

ORIGINAL

Effects of lifestyle habits and eating meals together with the family on the prevalence of obesity among school children in Tokushima, Japan : a cross-sectional questionnaire-based survey

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Abstract : Obesity in children has become a major global public health concern. The prevention of obesity must start from early childhood in order to establish sound lifestyle habits and promote healthy adulthood. In this study, we evaluated factors associated with the prevention of obesity and the development of healthy lifestyle habits in children. A cross-sectional, questionnaire-based survey was performed in elementary and junior high school students in Tokushima Prefecture, Japan, during the summer of 2004. The questionnaire consisted of 30 items such as physique, sleep, eating habits, diet, exercise, free time, and attending after-school lessons. Our study revealed that eating meals as a family every day is associated with a lower rate of obesity as well as getting good lifestyle habits such as eating balanced meals and getting enough sleep. Of the 3,291 students who responded to the questionnaire, 2,688 (81.7%) reported that they eat meals with their family every day. The percentage of students who eat meals with their family every day decreased with increasing school grade, with the lowest percent in the junior high school students. However, the results regarding female junior high school students revealed a marked association between eating meals with the family every day and good lifestyle habits. We recommend that parents and school teaching staff encourage the establishment of sound, healthy lifestyle habits in children from early childhood as an effective measure for the prevention of obesity. *J. Med. Invest.* 55 : 71-77, February, 2008

Keywords : obesity, children, questionnaire survey, eating with family, lifestyle habits

INTRODUCTION

Recent publications predict that the severity of obesity will continue to rise and its prevalence will increase globally ; in the United Kingdom, it has

been stated that there could be further increases in the prevalence of obesity among U.K. children, with about 19% of boys and 24% of girls aged 10 being predicted to be obese by 2010 (1). Many studies demonstrated that overweight children tend to become overweight and obese adults. Also, there is substantial evidence that childhood obesity is a major risk factor for adulthood morbidity, especially cardiovascular disease. Therefore, in recent years, the prevention of obesity in childhood has been considered crucial for the prevention of lifestyle-related

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diseases in adults (2, 3).

Previous studies have shown the association between the prevention of obesity in children and their lifestyle habits, such as the contents of meals, exercise, and how they spend their leisure time (such as watching TV) (4-7). The prevention of obesity should start from childhood and must be combined with health education strategies and other measures for the encouragement of health-promoting habits, which is necessary for the healthy growth of the bodies and minds of children (8).

In this study, we aimed at evaluating the factors associated with the prevention of obesity and the formation of healthy lifestyle habits in school children in Tokushima Prefecture.

SUBJECTS AND METHODS

To evaluate the factors associated with childhood obesity and the methods for its prevention among children in Tokushima Prefecture, we included children from three different age groups. Therefore, we selected three different grades of school children to represent the desired age groups eligible for our study : first and fourth grade elementary and first grade junior high school children. In Tokushima Prefecture, there are 237 elementary schools and 93 junior high schools, from which 88 and 39 schools were randomly selected, respectively. From each one of the 127 randomly selected schools, only one class was included in our study. Thus, 45 classes of first grade and 43 classes of fourth grade elementary school and 39 classes of junior high school children constituted the total sample size of 3,301 children who participated in our study. We conducted this cross-sectional, questionnaire-based survey study in Tokushima Prefecture during a two-month period from June to July 2004.

We prepared a 30 item questionnaire that focused on personal information, e.g., age, sex, weight, height, etc., and information on meals, physical activity, sleeping, and how the children spend their leisure time. Questionnaires were distributed to all participating children, who were asked to answer the

questions and return the questionnaires to us. For elementary school children, parents were requested to answer the questionnaire for their children, while junior high school children responded to the questionnaire by themselves. Obesity was checked in every child according to the standard methods followed in determining obesity in Japan. Obesity in children is defined as those whose relative body weight is more than 120% of the standard weight for their sex and height. The standard weight based on the median weight for each height (per cm) by sex was calculated from Tokushima-based data obtained between 2000 and 2002 (9). We achieved a 100% response rate for our questionnaire-based survey. However, nine children missed answering some questions. The number of students was 1144 (569 males and 575 females), 1,020 (513 males and 507 females), and 1,137 (581 males and 556 females) for the first and fourth grade elementary and first grade junior high schools, respectively.

