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Application of the infant and young child feeding index and the evaluation of its relationship with nutritional status in 6-24 months children

Aplicação do índice de alimentação de lactentes e crianças pequenas e avaliação de sua relação com o estado nutricional de crianças de 6 a 24 meses

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ABSTRACT

Objective
To evaluate the complementary feeding practices of mothers in infant and child nutrition using Infant and Young Child Feeding Indicator and Infant and Child Feeding Index and to determine their relationship with nutritional status.

Methods
Study data were collected through an online questionnaire administered to 141 parents on healthy 6-24 month infants/children. Complementary feeding practices for infants/children were evaluated in line with the Infant and Child Feeding Index and Infant and Young Child Feeding Indicator. In the evaluation of growth, weight for age z-scores, length for age z-scores, and weight for length z-scores of infants/children were calculated with the World Health Organization Anthro program.

Results
74.5% of 141 infants and children (71 boys, 70 girls) evaluated in the study are breastfed. The prevalence of stunting, wasted, and underweight was determined as 6.4%, 0.7%, and 4.3%, respectively. When evaluated using Infant and Young Child Feeding Indicator, it was determined that 82.3% of children met the minimum meal frequency, 80.9% met the minimum dietary diversity, and 67.4% met the minimum acceptable diet. Regarding Infant and Child Feeding Index evaluations of the children, while there was no difference between 9-11 and 12-24 month age groups, the mean Infant and Child Feeding Index score in the 6-8 month group was significantly lower than the other age groups (p=0.000). The Infant and Child Feeding Index scores used to evaluate complementary feeding practices in our study were found to be high in most infants/children. No clear relationship was found between stunting and minimum acceptable diet, minimum dietary diversity or minimum meal frequency, which are indicators of both Infant and Child Feeding Index scores and World Health Organization, Infant and Young Child Feeding Indicator.

Conclusion
The Infant and Child Feeding Index scores used to evaluate complementary feeding practices in our study were high in most infants/children. In addition, the high rates of MMF, minimum dietary diversity, and minimum acceptable diet coverage in evaluating infants/children in terms of World Health Organization indicators show that they have appropriate complementary feeding practices. However, study found no clear relationship between stunting and minimum acceptable diet, minimum dietary diversity or MMF, which are indicators of both Infant and Child Feeding Index I scores and WHO Infant and Young Child Feeding Indicator. It was concluded that World Health Organization Infant and Young Child Feeding Indicator indicators may be better than length for age z-scores in the weight for length z-scores explanation.

Keywords: Complementary feeding. Feeding index. Infant nutrition. Nutritional status. Stunting.

RESUMO

Objetivo
Avaliar as práticas de alimentação complementar das mães na nutrição de lactentes e crianças utilizando o Indicador de Alimentação de Lactentes e Crianças Pequenas e o Índice de Alimentação de Lactentes e Crianças e determinar sua relação com o estado nutricional.

Métodos
Os dados do estudo foram coletados por meio de um questionário online administrado a 141 pais de bebês/crianças saudáveis de 6 a 24 meses. As práticas de alimentação complementar de lactentes/crianças foram avaliadas de acordo com o Índice de Alimentação de Lactentes e Crianças e o Indicador de Alimentação de Lactentes e Crianças Pequenas. Na avaliação do crescimento, os escores z de peso para idade, escores z de comprimento para idade e escores z de peso para comprimento de bebês/crianças foram calculados com o programa Organização Mundial da Saúde Anthro.

Resultados
Quando avaliadas por meio do Indicador de Alimentação de Lactentes e Crianças Pequenas, constatou-se que 82,3% das crianças atendiam à frequência mínima de refeições, 80,9% atingiam a diversidade alimentar mínima e 67,4% atingiam a dieta mínima aceitável. Em relação às avaliações do Índice de Alimentação de Lactentes e Crianças das crianças, embora não tenha havido diferença entre as faixas etárias de 9 a 11 e 12 a 24 meses, a pontuação média do Índice de Alimentação de Lactentes e Crianças no grupo de 6 a 8 meses foi significativamente menor do que nas outras faixas etárias (p=0,000). Os escores do Índice de Alimentação de Lactentes e Crianças utilizados para avaliar as práticas de alimentação complementar em nosso estudo foram elevados na maioria dos bebês/crianças. Não foi encontrada nenhuma relação clara entre o atraso no crescimento e a dieta mínima aceitável, diversidade alimentar mínima ou frequência mínima de refeição ,que são indicadores tanto das pontuações do Índice de Alimentação de Lactentes e Crianças como do Indicador de Alimentação de Lactentes e Crianças Pequenas da Organização Mundial da Saúde.

