

Characteristics of and Factors Related to Parental Perceptions of Feeding Preterm Toddlers and Preschoolers: Comparison with the Characteristics of Full-Term Children

Sakiko Shigemoto* and Miho Narama

Nagoya University Graduate School of Medicine, Nagoya, Japan

Abstract

Objective: The purpose of this study was to determine the characteristics of Parental Perceptions of Toddlers and Preschoolers Feeding Assessment Index (PPTPFAI) scores of parents with preterm children through comparisons with full-term children; to identify factors associated with PPTPFAI for preterm children; and to obtain recommendations for nursing care aimed at supporting parents who feed preterm children.

Methods: We conducted a cross-sectional study of parents of pre- and full-term toddlers and preschoolers using an anonymous self-administered questionnaire and an interview. We performed descriptive statistical analysis using the Spearman rank correlation coefficient and Mann-Whitney U test. We set the PPTPFAI as the dependent variable and performed a stepwise multiple regression analysis.

Results: Comparisons of the PPTPFAI total score or the individual sub factor scores between the 76 preterm children and 76 full-term children revealed no significant difference. We found no significant correlation between gestational age at birth, physique at birth, or duration of hospitalization directly after birth and PPTPFAI total score or individual sub factor scores in parents of preterm children. The main factors influencing the PPTPFAI score were the child's reaction score, child's age, and Parenting Stress Index-Short Form score.

Conclusion: For parents to feel that they are supporting their preterm children's eating on their own initiative, it is important to focus nursing care on the perceptions of parents of their preterm children's reactions as well as parenting stress.

Keywords: Preterm children; Toddler and preschooler; Parental perception; Feeding; Assessment index; Nursing

Introduction

In 2012, the preterm birth rate was 5.7% in Japan [1]. Advances in medicine have improved the survival of newborns delivered at 22–23 weeks of gestation or with a birth weight of <500 g. Delays in growth, mastication, and speech occur more commonly in preterm toddlers and preschoolers. In Taiwan, Howe et al. showed that there was a high co-occurrence between low birth weight children and feeding problems in their first 5 years of life, which was determined on the basis of the frequency of hospital admissions or outpatient ambulatory care service use [2]. Therefore, parents are concerned about their children's eating habits, which comprise the daily activity of parents and their children, and are directly related to survival. Such parents often wonder why their children are not eating or wish they would eat more. Mothers of preterm infants have experiences of being alive together with their babies [3] and adapting to the maternal role [4]. Additionally, Linden et al. revealed that parents of preterm children who were 7 years of age scored higher on the Parenting Stress Index than term-born controls; child externalizing behaviour and parental coping predicted higher parenting stress in the preterm group [5]. To support the eating habits of preterm children, first, it is important for nurses to understand parents' perceptions of feeding and work on these perceptions.

Eating behaviour in preterm children is unclear. Although the caloric intake according to body weight in the weaning period tends to be high in preterm infants born at <32 weeks gestation, studies suggest that the ratio of caloric intake from foods versus milk is low [6]. Feeding styles during infancy must be carefully considered, because parents are more likely to comply with a child's requests during infancy [7]; however, there is a lack of literature on parental perceptions of feeding their toddlers and preschoolers. Recent studies have begun to elucidate the mechanism of onset of metabolic syndrome, suggesting

that poor nutrition and subsequent nutritional excess between the foetal period and infancy increase the risk of developing this condition [8]. These findings can increase parental anxiety about the future onset of metabolic syndrome in preterm and low birth weight infants.

To assess parental perceptions of feeding toddlers and preschoolers, we created the Parental Perception of Toddler and Preschooler Feeding Assessment Index (PPTPFAI) [9]. By using this index in nursing care practice for toddlers and preschoolers, we can create opportunities for parents to reflect on their daily involvements and promote their awareness of feeding. Moreover it helps parents and nurses have a common sense of parental perceptions of feeding children. We then determined whether there were differences in PPTPFAI scores between parents of pre-term children and those of full-term children. We also ascertained how growth and development, health, nutrition, reactions during meals, parenting stress, and social support affect PPTPFAI scores in preterm children, in order to understand parental perceptions of feeding preterm toddlers and preschoolers and apply this knowledge in nursing care aimed at providing support parents who feed preterm children.

***Corresponding author:** Sakiko Shigemoto, Nagoya University Graduate School of Medicine, Nagoya, Japan, Tel: 81523635248; E-mail: shigemoto.sakiko@b.mbox.nagoya-u.ac.jp.

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Study Purpose

The aims of this study were as follows:

- a) To determine the characteristics of PPTPFAI scores of parents with preterm toddlers and preschoolers through comparisons with full-term toddlers and preschoolers;
- b) To identify factors associated with PPTPFAI scores of parents with preterm toddlers and preschoolers; and
- c) To obtain recommendations for nursing care aimed at supporting parents who feed preterm toddlers and preschoolers.