Statistical analysis

Questionnaires were collected, the data were coded and entered into a computer, and then analyzed using the SPSS (Statistical Package for Social Sciences) version 11. The chi-square test, Mann-Whitney test, Mantel-Haenszel analysis, and analysis of covariance (ANCOVA) were used to examine the differences between groups with and without adjustments for school years.

RESULTS

A total of 1,336 males (80.6%) and 1,352 females (82.8%) replied that they eat meals as a family every day. According to school years, the percentage of students who eat meals as a family every day decreased with increasing school years in both males and females : 522 males (92.1%) and 533 females (93.0%) in the first year of elementary school, 456 males (89.1%) and 452 females (89.5%) in the fourth year of elementary school, and 358 males (61.8%) and 367 females (66.0%) in the first year of junior high school (Table 1).

Table 1 Gender and eating with one's family of the children distributed according to their school grade.

Number(%)	Boys		p	Girls		p
	Eat with family			Eat with family		
	Every day	Not every day		Every day	Not every day	
First grade of elementary school	522(92.1)	45(7.9)		533(93.0)	40(7.0)	
Fourth grade of elementary school	456(89.1)	56(10.9)	<0.001	452(89.5)	53(10.5)	<0.001
First grade of junior high-school	358(61.8)	221(38.2)		367(66.0)	189(34.0)	
Total	1336(80.6)	322(19.4)		1352(82.7)	282(17.3)	

1st-year of elementary school

Table 2 shows the analysis of data regarding obesity and life style among school children in the first year of elementary school. In males, the percentages of children who eat breakfast every day and those who eat vegetables every day were significantly higher in the group who eat meals as a family every day compared to those who do not, while, in the females, the percentage of girls who eat vegetables every day was significantly higher in the group who eat meals as a family every day than in the other group.

4th-year of elementary school

In males in the fourth year of elementary school, the percentage of children who eat breakfast every day was significantly higher in the group who eat meals as a family every day compared to those who do not. However, significance was not observed in females of the same grade. The percentage of obese children was significantly lower among females of the fourth grade who eat meals as a family every day than the group who do not (Table 3).

1st-year of junior high school

In males in the first year of junior high school, the percentages of children who eat breakfast every day and those who eat vegetables every day were significantly higher in the group who eat meals as a family every day than in their counterparts. In the females, the girls who eat meals as a family every day showed a significantly higher percentage of eating breakfast every day, eating vegetables every day, and of getting a longer sleep time than their counterparts. Those girls also showed a significantly lower frequency of eating precooked noodles, and a significantly shorter time spent indoors or watching TV (Table 4).

After adjustments for school years, data were separately re-analyzed for boys and girls (Table 5). In males, the percentages of children who eat breakfast every day and those who eat vegetables every day were significantly higher in the group who eat meals as a family every day than in their counterparts. In addition, the group who eat meals as a family every day showed a significantly longer sleep time than the others.

Table 2 Comparison between first grade elementary school children who eat with their family every day and those who do not as regards obesity and different lifestyle habits.