Conclusão
Escores altos do Índice de Alimentação de Lactentes e Crianças na maioria dos bebês/crianças são um bom indicador de Indicador de Alimentação de Lactentes e Crianças Pequenas nessa população. No entanto, nenhuma relação clara foi encontrada entre o déficit de estatura e os escores do Índice de Alimentação de Lactentes e Crianças e do Indicador de Alimentação de Lactentes e Crianças Pequenas neste estudo.

Palavras-chave: *Alimentação complementar. Índice de alimentação. Nutrição do lactente, Estado Nutricional. Déficit de crescimento.*

INTRODUCTION

The complementary feeding period is a period that is important for the healthy growth and development of infants and young children, in which appropriate, timely, adequate, and safe foods should be given to children 6 months and older to meet the changing nutritional requirements after the 6th month of life [1]. Breast milk is no longer sufficient to meet an infant's nutritional requirements after six months, and failure to provide complementary foods at an appropriate age can result in

growth retardation, which can predispose to malnutrition [2]. The World Health Organization (WHO) has created the Infant and Young Child Feeding Indicator (IYCFI) to monitor and guide the feeding practices of young children aged 6-24 months [1,3]. These indicators are mainly related to breastfeeding and complementary feeding and have been updated and expanded in 2021 [4].

It is stated that scaling up community-based nutrition approaches to improve infant and young child feeding practices will significantly reduce the overall burden of child mortality and existing inequalities [5]. For this purpose, Ruel and Menon, developed the Infant and Child Feeding Index (ICFI) [6] to evaluate infant and child feeding practices, based on data from five Latin American countries. It is known that the decrease in length for age z-scores (LAZ) mostly occurs during the 6-24 month complementary feeding period. The inadequate amount and quality of complementary foods given to children and malnutrition are among the important risk factors for stunting [7, 8]. When evaluated in terms of our country, according to the 2018 Turkey Demographic and Health Survey (TNSA) data, 6% of children under the age of 5 are still stunted or very short, and there are regional differences [9].

For these reasons, the study aimed to evaluate mothers' complementary feeding practices regarding on infant and child nutrition using IYCFI and ICFI, and to determine their relationship with nutritional status. As far as we know, the absence of any study using these indexes in our country also adds a unique value to our study.

METHODS

Study Design and Population

This study was carried out as a cross-sectional study by snowball sampling method, including 6-24-months-old children and their mothers residing in different provinces in Turkey. This study was carried out as a cross-sectional study (between May 2021 and December 2021), including 6-24-months-old children and their mothers residing in different provinces in Turkey. Accordingly, infants and children were evaluated in 3 groups as 6-8 months (n=41), 9-11 months (n=41), and 12-24 months (n=59). Ethical approval of the study was obtained from Gazi University Ethics Committee with the decision dated 23.03.2021/05 and numbered (Code nº 2021-366).

Anthropometric Measurements and Evaluation

Body weight and height measurements of mothers and infants/children were taken based on the declaration. The height and body weights of the mothers were taken by them at home. For the anthropometric measurements of infants and young children, it was requested to indicate the measurements taken in the last one month in the health institution, which was stated to be followed.

The WHO Anthro software (2009) was used for calculating the z-score of the infants' body weight and length for age. Weight for age z score (WAZ) is classified as <-2 SD underweight, ≥-2 SD-<+1 SD normal, ≥1 SD overweight. Length for age z score (LAZ) is classified as <-2 SD stunted, ≥-2 SD-<+3 SD normal, and ≥+3 SD tall. Weight for length z score (WLZ) is classified as <-2 SD wasted, ≥-2 SD-<+2 SD normal, ≥+2 SD-<+3 SD overweight, and ≥+3 SD obese [10].