Methods

Study design

We performed a cross-sectional study using an anonymous self-administered questionnaire. We also interviewed the parents to complete the Food Frequency Questionnaire whenever possible.

Participants

- i. **Preterm group:** This group included caregivers of children fulfilling the following conditions in five paediatric outpatient facilities in two prefectures of the Chubu region. The selection criteria were: (1) born before 37 weeks gestation; (2) age ≥ 2 years but not attending school; (3) had not undergone a medical procedure such as a gastrostomy or tracheostomy; and (4) had the lowest birth weight in case of multibirths. Where information was available prior to the investigation, we prioritized selection of infants below the 10th percentile for birth weight, with birth size standards being set according to the gestational age for Japanese neonates [10]. We invited 117 caregivers to participate and received responses from 111. We excluded responses in which the gestational age or birth weight was unclear, inadequate information about parental perceptions of feeding was provided, and one father's response in which matching with a full-term child was unfeasible. Ultimately, a total of 76 responses (a valid response rate of 65%) were analysed.
- ii. **Full-term group:** For this group, we investigated the backgrounds and PPTPFAI scores of 571 caregivers of children in two public health centres and two public elementary schools in a prefecture of the Chubu region. We matched the full-term children's responses, according to sex and age (± 1), to the responses from the preterm children group and selected 76 responses.

Measurement

Background

We inquired about each participant's relationship to the child, age, employment, number of births of the mother, family structure, child's caregiver, age and sex of the participating children, gestational age at birth, and birth and current physique of the child. We also asked the parents of the preterm children about their children's duration of hospitalization directly after birth and health care needs.

PPTPFAI

We used the 18-item PPTPFAI developed by Shigemoto et al. to assess parental feelings or beliefs in regards to feeding their toddlers and preschoolers from the perspective of nursing care practice [9, 11].

This index was based on four factors: F1, assisting children to eat on their own initiative; F2, taking care of children's health and regulating their eating lifestyles; F3, demanding good manners; and F4, understanding children's wants. Responses were measured on a five-point scale of "Strongly Disagree (1 point)," "Disagree (2 points)," "Not Sure (3 points)," "Agree (4 points)," and "Strongly agree (5 points)." Higher scores represent greater parental perceptions of feeding toddlers and preschoolers. Cronbach's coefficient alpha values for the 18 items were 0.77 and 0.83 for 76 preterm children and 213 toddlers and preschoolers, respectively.

Factors associated with PPTPFAI score

The backgrounds of the preterm children and their parents, as well as the following items and scales (1–3), were defined as associated factors:

a) Children's nutrition

We inquired about the type of milk consumed at 4 months of age as well as currently. Furthermore, we used the Food Frequency Questionnaire Based on Food Groups (FFQg) Ver 2.0, to calculate caloric intake [12, 13]. The FFQg comprises a series of simple questions based on 29 food groups and 10 preparation methods that assesses the daily meal contents for approximately 1–2 months with proven reliability and suitability [14]. We consulted the developer of the FFQg and were informed that an investigation in children is possible if the portion size can be confirmed; therefore, we conducted an interview survey whenever possible. Moreover, we performed the calculations by exchanging infant formula with cow's milk with the developer's approval. Six children drank infant formula, and one child drank the mother's milk, but we did not include this in the total caloric intake.

b) Children's reactions

To assess the parents' perception of their children's reaction during meals, we used the following questions: "Your child shows an interest in the meals you prepare," "Your child is in a good mood while eating," and "Your child smiles at you while eating." The responses were measured on the same five-point scale as the PPTPFAI. Cronbach's coefficient alphas for the three items were 0.73 and 0.76 for pre- and full-term children, respectively. We defined this as a child's reaction (CR) during meals that pleases the parent.

c) Parenting stress

We used the practical version of the 19-item Parenting Stress Index-Short Form (Japanese version) (PSI-SF) that was developed to measure parenting stress during health examinations [15,16]. Cronbach's coefficient alpha for the PSI-SF practical version total score was 0.82, while the Spearman's rank correlation coefficient between each item of the practical version and the 25 items of the original version was 0.41–0.63, which confirmed the tool's reliability and suitability. Responses were measured on the same five-point scale as the PPTPFAI (except for two questions scored inversely). Higher scores represented higher parenting stress.