	Boys			Girls		
	Eat with family		p	Eat with family		p
	Every day	Not every day		Every day	Not every day	
Number(%)	522 (92.1)	45 (7.9)		533 (93.0)	40 (7.0)	
Physique						
Obese	43 (9.5)	6 (15.4)	0.241 ^{a)}	30 (6.6)	2 (5.9)	0.876 ^{a)}
Non-obese	409 (90.5)	33 (84.6)		427 (93.4)	32 (94.1)	
Feeding on awakening in morning						
Good	182 (35.0)	12 (26.7)	0.259 ^{a)}	178 (33.5)	18 (45.0)	0.140 ^{a)}
Not good	338 (65.0)	33 (73.3)		353 (66.5)	22 (55.0)	
Eating breakfast						
Every day	463 (88.7)	35 (77.8)	0.032 ^{a)}	462 (86.7)	33 (82.5)	0.457 ^{a)}
Not every day	59 (11.3)	10 (22.2)		71 (13.3)	7 (17.5)	
Eating vegetables						
Every day	206 (39.6)	11 (24.4)	0.045 ^{a)}	218 (41.0)	9 (22.5)	0.021 ^{a)}
Not every day	314 (60.4)	34 (75.6)		314 (59.0)	31 (77.5)	
Frequency of eating instant noodles						
Once a week	447 (86.1)	37 (82.2)	0.471 ^{a)}	473 (89.1)	32 (80.0)	0.083 ^{a)}
More once a week	72 (13.9)	8 (17.8)		58 (10.9)	8 (20.0)	
Average hours spent ± SD						
Sleeping	9.3±0.58	9.3±0.58	0.543 ^{b)}	9.3±0.65	9.1±0.58	0.165 ^{b)}
In room	3.2±1.55	3.4±1.55	0.394 ^{b)}	2.9±1.44	3.1±1.89	0.896 ^{b)}
Watching television	1.5±0.91	1.6±1.06	0.904 ^{b)}	1.5±0.93	1.6±0.99	0.797 ^{b)}

^{a)}χ² test

^{b)}Mann-Whitney test

Table 3 Comparison between fourth grade elementary school children who eat with their family every day and those who do not as regards obesity and different lifestyle habits.

	Boys			Girls			
	Eat with family		p	Eat with family		p	
	Every day	Not every day		Every day	Not every day		
Number(%)	456 (89.0)	56 (10.9)		452 (89.5)	53 (10.5)		
Physique							
	Obese	52 (12.3)	10 (19.6)	0.145 ^{a)}	36 (8.4)	13 (27.7)	<0.001 ^{a)}
	Non-obese	370 (87.7)	41 (80.4)		392 (91.6)	34 (72.3)	
Feeding on awakening in morning							
	Good	132 (29.0)	11 (20.0)	0.160 ^{a)}	140 (31.0)	12 (22.6)	0.211 ^{a)}
	Not good	323 (71.0)	44 (80.0)		312 (69.0)	41 (77.4)	
Eating breakfast							
	Every day	407 (89.3)	41 (73.2)	<0.001 ^{a)}	404 (89.6)	47 (88.7)	0.840 ^{a)}
	Not every day	49 (10.7)	15 (26.8)		47 (10.4)	6 (11.3)	
Eating vegetables							
	Every day	190 (41.7)	17 (30.4)	0.104 ^{a)}	201 (44.5)	21 (39.6)	0.501 ^{a)}
	Not every day	266 (58.3)	39 (69.6)		251 (55.5)	32 (60.4)	
Frequency of eating instant noodles							
	Once a week	379 (83.5)	43 (76.8)	0.211 ^{a)}	378 (83.8)	45 (84.9)	0.838 ^{a)}
	More once a week	75 (16.5)	13 (23.2)		73 (16.2)	8 (15.1)	
Average hours spent \pm SD							
Sleeping		9.3 \pm 0.58	8.6 \pm 0.87	0.030 ^{b)}	8.8 \pm 0.66	8.8 \pm 0.69	0.501 ^{b)}
In room		3.3 \pm 1.55	3.1 \pm 1.60	0.278 ^{b)}	3.4 \pm 1.60	3.4 \pm 1.94	0.800 ^{b)}
Watching television		1.6 \pm 0.99	1.4 \pm 0.93	0.110 ^{b)}	1.8 \pm 1.10	1.9 \pm 1.17	0.901 ^{b)}

^{a)} χ^2 test^{b)}Mann-Whitney test**Table 4** Comparison between first grade junior high-school children who eat with their family every day and those who do not as regards obesity and different lifestyle habits.

