



Association between maternal feeling about pregnancy and child's lifestyle

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ASSOCIATION BETWEEN MATERNAL FEELING ABOUT PREGNANCY AND CHILD'S LIFESTYLE

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Abstract : The number of children with undesirable lifestyles has recently increased. We tested the hypothesis that maternal feelings about pregnancy might be associated with their attitude towards promoting healthy lifestyles in their children. We used a city database collected from guardians of 204 randomly selected children aged 1 to 3 years in Nihonmatsu City, Fukushima. Maternal feeling about pregnancy was measured using a 10-point scale, and a child lifestyle score was calculated as the sum of desirable lifestyle habits (sleeping, eating, watching TV/videos, and tooth brushing). Associations between maternal feeling and her child's lifestyles were examined with multiple logistic regression analysis. For all lifestyle items, proportion of children with undesirable lifestyle habits was higher in the "unhappy group" (those who scored 1 to 9) than in the "happy group" (those who scored 10). In particular, a child's short sleeping hours (odds ratio [OR]=3.01) and lifestyle score of less than 3 ([OR]=3.60) were significantly associated with unhappy feelings. This was apparent among mothers aged 29 (median age) or younger. Our results indicate an association between a mother's unhappy feelings about pregnancy and her child's undesirable lifestyle, especially among relatively younger mothers. These findings provide public health implications important for early familial intervention to improve children's lifestyles.

Key words : Child, lifestyle, pregnancy, mothers, Japan

INTRODUCTION

In recent years, children's lifestyles have changed drastically in Japan¹⁾. According to a national survey conducted in 2000 by The Japanese Society of Child Health, children's nocturnal sleep durations have become shorter due to later bedtimes²⁾. Bedtime for the more than half of children (54.4% for 1-year olds, 59.2% for 2-year olds, 51.7% for 3-year olds)

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was 10 p.m. or later, which represents a more than two-fold increase since 1980²⁾. An increase in time spent watching TV/videos has also been reported, with about 70% of children watching TV/videos more than 2 hours per day²⁾. The proportion of children who play inside the house has also increased²⁾. The Nutrition Surveillance of Young Children conducted in 2005 reported that the proportion of children who have an unbalanced diet has nearly doubled over the last decade, and about 40% of children do not eat vegetables every day³⁾. Along with these undesirable lifestyle habits, there is a nationwide increase in childhood obesity, which contribute to development of lifestyle disease during childhood and adulthood⁴⁾.

Children's lifestyles are largely influenced by their familial environment, such as parental lifestyles, parent education, and socioeconomic status. Family structure, mother's work status, and parental physical activity have been reported as correlates of children's physical activity^{5,6)}. Previous studies have shown that parental dietary behaviors, parental awareness of dietary behaviors, and child-feeding practices influence their children's development of dietary behaviors^{7,8)}.

The role of maternal mental status has received increased attention in Japan due to the government's intention to improve the parenting environment and in turn, increase the declining birth rate. Studies, mostly from western countries, have reported that maternal feelings about the pregnancy are associated with negative lifestyle practices, such as drinking and smoking during pregnancy⁹⁾. Furthermore, these feelings influence children's psychomotor development, and emotional and attentional regulation¹⁰⁾. Researchers in Japan have begun investigating long-term influences of maternal mental state on children's psychological and physical development¹¹⁾, but have not examined children's lifestyles, even though prevention of lifestyle-related diseases is the main goal of the government's national health plan¹²⁾.

In an attempt to investigate factors which may aid in early family intervention to improve children's lifestyles, we analyzed the association between Japanese maternal feelings about pregnancy and children's lifestyles using existing community data from one city in Japan. The following four lifestyle indicators available in the dataset were included in the present analyses : child's sleeping hours, mother's attitudes towards her child's dietary habits, time spent watching TV/video, and tooth brushing. Selection of these lifestyle indicators was based on previous review studies on childhood obesity which indicates physical activity, sedentary behavior (e.g., watching television and reading), dietary patterns, and sleeping hours as fundamental components of a child's lifestyle^{13,14)}. In addition, child's dental habits have been reported to be associated with maternal cognitive, behavioral, and psychosocial factors¹⁵⁾.

METHODS

Data were obtained from a database developed to frame a healthy lifestyle support plan in Nihonmatsu City, Fukushima Prefecture, Japan¹⁶⁾. The database contained responses to a health survey conducted in accordance to the national health plans ("Healthy Japan 21" and

“Healthy and Happy Family 21”). Guardians of children aged 1 to 3 years were selected from a residence registry as of November 1, 2006 through single-stage random sampling. With a sampling ratio of 13%, which was set considering the survey feasibility and assuming the response rate to be 50%, 204 out of 1566 children were selected. Anonymous, self-administered questionnaires were distributed and collected via mail. In the present analysis, we excluded data for which responses had been made by someone other than the mother. Use of the database was approved by the city, and we worked in accordance with the Ethical Guidelines for Epidemiological Studies established by the Japanese government.