Procedure

Preterm group: Participants were selected by neonatal paediatricians or nurses. Between January and December 2010, one main researcher explained the research objectives and methods as well as the ethical considerations orally and in writing in exam or waiting rooms. The questionnaire and a postage-paid return envelope were provided to those individuals who consented to participate in the study. The self-administered questionnaire excluding the FFQg required

approximately 30 minutes to complete; therefore, the responses were collected on-site or retrieved later. The FFQg required approximately 20–30 minutes; therefore, the responses were collected orally via interview (or the questionnaire was self-administered and collected later if the participants did not have sufficient time to complete it at the facility) and entered into an Excel spread sheet by the researcher. Upon their request, we allowed 67 of 71 participants to view the results of the FFQg on the computer screen after the entire survey was completed. We linked the self-administered questionnaire and FFQg data in a manner that preserved anonymity.

Full-term group: Researchers or facility managers explained the research objectives and methods as well as the ethical considerations orally and in writing to the caregivers during health examinations or orientation sessions for new students before they entered elementary school. The questionnaire and a postage-paid return envelope were provided to each participant and the responses were either collected on-site or retrieved subsequently.

Data analysis

We used SPSS Statistics Ver. 19 to perform the descriptive statistical analysis. The PPTPFAI F2, F3 and F4 scores were not normally distributed variables according to the Shapiro-Wilk test, while PPTPFAI total and F1 scores were. Therefore, we used the Spearman rank correlation coefficient, Mann-Whitney U test, and Chi square test. We set the PPTPFAI as the dependent variable and performed a stepwise multiple regression analysis (probability of F-to-enter, 0.05; probability of F-to-remove, 0.10). We used a dummy variable for qualitative variables such as sex. The significance level was set at 5%.

Ethical considerations

We explained the research objectives and methods, and assured caregivers that their participation was voluntary and that there would be no consequence for non-participation prior to commencing the study. The survey was also conducted anonymously. The self-administered questionnaires and interviews were conducted in a location that preserved the privacy of participants, and all data were stored in a locked room. All data would be destroyed at the conclusion of the study.

The study was conducted with approval from the bioethics committee of the institution with which the researcher was affiliated. We also obtained approval from the ethics committee of the surveyed facility as necessary.

Results

Participants' characteristics

a) Preterm group: All 76 (100%) of the participants were mothers of preterm children with an average age of 35.3 ± 4.4 (range, 25–45) years.

The participants had an average of 1.7 ± 0.6 (range, 1–3) children, 55 participants (72.4%) of whom were primiparous while 21 (27.6%) had experienced multiple pregnancies. Most of the participants (61; 80.3%) responded that they lived with their nuclear family, 14 (18.4%) lived with extended family, and one (1.3%) did not respond. Just over half of the respondents (45; 59.2%) indicated that they were homemakers or on parental leave, 31 (40.8%) were still working, and 32 (42.1%) considered day-care or kindergarten employees as the caregivers of their children.

Among the preterm toddlers and preschoolers, there were 36 (47.4%) boys and 40 (52.6%) girls. Most (64; 84.2%) were single-birth children, 11 (14.5%) were twins, and one (1.3%) set of triplets. The average gestational age was 28.8 ± 3.3 (range, 23–36) weeks; the average birth weight was 1027.2 ± 425.4 (range, 314.0–2024.0) g, with 36 participants (47.4%) being below the 10th percentile for birth weight. The average hospitalization duration directly after birth was 3.2 ± 1.9 months (range, 5 days to 11 months). The average age of the children at the time of the investigation was 3.1 ± 1.2 (range, 2–6) years, average weight was 12.3 ± 3.4 (range, 5.8–23.8) kg, and average height was 90.8 ± 11.1 (range, 70.0–120.5) cm. Of the mothers, 16 (21.1%) and 18 (23.7%) had children that were less than -2 standard deviation (SD) from the average weight and height, respectively, according to the cross-sectional growth chart [17]. Five children (6.6%) had received growth hormone treatment; 12 children (15.8%) required medication or physiotherapy.

The age of the parents in the preterm children group was significantly higher than those in the full-term children group, and the gestational age at birth, birth weight, birth height, current weight, current height, and number of children who live together were lower in the preterm children group than in the full-term children group (Table 1). In addition, the ratio of primiparous women (p=0.008), ratio of multiple births (p=0.005), and ratio of perceiving day-care or kindergarten employees as caregivers (p=0.046) were higher in the preterm children group than in the full-term group.

b) Full-term group: The 76 mothers of the full-term children had an average age of 33.6 ± 4.7 (range, 24–44) years and an average of 2.0 ± 0.7 (range, 1–3) children. A total of 39 participants (51.3%) indicated that this was their first pregnancy. Most of the participants (60; 78.9%) responded that they lived in a nuclear family, while 49 (59.2%) indicated that they were homemakers or on parental leave.

Among the full-term children, the average gestational age was 38.9 ± 1.1 weeks and the average birth weight was 3064.7 ± 373.8 g. Two children (2.6%) were twins. The average age of the children at the time of the investigation was 3.2 ± 1.5 years, average weight was 14.4 ± 3.7 kg, and average height was 95.1 ± 13.5 cm.