	Boys			Girls			
	Eat with family		p	Eat with family		p	
	Every day	Not every day		Every day	Not every day		
Number(%)	358 (61.8)	221 (38.2)		367 (66.0)	189 (34.0)		
Physique							
	Obese	53 (15.3)	41 (19.3)	0.218 ^{a)}	40 (11.6)	19 (10.9)	0.811 ^{a)}
	Non-obese	293 (84.7)	171 (80.7)		304 (88.4)	155 (89.1)	
Feeding on awakening in morning							
	Good	71 (19.8)	39 (17.6)	0.515 ^{a)}	72 (19.7)	24 (12.8)	0.042 ^{a)}
	Not good	287 (80.2)	182 (82.4)		294 (80.3)	164 (87.2)	
Eating breakfast							
	Every day	290 (81.0)	155 (70.1)	0.003 ^{a)}	314 (85.6)	122 (64.9)	<0.001 ^{a)}
	Not every day	68 (19.0)	66 (29.9)		53 (14.4)	66 (35.1)	
Eating vegetables							
	Every day	189 (52.8)	91 (41.2)	0.007 ^{a)}	219 (59.7)	75 (40.1)	<0.001 ^{a)}
	Not every day	169 (47.2)	130 (58.8)		148 (40.3)	112 (59.9)	
Frequency of eating instant noodles							
	Once a week	208 (58.1)	125 (56.6)	0.716 ^{a)}	271 (73.8)	112 (60.2)	<0.001 ^{a)}
	More once a week	150 (41.9)	96 (43.4)		96 (26.2)	74 (39.8)	
Average hours spent \pm SD							
Sleeping		9.3 \pm 0.58	7.4 \pm 1.28	0.193 ^{b)}	7.4 \pm 1.07	7.0 \pm 1.15	<0.001 ^{b)}
In room		5.0 \pm 2.48	5.0 \pm 2.58	0.735 ^{b)}	5.1 \pm 2.51	5.9 \pm 2.72	0.003 ^{b)}
Watching television		1.9 \pm 1.50	1.9 \pm 1.50	0.703 ^{b)}	2.1 \pm 1.60	2.7 \pm 2.07	0.003 ^{b)}

^{a)} χ^2 test^{b)}Mann-Whitney test

Table 5 Comparison of obesity and different lifestyle habits in all the studied children after adjusting for their school year.

	Boys			Girls		
	Eat with family		p	Eat with family		p
	Every day	Not every day		Every day	Not every day	
Number(%)	1336 (80.6)	322 (19.4)		1352 (82.8)	282 (17.3)	
Percent						
Physique*						
Obese	12.4	18.1	0.049 ^{a)}	8.9	14.3	0.114 ^{a)}
Non-obese	87.6	81.9		91.1	85.7	
Feeding on awakening in morning*						
Good	27.9	21.5	0.103 ^{a)}	28.0	27.1	0.197 ^{a)}
Not good	72.1	78.5		72.0	72.9	
Eating breakfast*						
Every day	86.2	73.7	<0.001 ^{a)}	87.2	78.4	<0.001 ^{a)}
Not every day	13.8	26.3		12.8	21.6	
Eating vegetables*						
Every day	44.9	32.1	<0.001 ^{a)}	48.4	33.8	<0.001 ^{a)}
Not every day	55.1	67.9		51.6	66.2	
Frequency of eating instant noodles*						
Once a week	78.0	71.6	0.332 ^{a)}	82.3	74.8	0.002 ^{a)}
More once a week	22.0	28.4		17.7	25.2	
Average hours spent ± SD						
Sleeping**	8.6±0.56	8.3±0.41	<0.001 ^{b)}	8.5±0.51	8.1±0.40	<0.001 ^{b)}
In room**	3.8±1.22	4.0±0.89	0.337 ^{b)}	3.8±1.21	4.4±0.94	<0.001 ^{b)}
Watching television**	1.7±0.70	1.7±0.52	0.937 ^{b)}	1.8±0.79	2.2±0.62	<0.001 ^{b)}

^{a)}Mantel-Haenszel test

^{b)}ANCOVA test

* : rate after direct adjustment for the children school year (standard population : total)

** : average hour time and SD after adjustment for the children school year

For females, the percentages of girls who eat breakfast every day and those who eat vegetables every day were significantly higher in the group who eat meals as a family every day than in their counterparts. In addition, females who eat meals as a family every day showed a significantly lower frequency of eating precooked noodles than the other group. Moreover, the girls who eat meals as a family every day showed a significantly longer mean sleeping time and a significantly shorter time spent indoors and watching TV.