Infant and Young Child Feeding Indicators and Evaluation

Infant and young child feeding indicators are defined and evaluated according to WHO. The definitions are as follows [1].

Ever breastfed (EvBF): It represents the percentage of children born and breastfed in the last 24 months.

Early initiation of breastfeeding (EIBF): It refers to the growth of the son born within 24 months, which is laid within one hour of birth.

Continued Breastfeeding 12-23 Months (CBF): It represents the percentage of children aged 12-23 months who were breastfed the previous day.

Introduction Of Solid, Semi-Solid, or Soft Foods 6–8 Months (ISSSF): It represents the percentage of infants aged 6-8 months who consumed solid, semi-solid, or soft food in the previous day.

Minimum Dietary Diversity 6-23 Months (MDD): It represents the percentage of children aged 6-23 months who consumed food and drink from at least five of the eight defined food groups in the previous day.

Minimum Meal Frequency 6-23 Months (MMF): It represents the percentage of children aged 6-23 months who consumed food and drink from at least five of the eight defined food groups in the previous day.

Minimum Milk Feeding Frequency For Non-Breastfed Children 6-23 Months (MMFF): It represents the percentage of 6-23-month-old non-breastfed children who consumed at least two milk and its products in the previous day.

Minimum Acceptable Diet 6-23 Months (MAD): It represents the percentage of children aged 6-23 months who consumed the minimum acceptable diet in the previous day. For breastfed children: at least minimal dietary variation and minimum meal frequency for their age in the previous day; For non-breastfed children, it includes at least minimal dietary variation and minimum frequency of meals for their age in the previous day, as well as at least two milk feedings.

Bottle-Feeding 0-23 Months (BoF): It represents the percentage of children aged 0-23 months who were bottle-fed the previous day.

Evaluation of Infant and Child Feeding Index (ICFI)

In our study, the " Infant and Child Feeding Index (ICFI)" adapted from Ruel and Menon was used. This index includes breastfeeding (whether the child is currently breastfed), bottle-feeding (whether the child has used a bottle in the previous 24 hours), dietary diversity score (number of food groups from the seven groups consumed by the child in the previous 24 hours: cereals, legumes/oilseeds/nuts; dairy products; eggs/fish/poultry, meat, vegetables, and fruit), food group frequency score (how many days the child consumed each food group in the last seven days), and meal frequency score (how many times the child has eaten food, including meals and snacks, in the last 24 hours) components. The overall scoring system is scored as "zero" (0) for a negative/harmful practice and at least "one" (1) for a positive practice. Practices are evaluated positively or negatively based on available scientific evidence about child feeding recommendations and their benefits or risks. The index score is then in the range of 0-12 by summing the scores obtained from each category, and each is categorized as low (0-4 points), average (5-8 points), and high (9-12 points) [6].

The data was analyzed with the statistical package program IBM®SPSS® (version 22.0) with appropriate statistical methods. While evaluating the study data, mean and standard deviation were used for quantitative (numeric) variables in descriptive statistical analyses. Since IYCFI components were categorical variables, chi-square analysis was applied. Also, it was determined that the ICFI total score and its components did not show normal distribution, the significance of the means between the groups was analyzed with the Kruskal-Wallis test. $p<0.05$ was considered significant. The group that caused the difference was determined by post-hoc Tamhane's T2 and shown with different characters. Spearman's correlation analysis was used to analyze the relationship between parameters, and $p<0.05$ was considered statistically significant.

RESULTS

Sociodemographic and complementary feeding characteristics

Parents were responsible for the nutrition of infants and children at the rate of 87.9%. When the transition times to complementary feeding were examined, 69.5% of infants and children started complementary foods on time (17-26 weeks), while 29.1% started late (after 36 weeks). The details of the sociodemographic and complementary feeding characteristics of the participants are given in Table 1.

Table 1 – General characteristics of the participants.