PPTPFAI Comparison

Comparisons of the PPTPFAI total score or the individual F1-F4

	preterm children			full-term children			p-value
	N	Median	Mean(SD)	N	Median	Mean(SD)	
Background of parent							
Age	76	36.0	35.3 (4.4)	74	33.0	33.6 (4.7)	0.016 *
Number of children who live together	76	2.0	1.7 (0.6)	76	2.0	2.0 (0.7)	0.005 **
Background of children							
Gestational age at birth (week)	76	28.0	28.8 (3.3)	76	39.0	38.9 (1.1)	0.000 ***
Birth weight (g)	76	917.0	1027.2 (425.4)	75	3062.0	3064.7 (373.8)	0.000 ***
Birth height (cm)	68	34.0	34.6 (5.1)	66	49.9	49.5 (2.1)	0.000 ***
Age (years)	76	3.0	3.1 (1.2)	76	3.0	3.2 (1.5)	0.535
Weight (kg)	73	11.5	12.3 (3.4)	75	13.8	14.4 (3.7)	0.000 ***
Height (cm)	72	89.4	90.8 (11.1)	71	94.7	95.1 (13.5)	0.040 *

***p<0.001; **p<0.01; *p<0.05 (Mann-Whitney U test)

Table 1: Background of parents and children.

scores between the pre- and full-term children groups revealed no significant difference (Table 2).

CR Comparison

The average total CR scores for the preterm children group was 11.6 ± 1.8 (range, 8–15) points. Similarly, the average score for the full-term infant group was 12.2 ± 1.9 (range, 8–15) points. No significant difference was observed between groups.

PSI-SF Comparison

The average PSI-SF total score was 43.6 ± 9.3 (range, 27–63) points for the preterm children group and 42.3 ± 9.4 (range, 21–66) points for the full-term children group. No significant difference was observed between groups.

Factors Related to PPTPFAI Scores of Parents of Preterm Children Children’s Birth and Current Conditions

We found no significant correlation between gestational age at birth, physique at birth, or duration of hospitalization duration directly after birth and PPTPFAI total score or individual F1–F4 scores.

The PPTPFAI total and F3 scores were significantly higher in the 4–6-year-old group than in the 2–3-year-old group, the ≥ 90 cm height group than the <90 cm group, and the ≥ 12 kg weight group than the <12 kg group. Additionally, the F1 and F4 scores were significantly higher in children with heights ≥ 90 cm than in those with heights <90 cm. When children’s heights and weights were grouped into $\leq -2SD$ and $> -2SD$, the analysis did not reveal a significant difference. We also found no significant correlation between healthy preterm children and those who required medications or physiotherapy.

There was no significant correlation between type of milk consumed at 4 months of age and PPTPFAI scores. The F1 score was significantly higher in children with a current caloric intake ≥ 1000 kcal than in those with an intake <1000 kcal. Using the Dietary Reference Intakes for Japanese 2015 [18], we classified the participants according to sex and age as well as caloric intake below and above the reference standard and the analysed differences; however, no significant difference was found between the groups. The PPTPFAI total, F1, F2, and F4 scores were significantly higher in children with a CR score ≥ 12 than in those with a score ≤ 11 (Table 3).

	N	PPTPFAI total		Factor 1		Factor 2		Factor 3		Factor 4	
		Median	Mean(SD)	Median	Mean(SD)	Median	Mean(SD)	Median	Mean(SD)	Median	Mean(SD)
Preterm	76	66.5	66.1 (7.4)	25.0	25.3 (3.6)	15.0	14.9 (2.8)	18.0	17.7 (3.2)	8.0	8.1 (1.1)
Full-term	76	67.0	66.8 (7.1)	25.5	25.5 (3.6)	15.0	15.3 (2.7)	18.0	17.7 (3.1)	8.0	8.3 (1.0)
		p=0.479		p=0.706		p=0.429		p=0.959		p=0.478	

No significant difference between pre- and full-term groups (Mann-Whitney U test).

PPTPFAI: Parental Perception of Toddler and Preschooler Feeding Assessment Index

Factor 1: assisting children to eat on their own initiative

Factor 2: taking care of children’s health and regulating their eating lifestyles

Factor 3: demanding good manners

Factor 4: understanding children’s wants

Table 2: Comparison of PPTPFAI scores between parents of pre- and full-term children.