The questionnaire, which was jointly developed by the city and our team in the Department of Public Health at Fukushima Medical University, consisted of items pertaining to socio-demographic background, feelings about pregnancy, maternal antenatal health behavior and knowledge, child-rearing conditions, and the child’s lifestyle. Respondents rated their feelings about pregnancy on a 10-point scale ranging from 1 (very unhappy) to 10 (very happy), which was used in the National Survey of Family Growth (NSFG) in the United States. The measurement was translated into Japanese as described previously¹⁷⁾. In this study, respondents were dichotomized into two groups by their score: the happy group (score of 10) and the unhappy group (score of 1–9). This classification was based on a previous survey report by NSFG, in which respondents scoring 10 were treated as one group while those scoring 1 to 9 were classified into four groups¹⁸⁾.

Questions regarding children’s lifestyles were cited from the Child Health Survey 2000²⁾. For each lifestyle item, we defined “undesirable” habits as follows: sleeping less than 11.5 hours/day, watching TV 3 or more hours/day, and mothers answering “no” to questions asking whether they pay attention to their children’s dietary habits and whether they brush their children’s teeth every day. Median values were used to dichotomize sleeping hours and time spent watching TV/video. Each desirable habit was counted as 1 point, and we defined the total lifestyle score as the sum of the four habits. This type of scoring is similar to the Health Practice Index in the Alameda study and our previous study^{19,20)}.

We examined the association of unhappy feeling about the pregnancy (score of 1–9) with undesirable lifestyle indicators by using multiple logistic regression analysis. We controlled for seven factors which were previously reported to associate with maternal parenting behavior^{21–23)} and available in our dataset: child’s age, sex, living with siblings, living with grandparents, mother’s age at delivery, mother’s confidence in child rearing, and father’s cooperation in child rearing. To further explore the influences of confounding factors, we conducted stratified analyses, and tested for homogeneity when needed. Analyses were performed using Dr. SPSS II statistical software for Windows (SPSS Japan Inc., Tokyo).

RESULTS

The total number of respondents was 128 (response rate=62.7%). We analyzed 117 and excluded 11 because the questionnaires had been completed by people other than the mothers.

Characteristics of respondents are shown in Table 1. Proportion of boys was 52.1% and

Table 1. Characteristics of respondents

	Mean (SD) or <i>N</i> (%) [<i>N</i> =117]
Parents	
Maternal age at delivery	29.0 (4.7)
Paternal age at delivery	31.4 (6.0)
Maternal confidence in child rearing	
Have confidence	20 (17.1)
No confidence	97 (82.9)
Paternal cooperation in child rearing	
Cooperative	103 (88.0)
Not cooperative	12 (10.3)
Children	
Sex	
Boy	61 (52.1)
Girl	56 (47.9)
Age (years)	
1	32 (27.4)
2	36 (30.8)
3	49 (41.9)
Cohabitation	
†Grandparents	
Yes	66 (56.4)
No	49 (41.9)
†Siblings	
Yes	35 (29.9)
No	80 (68.4)

† : Totals across columns for these items do not add up to the total number indicated in top row because of missing data.

children's age distribution was as follows : 1 year old 27.4%, 2 years old 30.8%, and 3 years old 41.9%. Median age of mothers at delivery was 29 years (range=18-45). Percentage of mothers who rated their feeling about the pregnancy as a 10 (classified as the "happy group") was 63.2%. Children slept a median of 11.5 hours/day (range=9.75-13.5), including naps. Only 47.0% of children spent less than 2 hours/day watching TV/video, while 24.8% spent more than 3 hours/day watching TV/video. Median lifestyle score was 3 (range=0-4).