Variables	6-8 months (n=41)		9-11 months (n=41)		12-24 months (n=59)		Total (n=141)	
	n	%	n	%	n	%	n	%
Sex								
Male	14	34.1	20	48.8	37	62.7	71	50.4
Female	27	65.9	21	51.2	22	37.3	70	49.6
Mother's educational status								
High school and below	2	4.9	1	2.4	12	20.4	15	10.6
University	28	68.3	26	63.4	37	62.7	91	64.6
Graduate	11	26.8	14	34.1	10	16.9	35	24.8
Mother's working status								
Yes	34	82.9	27	65.9	37	62.7	98	69.5
No	7	17.1	14	34.1	22	37.3	43	30.5
Caregiver								
Parents	40	97.6	39	45.1	45	76.3	124	87.9
Family elders	1	2.4	2	4.9	12	20.3	15	10.6
Caregiver	–	–	–	–	2	3.4	2	1.4
Time to start complementary food								
Before 17 weeks	–	–	–	–	2	3.4	2	1.4
Between 17-26	29	70.7	32	78.0	37	62.7	98	69.5
After 26 weeks	12	29.3	9	22.0	20	33.9	41	29.1
First complementary food given to infant/children								
Vegetables	17	41.5	17	41.5	25	42.4	59	41.8
Fruit	7	17.1	2	4.9	2	3.4	11	7.8
Yoghurt	16	39.0	21	51.2	31	52.5	68	48.2
Egg yolk	–	–	1	2.4	1	1.7	2	1.4
Grains (rice)	1	2.4	–	–	–	–	1	0.7

Anthropometric measurements and evaluations

The mean age of the children is 11.9±4.8, and their mean weight is 9.98±1.9 kg. In the evaluation using WHO standards, 58.9% of the children were normal according to the WAZ score, 6.4% were stunted according to the LAZ score, and 12.8% were overweight and obese according to the WLZ score. When the z scores were compared according to the groups, it was determined that the z score value increased as the age group increased only in WLZ (p<0.05). Data on maternal anthropometric characteristics and anthropometric characteristics of infants are given in Table 2 in detail.

Table 2 – Anthropometric measurements of mothers and infants/children.

Variables	6-8 months (n=41)	9-11 months (n=41)	12-24 months (n=59)	Total (n=141)	p
	x̄±SD	x̄±SD	x̄±SD	x̄±SD	
Mother					
Age (years)	30.5±2.9	31.06±4.5	30.02±3.9	30.4±3.9	0.804
Body weight (kg)	65.6±12.0	64.1±11.3	65.3±12.9	65.0±12.1	0.831
Height (cm)	163.3±5.4	163.8±5.4	163.2±6.0	163.4±5.6	0.973
BMI (kg/m²)	24.6±4.2	23.9±4.05	24.4±4.37	24.3±4.2	0.785
Infants/children					
Age (months)	7.05±0.8	9.8±0.7	16.7±3.4	11.9±4.8	
Body weight (kg)	8.34±1.2	9.47±1.2	11.47±1.7	9.98±1.9	
Length (cm)	69.6±3.21	72.3±4.07	81.3±5.9	75.3±7.0	
WLZ	0.1±1.02[a]	0.8±1.2[b]	0.9±1.7[b]	0.7±1.4	0.026*
LAZ	0.7±1.1	0.1±1.4	0.2±2.0	0.3±1.7	0.121
WAZ	0.4±0.9	0.6±0.9	0.8±1.1	0.6±1.0	0.189
WAZ n (%)					
Underweight (<-2 SD)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Normal (≥-2 SD-<+1 SD)	30 (73.2)	29 (70.7)	30 (50.8)	89 (63.1)	
Overweight (≥1 SD)	11 (26.8)	12 (29.3)	29 (49.2)	52 (36.9)	
LAZ n (%)					
Stunted (<-2 SD)	-	3 (7.3)	6 (10.2)	9 (6.4)	
Normal (≥-2 SD-<+3 SD)	40 (97.6)	37 (90.2)	49 (83.1)	126 (89.4)	
Tall (≥+3 SD)	1 (2.4)	1 (2.4)	4 (6.8)	6 (4.3)	
WLZ n (%)					
Wasted (<-2 SD)	-	-	1 (1.7)	1 (0.7)	
Normal (≥-2 SD-<+2 SD)	40 (97.6)	35 (85.4)	47 (79.7)	122 (86.5)	
Overweight (≥+2 SD-<+3 SD)	-	3 (7.3)	5 (8.5)	8 (5.7)	
Obese (≥+3 SD)	1 (2.4)	3 (7.3)	6 (10.2)	10 (7.1)	

Note: *p<0.05. SD: Standard Deviation. LAZ: length for age z-scores; WAZ: weight for age z-scores; WLZ: weight for length z-scores.