	N	PPTPFAI total	Factor 1	Factor 2	Factor 3	Factor 4
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Birth condition						
Sex						
Boy	36	65.9 (7.1)	25.3 (3.2)	14.5 (3.2)	17.9 (2.9)	8.2 (1.0)
Girl	40	66.2 (7.8)	25.2 (4.0)	15.3 (2.4)	17.6 (3.5)	8.1 (1.1)
Number of children at birth						
Single	64	65.8 (7.1)	25.0 (3.5)	14.8 (2.8)	17.8 (3.2)	8.1 (1.0)
Twins or triplets	12	67.3 (9.3)	26.4 (4.2)	15.4 (3.0)	17.3 (3.3)	8.2 (1.2)
Gestational age at birth						
<28 weeks	33	66.1 (6.7)	25.5 (2.9)	14.9 (2.7)	17.5 (3.3)	8.1 (0.9)
≥ 28 weeks	43	66.0 (8.0)	25.0 (4.1)	14.9 (3.0)	17.9 (3.2)	8.1 (1.2)
Birth weight						
<1000 g	44	66.2 (6.6)	25.3 (3.0)	15.2 (2.6)	17.6 (3.1)	8.1 (1.0)
≥ 1000 g	32	65.8 (8.6)	25.3 (4.3)	14.6 (3.1)	17.9 (3.3)	8.2 (1.2)
<10 th percentile	36	66.0 (9.1)	25.2 (4.1)	14.9 (3.4)	17.9 (3.6)	8.1 (1.2)
≥ 10 th percentile	40	66.1 (5.6)	25.3 (3.1)	15.0 (2.2)	17.6 (2.9)	8.2 (0.9)
Birth height						
<35 cm	38	66.7 (6.7)	25.2 (3.1)	15.4 (2.7)	18.1 (3.1)	8.1 (0.9)
≥ 35 cm	30	66.5 (8.5)	25.5 (4.4)	14.9 (2.9)	17.8 (3.4)	8.3 (1.2)
<10 th percentile	27	67.0 (8.8)	25.4 (4.2)	15.1 (3.6)	18.5 (3.4)	8.1 (1.2)
≥ 10 th percentile	41	66.3 (6.6)	25.3 (3.4)	15.2 (2.2)	17.6 (3.0)	8.2 (1.0)
Hospitalization duration directly after birth						
<3 months	33	66.5 (8.6)	25.6 (4.4)	14.7 (3.1)	17.9 (3.2)	8.2 (1.2)
≥ 3 months	42	65.6 (6.5)	24.8 (2.8)	15.1 (2.7)	17.6 (3.3)	8.0 (0.9)
Current condition						
Age						
2–3 years	49	64.3 (7.0) **	24.8 (3.4)	14.7 (2.9)	16.9 (3.4) **	7.9 (1.1) *
4–6 years	27	69.2 (7.3)	26.1 (3.9)	15.3 (2.8)	19.3 (2.2)	8.5 (0.9)

Health care needed							
No	64	66.5 (7.7)	25.5 (3.7)	15.1 (2.8)	17.8 (3.4)	8.2 (1.1)	
Yes	12	63.9 (5.6)	24.0 (2.9)	14.2 (3.2)	17.7 (2.1)	8.0 (1.0)	
Weight							
<12 kg	40	64.0 (7.4) *	24.5 (3.6)	14.6 (3.0)	17.0 (3.4) *	8.0 (1.1)	
≥12 kg	33	68.6 (7.1)	26.2 (3.6)	15.4 (2.6)	18.7 (2.8)	8.4 (1.0)	
≤-2 SD	16	64.9 (8.1)	24.3 (3.4)	15.0 (3.1)	17.7 (4.3)	7.9 (1.3)	
>-2 SD	54	66.5 (7.6)	25.5 (3.8)	14.9 (2.9)	17.9 (3.0)	8.2 (1.0)	
Height							
<90 cm	39	63.7 (7.3) **	24.4 (3.6) *	14.6 (3.0)	16.8 (3.3) **	7.9 (1.1) *	
≥90 cm	34	69.0 (6.7)	26.2 (3.6)	15.4 (2.5)	19.1 (2.5)	8.4 (1.0)	
≤-2 SD	18	65.3 (7.8)	25.1 (3.5)	14.6 (3.4)	17.5 (3.2)	8.1 (1.3)	
>-2 SD	50	66.5 (7.7)	25.2 (3.9)	15.0 (2.7)	18.1 (3.3)	8.1 (1.0)	
Nutrition and Reaction							
Type of milk consumed at 4 months of age							
Human milk	26	67.4 (7.6)	25.6 (3.7)	15.3 (3.0)	18.3 (2.7)	8.2 (0.9)	
Infant formula or mixed-fed	50	65.3 (7.3)	25.1 (3.6)	14.7 (2.7)	17.4 (3.4)	8.1 (1.1)	
Caloric intake at present							
<1000 kcal	23	64.1 (9.3)	23.6 (4.3) *	15.0 (3.4)	17.6 (3.9)	7.9 (1.1)	
≥1000 kcal	48	66.9 (6.6)	25.9 (3.2)	14.9 (2.6)	17.9 (3.0)	8.2 (1.0)	
Below estimated energy requirement ^a	40	65.8 (7.7)	24.6 (3.4)	15.0 (2.8)	18.2 (3.5)	8.1 (1.2)	
At or above estimated energy requirement	31	66.3 (7.6)	26.0 (3.9)	14.8 (3.0)	17.3 (3.0)	8.2 (1.0)	
CR ^b during meals that pleases the parent							
≤11 points	35	63.3 (6.9) **	23.6 (3.2) ***	13.9 (3.1) **	18.1 (3.3)	7.7 (0.9) **	
≥12 points	41	68.4 (7.1)	26.7 (3.3)	15.8 (2.2)	17.4 (3.2)	8.5 (1.1)	