DISCUSSION

Our study evaluated factors associated with obesity among school children in Tokushima, aiming to identify lifestyle habits that can affect the occurrence of obesity in order to prevent them. In this cross-sectional study, we evaluated the issue of eating meals as a family every day to clarify if it is associated with obesity and other lifestyle habits. The question was : “Do you eat together with your family at least once a day?” The corresponding an-

swer was from one of five choices : 1 : almost every day of the week, 2 : four or five times / week, 3 : two or three times / week, 4 : once / week, 5 : almost never. Based on the answers, we categorized students into two main groups : those who eat almost everyday with their families (answer No.1) as one group, and those who gave a different answer (answer Nos. 2-5) as the other. In fact, the question did not specify which members of the family to eat with or the meal that is shared with the family. In Japan, eating lunch usually takes place in schools, while breakfast and supper are eaten at home.

Also, we do not know if the respondents understood whether the question meant eating with the family while sitting together at the table to eat, or just to eat at home in the presence of one or more of the family members who may be either eating together or busy doing something else.

Children’s lifestyle habits (such as contents of meals and eating habits) are affected by their parents. Therefore, many studies have suggested the necessity for interventions in parents for the prevention of obesity and the formation of good lifestyle habits in their children (10-16). The question-

naire item that asked about eating meals as a family every day was included to reflect the lifestyles of both children and their parents.

Therefore, our analysis was based on comparisons between those who eat with their family everyday and those who do not. Our results demonstrated that eating meals as a family every day was associated with the absence of obesity and good lifestyle habits such as the contents of meals and sleep. Also, the results showed a significantly earlier supper time for girls who eat meals as a family every day than others who do not (data not shown). As a parent-associated factor, this early supper time may be associated with the home situation (for example, full-time housewives and working conditions such as part-time jobs) (2, 6), allowing parents (mostly mothers or grandmothers) to prepare supper relatively early to facilitate eating together as a family, though this situation was not surveyed in this study. Though the number of family members eating together was not included in this questionnaire, eating in a lively atmosphere may reduce the risk of obesity, contributing to the development of good lifestyle habits. This is supported by reports that confirmed a lower risk of obesity (especially in female children) in the presence of brothers and sisters (17).

Concerning child-associated factors (cram school, watching TV, games, etc.), the percentage of children who do not attend cram schools was significantly higher in the group who eat meals as a family every day (data not shown). Generally, the percentage of children who attend cram schools rises with increasing school grade, a finding which may have reduced the percentage of children who eat meals as a family every day.

As for these results, two factors are thought to be involved : first, for children attending cram school, there is a possibility their supper time changes. A second reason is that, with advancing school grade, children grow and become independent of their parents, so, mothers usually start to have jobs, and this may explain the later supper times. It is important here to mention that among the female junior high school students, there were significant differences in getting good lifestyle habits among those who eat meals as a family every day compared to those who do not.

These data are of great importance for two reasons. One reason is that junior high school girls are undergoing or will soon be entering their second physical growth period, in which they are often emo-

tionally unstable, so it is good for girls to eat meals as a family, show a longer sleep time, have pleasant feelings on awakening, and eat breakfast every day. The second reason is that obesity and lifestyle habits in children have been reported to be associated with those in adults. Therefore, it is very important for children to acquire good lifestyle habits during their childhood to continue such good lifestyle practices into adulthood. These girls are future mothers, who will have a great influence on the lifestyles of their children and subsequent generations.

Our findings are important for those who are concerned with and planning adolescent health promotion, and may provide clues to help in developing and establishing good lifestyle habits among children. Parents and school teaching staff should promote sound, healthy lifestyle habits in children from early childhood as an effective primary preventive measure against childhood and adult obesity.