Associations between maternal feeling about pregnancy and child's lifestyle are shown in Table 2. For all items, the proportion of mothers giving undesirable answers was higher in the unhappy group than the happy group. In particular, we observed significant associations for not brushing the child's teeth every day (odds ratio [OR]=2.72) and for overall low lifestyle score (OR=2.52) in bivariate analyses. After adjusting for seven factors previously reported to be associated with parenting, child's dental habit did not remain significant, and the ORs of lifestyle score and child's sleeping hours increased. An additional analysis showed that the proportion of children whose bedtime was 10 p.m. or later was slightly

Table 2. Association between maternal feelings about pregnancy and child's lifestyle

Outcomes	% (N/total respondents)		Pregnancy happiness score [†]		Crude		Adjusted [‡]	
	Unhappy (N=43)	Happy (N=74)	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)
Child's sleeping hours (<11.5 hours/day)	48.7 (19/39)	34.4 (22/64)	1.81	(0.81-4.09)	3.01*	(1.15-7.92)		
Pay attention to child's dietary habits (No)	37.2 (16/43)	20.5 (15/73)	2.29	(0.99-5.31)	2.48	(0.92-6.68)		
Time spent watching TV/video (≥3 hours/day)	27.9 (12/43)	23.3 (17/73)	1.28	(0.54-3.01)	0.91	(0.33-2.51)		
Brush child's teeth every day (No)	32.6 (14/43)	15.1 (11/73)	2.72*	(1.10-6.72)	2.76	(0.92-8.25)		
Lifestyle score [§] (< 3)	43.6 (17/39)	23.4 (15/64)	2.52*	(1.07-5.95)	3.60*	(1.30-9.97)		

[†]Pregnancy happiness score ranged from 1 (very unhappy) to 10 (very happy). Score of 1-9 was classified as unhappy and 10 as happy.
[‡]The odds ratio (OR) was calculated by using "happy" pregnancy as a reference group and adjusted by multiple logistic regression analysis for seven factors ; child's age and sex, maternal age at delivery, cohabitation with grandparents and siblings, maternal confidence in child rearing, and paternal cooperation in child rearing.
[§]Lifestyle score consisted of 4 items. Each favorable lifestyle habit was scored as 1 : sleeping hours (≥ 11.5 hours/day), parental attention to child's dietary habit (yes), time spent watching TV/video (<3 hours/day), and child's toothbrushing habits (every day). Scores ranged from 0 to 4.
**p* < 0.05

higher in the unhappy group (27.9%) compared to the happy group (21.9%), but not significant.

By performing bivariate logistic regression analyses entering one adjusting factor at a time, we found that an increase in OR of the unhappy group (against the happy group) for sleeping hours and lifestyle score occurred only when we adjusted for maternal age at delivery. We subsequently carried out stratified analyses according to maternal median age at delivery where groups were equal to or younger than 29 years of age ($N=62$) and older than 29 years of age ($N=48$). Feelings about pregnancy were significantly associated with child's sleeping hours (Fisher's exact test, $p=0.04$) and lifestyle scores ($p=0.01$) in the group of women who were 29 or younger at delivery (Table 3). Additionally, although not statistically significant, proportion of longer time spent watching TV/video was higher in the happy group compared to the unhappy group among older mothers. Statistical significance of homogeneity tests between the two age groups was 0.11 for sleeping hours and less than 0.04 for the lifestyle score.

DISCUSSION

The present study represents a pioneer trial in Japan to facilitate research on early

Table 3. Association between maternal feelings about pregnancy and child's lifestyle by maternal age.

	<i>N</i> (%)		<i>P</i> value [†]
	Pregnancy happiness score		
	Unhappy (<i>N</i> =24)	Happy (<i>N</i> =38)	
Aged 29 years or younger			
Child's sleeping hours (<11.5 hours/day)	12 (57.1)	8 (26.7)	0.04
Pay attention to child's dietary habits (No)	9 (37.5)	6 (15.8)	0.07
Time spent watching TV/video (≥3 hours/day)	8 (33.3)	9 (23.7)	0.56
Brush child's teeth every day (No)	7 (29.2)	5 (13.2)	0.19
Lifestyle score (<3)	10 (47.6)	4 (13.3)	0.01
	<i>N</i> (%)		<i>P</i> value [†]
	Pregnancy happiness score		
	Unhappy (<i>N</i> =15)	Happy (<i>N</i> =33)	
Aged 30 years or older			
Child's sleeping hours (<11.5 hours/day)	6 (42.9)	12 (38.7)	1.00
Pay attention to child's dietary habits (No)	5 (33.3)	8 (25.0)	0.73
Time spent watching TV/video (≥3 hours/day)	1 (6.7)	8 (25.0)	0.24
Brush child's teeth every day (No)	5 (33.3)	4 (12.5)	0.12
Lifestyle score (<3)	5 (35.7)	9 (29.0)	0.73

[†] Fisher's exact test was used.