***p<0.001; **p<0.01; *p<0.05 (Mann-Whitney U test)

PPTPFAI: Parental Perception of Toddler and Preschooler Feeding Assessment Index

a: Based on data from the 2015 Dietary Reference Intakes for Japanese

b: CR is the child's reaction. This index consists of three items constructed by us.

Table 3: Factors related to PPTPFAI scores of parents with preterm children and children's birth and current conditions.

	N	PPTPFAI total	Factor 1	Factor 2	Factor 3	Factor 4
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Background of parent						
Age						
<35 years	28	66.3 (6.7)	25.2 (2.9)	14.9 (2.6)	18.1 (3.6)	8.1 (1.2)
≥35 years	48	65.9 (7.9)	25.3 (4.0)	15.0 (3.0)	17.5 (2.9)	8.2 (1.0)
Number of births						
Primiparous	55	66.1 (7.1)	24.9 (3.7)	15.1 (2.8)	18.1 (3.1)	8.1 (1.0)
Multiparous	21	65.9 (8.5)	26.2 (3.2)	14.6 (3.0)	16.9 (3.4)	8.2 (1.2)
Number of children						
Single	33	64.4 (7.8)	23.8 (3.7) **	14.7 (3.2)	17.9 (3.7)	7.9 (1.1)
Multiple	43	67.3 (6.9)	26.3 (3.2)	15.1 (2.5)	17.6 (2.8)	8.3 (1.0)
Family structure						
Nuclear family	62	65.5 (7.4)	25.2 (3.8)	14.7 (2.8)	17.4 (3.3)	8.2 (1.0)
Extended family	14	68.4 (7.3)	25.6 (3.0)	15.9 (2.9)	19.1 (2.5)	7.9 (1.3)
Employment						
Homemakers or on parental leave	45	65.4 (7.3)	25.0 (3.5)	15.1 (2.6)	17.4 (3.3)	8.0 (1.1)
Still working	31	66.9 (7.7)	25.6 (3.8)	14.7 (3.2)	18.2 (3.1)	8.4 (1.0)
Perceiving day-care or kindergarten employees as caregivers						
No	44	64.2 (7.0) *	24.8 (3.4)	14.6 (3.1)	17.1 (3.2) *	7.7 (1.0) ***
Yes	32	68.7 (7.3)	25.9 (3.8)	15.4 (2.5)	18.6 (3.0)	8.7 (0.9)
Parenting Stress						
PSI-SF						
≤43 points	37	68.2 (7.0) **	26.4 (3.6) **	15.6 (2.8) **	17.8 (3.2)	8.4 (1.0) **
≥44 points	36	63.1 (6.5)	23.6 (2.9)	14.0 (2.6)	17.7 (3.3)	7.7 (1.0)

***p<0.001; **p<0.01; *p<0.05 ((Mann-Whitney U test)

PPTPFAI: Parental Perception of Toddler and Preschooler Feeding Assessment Index

PSI-SF Parenting Stress Index-Short Form

Table 4: Factors related to PPTPFAI scores of parents with preterm children and parents' characteristics

Parents' Background and Parenting Stress

PPTPFAI total, F3, and F4 scores were higher in parents who responded that day-care or kindergarten employees took care of their children. Additionally, the F1 score was significantly higher in families

with multiple children compared to those with a single child.

The PPTPFAI total, F1, F2, and F4 scores were significantly higher in the group with a PSI-SF score ≤43 than in the group with a score ≥ 44 (Table 4).

Factors Influencing PPTPFAI Scores of Parents of Preterm Children

We performed a multiple regression analysis using the items shown to be associated with PPTPFAI scores as the independent variable and the PPTPFAI total or subscale scores as the dependent variable. If the correlation coefficient exceeded 0.7 as the independent variable (child's current weight and height, $r = 0.947$; age and height, $r = 0.857$; age and weight, $r = 0.760$), we chose the ages of the children with the fewest missing values.