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REFERENCES

1. Zaninotto P, Wardle H, Stamatakis E, Mindell J, Head J : Forecasting obesity to 2010. London : National Centre for Social Research/Department of Health, 2006
2. Gibson LY, Byrne SM, Davis EA, Blair E, Jacoby P, Zubrick SR : The role of family and maternal factors in childhood obesity. *Med J Aust* 186 : 591-595, 2007
3. Anderson SE, Cohen P, Naumova EN, Must A : Relationship of childhood behavior disorders to weight gain from childhood into adulthood. *Ambul Pediatr* 6 : 297-301, 2006
4. Sekine M, Yamagami T, Hamanishi S, Handa K, Saito T, Nanri S, Kawaminami K, Tokui N, Yoshida K, Kagamimori S : Parental obesity, lifestyle factors and obesity in preschool children : results of the Toyama Birth Cohort study. *J Epidemiol* 12 : 33-39, 2002
5. Kagamimori S, Yamagami T, Sokejima S,

- Numata N, Handa K, Nanri S, Saito T, Tokui N, Yoshimura T, Yoshida K : The relationship between lifestyle, social characteristics and obesity in 3-year-old Japanese children. *Child Care Health Dev* 25 : 235-247, 1999
6. Takahashi E, Yoshida K, Sugimori H, Miyakawa M, Izuno T, Yamagami T, Kagamimori S : Influence factors on the development of obesity in 3-year-old children based on the Toyama study. *Prev Med* 28 : 293-296, 1999
 7. Saelens BE, Sallis JF, Nader PR, Broyles SL, Berry CC, Taras HL : Home environmental influences on children's television watching from early to middle childhood. *J Dev Behav Pediatr* 23 : 127-32, 2002
 8. Chen X, Sekine M, Hamanishi S, Wang H, Gaina A, Yamagami T, Kagamimori S : Lifestyles and health-related : quality of life in Japanese school children : a cross-sectional study. *Prev Med* 40 : 668-678, 2005
 9. Sei M, Nakatsu T, Yuasa K, Tanaka H, Indriani, Munakata H, Nakahori Y : Prevalence of metabolic complication in children with severe obesity : *Pediatrics International* 49 : 545-552, 2007
 10. Laessle RG, Uhl H, Lindel B, Müller A : Parental influences on laboratory eating behavior in obese and non-obese children. *Int J Obes Relat Metab Disord* 1 : S60-62, 2001
 11. Laessle RG, Uhl H, Lindel B : Parental influences on eating behavior in obese and non-obese preadolescents. *Int J Eat Disord* 30 : 447-453, 2001
 12. Seibold ES, Knafelz K, Grey M : The family context of an intervention to prevent type 2 diabetes in high-risk teens. *Diabetes Educ* 29 : 997-1004, 2003
 13. Borra ST, Kelly L, Shirreffs MB, Neville K, Geiger CJ : Developing health messages : qualitative studies with children, parents, and teachers help identify communications opportunities for healthful lifestyles and the prevention of obesity. *J Am Diet Assoc* 103 : 721-728, 2003
 14. Wang H, Sekine M, Chen X, Kanayama H, Yamagami T, Kagamimori S : Sib-size, birth order and risk of overweight in junior high school students in Japan : results of the Toyama Birth Cohort Study. *Prev Med* 44 : 45-51, 2007
 15. Young KM, Northern JJ, Lister KM, Drummond JA, O'Brien WH : A meta-analysis of family-behavioral weight-loss treatments for children. *Clin Psychol Rev* 27 : 240-249, 2007
 16. Brunstrom JM, Mitchell GL, Baguley TS : Potential early-life predictors of dietary behaviour in adulthood : a retrospective study. *Int J Obes (Lond)* 29 : 463-74, 2005
 17. Dubois L, Girard M, Potvin Kent M : Breakfast eating and overweight in a pre-school population : is there a link? *Public Health Nutr* 9 : 436-442, 2006