMI reflects not only increased fat volume but also musculoskeletal mass²¹). This misclassification could lead to a dilution of the relationship between lifestyle of children and parental obesity. In the present study, both frequency and preference of physical activity were not associated with parental obesity. Other studies have produced contradictory findings. One previous study showed that physical activity and energy expenditure in children with obese mothers were not different from those with nonobese mothers⁷). However, another study reported that physical inactivity in parents was a strong predictor of inactivity in their children⁶). Therefore, in this study, misclassification of obese parents could weaken the relationship between physical inactivity of children and parental obesity. Therefore, further studies using validated methods to evaluate the degree of obesity will be

required to evaluate accurately the relationship between physical activity and parental obesity.

Thirdly, it is known that obese subjects may under report the degree of each lifestyle and nutritional status such as intake of greasy foods²²). However, as for TV watching, sleeping hours, and fast eating, the relationship between lifestyles of children and parental obesity would be stronger when accurate data are used in the analysis.

In conclusion, children with obese parents were significantly associated with increasing trends in the following categories: irregular intake of breakfast, fast eating, long TV watching, and short sleeping hours. These lifestyles are possible risk factors for the development of obesity. The aforementioned lifestyle characteristics observed in children with obese parents could strengthen the relationship between child and parental body composition, in addition to the genetic predisposition to obesity in children with obese parents. Therefore, education with lifestyle modifications for obese parents will be required to prevent further weight gain in children with obese parents.

The findings of this study were presented at the 70th congress of the Japanese Society for Hygiene in 2000 held in Osaka, Japan

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