Statistical significance of homogeneity tests between the two age groups was 0.11 for sleeping hours and less than 0.04 for lifestyle score.

development of children's lifestyles. Although the findings are preliminary, they indicate a possible association between unhappy maternal feelings about pregnancy and children's lifestyles in this sample, especially among young mothers. Interestingly, we found a significant difference between younger and older mothers. Results from the test of homogeneity statistically confirmed this difference, especially for the lifestyle score. Some features of younger mothers compared to older mothers have been reported. Proportion of unintended pregnancy, which is significantly associated with maternal unhappiness about pregnancy⁹⁾, tends to be higher among younger mothers²⁴⁾. Moreover, younger mothers in previous studies not only evaluated their parenting behavior lower, but also reported poorer self-rated health, more sleep problems, and greater fatigue than older mothers^{25–27)}.

Our results provide public health implications important for familial early intervention to improve children's lifestyles. Pregnant women in Japan are required to report their pregnancies to a local governmental office and receive a *Mother and Child Health Handbook*, in which they record results of antenatal care visits and child growth. While the procedure is simply administrative in most municipalities, individual health counseling is provided in some municipalities²⁸⁾. This opportunity is the only chance to contact *every* pregnant mother during the early stages of pregnancy, which can be used to assess the mother's feeling about her pregnancy and provide high-risk mothers with lifestyle instructions.

Moreover, antenatal classes and postnatal parenting classes organized at hospitals, clinics, and municipal health centers can be good opportunities to increase a mother's awareness as the gatekeeper for her family's health. Maternal environment during the prenatal stages in particular has long been recognized by pediatricians in Fukushima as an important component contributing to children's health²⁹⁾. However, it has not been fully addressed either as a form of epidemiologic research or in clinical practice. A closer relationship between antenatal and postnatal services, which would require concerted efforts among midwives, public health professionals, and medical professionals, is needed in order to facilitate smooth transitions from antenatal to postnatal health care. Additionally, as maternal feelings of happiness were associated with their child's desirable lifestyles, mental support for mothers to promote positive feelings during pregnancy and parenting are recommended. Currently, the local government of Fukushima prefecture is trying to improve mental support for mothers and their families³⁰⁾. The above conclusions were derived from discussions of our study's findings with Nihonmatsu City officers and public health nurses.

Three major limitations of this study should be noted. The first is recall bias. Maternal recall of feelings at the time of pregnancy may be influenced by her current parenting situation³¹⁾, and thus a prospective design study should be employed in future studies. Second, the sample size was small with a response rate of 62.7%. This limits further discussion regarding reverse outcomes in the older group. Third, our data was limited to existing community data from one city. Unfortunately, we could not obtain information on parental educational and financial statuses. Furthermore, questions about parental lifestyle habits were not included in the survey, thus no conclusions on potential correlations between child's lifestyle and parental lifestyle can be drawn. Finally, cross-validation with data from other regions in Japan would be required for generalization of our results. To confirm the association between

maternal feeling about pregnancy and child's lifestyle, further studies are required.

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Appendix

Questions from the Nihonmatsu City health survey¹⁶⁾ analyzed in the present study.

Socio-demographic background	Q1-1	What is your child's sex? (1. Male 2. Female)
	Q1-2	How old is your child as of November 1, 2006? () years old
	Q1-3	With whom does your child currently live? (1. Mother () years old 2. Father () years old 3. Grandparents 4. Siblings 5. Others)
	Q1-4	Who is answering this survey sheet? Please select one in relation to the index child. (1. Mother 2. Father 3. Grandparent 4. Others)
Maternal feeling about pregnancy	Q3	How did you feel at the time you realized you were pregnant? Please circle the number that best describes your feelings : 1 2 3 4 5 6 7 8 9 10 Very unhappy  Very happy
Maternal confidence in child rearing	Q14	Are there any moments when you don't feel confident about child rearing? (1. Yes 2. No 3. Not sure)
Paternal cooperation in child rearing	Q16	Do you think the child's father is cooperative in child rearing? (1. Always 2. Sometimes 3. Rarely 4. Not sure)
Child's lifestyle	Q26-1	Does your child eat breakfast almost every day? (1. Yes 2. No)
	Q26-2	Do you have anything that you pay attention to with regard to your child's dietary habits? (1. Yes 2. No)
	Q27	How often does your child brush their teeth? (Every day (1. Once 2. Twice 3. More than three times) 4. Sometimes 5. Never)
	Q28	When are your child's bedtime and wake-up time? Bedtime () o'clock Wake-up time () o'clock
	Q29	Does your child take a nap? (1. Yes --- () hours 2. No)
	Q30	How many hours does your child spend each day watching TV/videos? (1. Less than 1 hour 2. 1-2 hours 3. 2-3 hours 4. 3-4 hours 5. More than 4 hours)

Original questionnaire was in Japanese and translated for the purpose of this report.