PPTPFAI

We chose age of the child, CR, perception of day-care or kindergarten employees as caregivers, and PSI-SF as the independent variable. The multiple regression analysis results showed a sequential entry of CR, age of the child, and PSI-SF, with a coefficient of determination for the final model R^2 of 0.296, adjusted R^2 of 0.265, F-value of 9.668, and p-value of 0.000. The partial regression coefficient of the non-normalized CR was 1.405, while the normalized partial regression coefficient was 0.346, t-value was 3.266, and p-value was 0.002. Similarly, the partial regression coefficient for non-normalized age of the child was 1.489, while the normalized partial regression coefficient was 0.256, t-value was 2.526, and p-value was 0.014. Finally, the partial regression coefficient for non-normalized PSI-SF was -0.171, while the normalized partial regression coefficient was -0.220, t-value was -2.071, and p-value was 0.042 (Table 5).

F1

We chose age of the child, caloric intake, CR, PSI-SF, and number of children as independent variables. The multiple regression analysis results showed a sequential entry of CR, number of children, and PSI-SF, with a coefficient of determination for the final model R^2 of 0.446, adjusted R^2 of 0.420, F-value of 17.152, and p-value of 0.000. The partial regression coefficient of the non-normalized CR was 0.749, while the normalized partial regression coefficient was 0.382, t-value was 3.864, and p-value was 0.000. Similarly, the partial regression coefficient for non-normalized number of children was 1.795, while the normalized partial regression coefficient was 0.322, t-value was 3.416, and p-value was 0.001. Finally, the partial regression coefficient for non-normalized PSI-SF was -0.116, while the normalized partial regression coefficient was -0.303, t-value was -3.101, and p-value was 0.003.

F2

We chose CR and PSI-SF as the independent variables. The multiple regression analysis results showed an entry of CR with a coefficient of determination for the model R^2 of 0.122, adjusted R^2 of 0.110, F-value of 9.841, and p-value of 0.002. The partial regression coefficient of the non-normalized CR was 0.553, while the normalized partial regression coefficient was 0.349, t-value was 3.142, and p-value was 0.002.

F3

We chose age of the child and perception of day-care or kindergarten employees as caregivers as the independent variables. The multiple regression analysis results showed an entry of age of the child with a coefficient of determination for the model R^2 of 0.110, adjusted R^2 of 0.098, F-value of 9.137, and p-value of 0.003. The partial regression coefficient of the non-normalized age of the child was 0.863, while the normalized partial regression coefficient was 0.332, t-value was 3.023, and p-value was 0.003.

F4

We chose age of the child, CR, PSI-SF, and perception of day-care or kindergarten employees as caregivers as the independent variables. The multiple regression analysis results showed a sequential entry of CR, perception of day-care or kindergarten employees as caregivers, and PSI-SF, with a coefficient of determination for the final model R^2 of 0.427, adjusted R^2 of 0.402, F-value of 17.137, and p-value of 0.000. The partial regression coefficient of the non-normalized CR was 0.216, while the normalized partial regression coefficient was 0.373, t-value was 3.902, and p-value was 0.000. Similarly, the partial regression coefficient for non-normalized perception of day-care or kindergarten employees as caregivers was 0.891, while the normalized partial regression coefficient was 0.426, t-value was 4.669, and p-value was 0.000. Finally, the partial regression coefficient for non-normalized PSI-SF was -0.024, while the normalized partial regression coefficient was -0.218, t-value was -2.287, and p-value was 0.025.

Discussion

Our study subjects included extremely premature infants born at 23 weeks with a birth weight of 300 g, suggesting the involvement of possible health-related issues such as short stature and not eating owing to failure to masticate in infancy and childhood. However, we did not confirm significant differences between pre- and full-term children with respect to total PPTPFAI scores. Moreover, premature birth was not associated with parental perceptions of feeding preterm toddlers and preschoolers. This finding suggests that nurses must re-evaluate their belief that the more immature an infant is, the more difficult feeding is.

Our study revealed that the PPTPFAI total score in preterm children rose as the CR score increased, the child was older, body type was larger, and parenting stress was lower. The F2 and F3 subfactor scores of the PPTPFAI have a lower explanatory power; therefore, it is difficult to make a definitive statement regarding these characteristics. However, our study revealed the characteristics of feeding preterm children based on F1. PPTPFAI is a useful index for assessing parental perceptions of feeding in children whose reactions are difficult to decipher, the child's current age is younger, and parents often experience high levels of parenting stress.

Several factors influence the PPTPFAI for preterm children.

	B	SE	β	t	p
CR during meals that pleases the parent	1.405	0.430	0.346	3.266	0.002
Age of child	1.489	0.589	0.256	2.526	0.014
PSI-SF	-0.171	0.083	-0.220	-2.071	0.042

Stepwise multiple regression analysis with sequential entry of CR, age of child, and PS-SF with a coefficient of determination for the final model showed an R^2 of 0.296, adjusted R^2 of 0.265, F-value of 9.668, and p-value of 0.000.

PPTPFAI: Parental Perception of Toddler and Preschooler Feeding Assessment Index

CR: Child's Reaction

PSI-SF: Parenting Stress Index-Short Form

Table 5: Factors influencing PPTPFAI scores of parents with preterm children (N=73).

First, the CR that pleases their parents influences F4, the parental understanding of their children's wants. This result supports those of previous studies that showed that a child's temper [19] and feelings of inadequate attachment [20] as factors that influence feelings of difficulty in raising children. Although a significant difference in CR score was not observed between pre- and full-term children, the CR in preterm children was mild during early childhood, when developmental and growth retardation are most likely to manifest. This gives rise to the possibility of the parents not understanding their child's wants. Therefore, it is important to share the reactions of preterm children during meals with parents and to support parents. Similarly, the CR during meals influences F1 and F2. Parents can respect the initiatives of children and be aware of promoting their health by interacting with their children who enjoy meals. These parents' attitudes, in turn, lead their children to enjoy eating with their parents.

Second, family and social support affect parental perception of feeding their child. The presence of siblings for preterm children promoted F1. Parents of preterm children felt that the interaction between children promoted the preterm child's interest in eating and influenced eating behaviours, eventually leading to self-motivated eating. In addition, parents are exempt from the obligation and time of dedicated care to one child through the experience of raising multiple children. Moreover, they felt at ease leaving the child to eat based on his/her own initiative, concluding that their child's spontaneous eating is important. This study also demonstrates that parents who are aware that day-care and kindergarten employees contribute to bringing up their child experience F4. Accordingly, the ability of preterm children to express their wants increases in a group setting, and the employees' efforts can promote the parents' awareness of their children's wants.

Third, our study showed that parenting stress negatively affects F1 and F4; therefore, overall parenting stress associated with the characteristics of the preterm children and the parents influences parental feeling or belief in feeding the preterm child. Feelings of difficulty in the upbringing of preterm children increases as the follow-up period post-neonatal intensive care unit discharge decreases [21], suggesting the importance of nursing care during and immediately after neonatal intensive care unit treatment that helps parents understand their children's wants and helps them to initiate eating. Furthermore, it will be important to closely support preterm children and parents to ease long-lasting parenting stress.

Fourth, a positive correlation was confirmed between preterm children's current physique and PPTPFAI, as well as between caloric intake and F1. However, comparisons with growth curves and standard caloric intake values revealed no significant difference. These results suggest that nurses should focus not only on diagnoses of SGA or short stature but also on the preterm child's growth itself and the parent's awareness of such growth. Additionally, the PPTPFAI should be used to support parents who are concerned about their child's small size or low food intake as well as those who force their child to eat. Then, parents can feel that they assist preterm children to eat on their own initiative.

Finally, we discuss the factors associated with low explanatory power using multiple regression analysis models. In previous studies of a general population of toddlers and preschoolers, the F2 score was higher in mothers with first-time pregnancies compared with in those with multiple pregnancies [9]; however, we did not observe a significant difference in our study. In rearing preterm children, it is possible that the CR is a more influential factor than prior child-rearing experience. The F3 score was similar to that in the general children population, demonstrating that the child age influences their upbringing.

Given the above findings, the assessment of parents' perceptions of preterm children's reactions, parenting stress, and social support for parents are important, in order to enable sufficient care for preterm children's parents. Such practical nursing care can help parents feel a mutual interaction with preterm children and enable them to support their children's initiative eating.

Limitations and Future Directions

For this analysis of parental perceptions of feeding preterm toddlers and preschoolers, we used an index with confirmed reliability and suitability; to analyse the CR during meals for both the pre- and full-term children groups, we used an independently developed CR with confirmed internal consistency. Further investigations using qualitative research methods will be necessary to demonstrate the experience of parents of preterm children and the characteristics of preterm children's reactions.

The normalized coefficient of determination was 0.265–0.420 for the model in which the PPTPFAI total, F1, and F4 scores are the dependent variables in the analysis of factors influencing PPTPFAI scores. In contrast, the explanatory power of the model when F2 and F3 scores were dependent variables was low. It will be important to understand the child's habits to assess the parental perceptions of feeding in nursing care practice for preterm children.

Conclusion

This study revealed the following:

- There was no significant difference in PPTPFAI total score between parents of pre- and full-term children;
- The main factors influencing PPTPFAI total score in preterm children were CR score, the child's age, and PSI-SF score; and
- For parents to feel that they are supporting their preterm children's eating on their own initiative, it is important to focus nursing care on the parents' perceptions of their preterm children's reactions as well as parenting stress.

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