Complementary feeding practices according to WHO IYCF indicators

When the data on the nutrition of infants and children were evaluated according to the WHO IYCFI; 78% the mothers started Early İnitiation of of Breastfeeding (EIBF) for children. While 74.5% of infants/children continued to Ever Breastfeeding (EvBF), the rate of Bottle Feeding (BF) was 29.1%. The difference between the groups in terms of the number of EvBF infants/children is statistically significant (p<0.05). In children aged 12-24 months, the rate of continued breastfeeding (CBF) was 61%.

Most of the children (80.9%) consumed meals containing the recommended minimum dietary diversity (MDD) in a day. Similarly, 82.3% of the children were fed the minimum meal frequency (MMF) recommended for their age. 67.4% of breastfed and non-breastfed infants and young children meet the minimum acceptable diet (MAD) recommendation. 63.9% of infants/children (n=36) who did not receive breast milk meet the minimum milk feeding frequency (MMFF). In addition, all 6-8

month infants started the introduction of solid, semi-solid, or soft foods (ISSF). The difference between the three groups in terms of MDD, MAD and MMFF was determined to be statistically significant (p<0.05). Evaluations of IYCFI indicators by months are given in Table 3.

Table 3 – Evaluation of complementary feeding practices according to World Health Organization, Infant and Young Child Feeding Indicator.

Indicators	6-8 months (n=41)		9-11 months (n=41)		12-24 months (n=59)		Total (n=141)	
	n	%	n	%	n	%	n	%
Breatfeedıng Indicators								
Ever breastfed (EvBF)	35	85.4	34	82.9	36	61.0	105	74.5
			χ^2=9.718, p=0.008*					
Early initiation of breastfeeding (EIBF)	32	78.0	32	78.0	46	78.0	110	78.0
Continued Breastfeeding 12–23 Months (CBF)	–		–		36	61.0	–	
Complementary Feedıng Indıcators								
Minimum dietary diversity (MDD)								
Met	21	51.2	40	97.6	53	89.8	114	80.9
Not met	20	48.8	1	2.4	6	10.2	27	19.1
			χ^2=33.719, p=0.000*					
Minimum meal frequency (MMF)								
Met	32	78.0	34	82.9	50	84.7	116	82.3
Not met	9	22.0	7	17.1	9	15.3	25	17.7
			χ^2=0.761, p=0.684					
Minimum acceptable diet (MAD)								
Met	18	43.9	31	75.6	46	78.0	95	67.4
Not met	23	56.1	10	24.4	13	22.0	46	32.6
			χ^2=14.553, p=0.001*					
Minimum Milk Feeding Frequency For Non-Breastfed Children 6–23 Months (MMFF)								
Met	1	16.7	3	42.9	19	82.6	23	63.9
Not met	5	83.3	4	57.1	4	17.4	13	36.2
			χ^2=10.635, p=0.004*					
Introduction Of Solid, Semi-Solid, Or Soft Foods 6–8 Months (ISSSF)								
Yes	41	100.0	–		–		–	
Other indicators								
Bottle feding (BF)	14	34.1	9	22.0	18	30.5	41	29.1
			χ^2=1.579, p=0.454					

Note: *p<0.05.

Complementary feeding practices according to the ICFI

Feeding practices evaluated using ICFI components and categories showed that 83.7% of the children had high dietary diversity scores, and 44.7% had average meal frequency scores. Meal frequency score was found to be significantly higher in the 6-8 and 9-11-month-old groups than in 12-24-month-old children (p=0.000). The group with the lowest mean dietary diversity score (1.5±0.5) was the 6-8-month-old group. Dietary diversity scores were similar (1.9±0.1) in the 9-11 and 12-24 month group, and were significantly higher than in the 6-8 month group (p=0.000). The 12-24 month group had the highest frequency score of the food group (4.1±1.1) compared to the other age groups (p<0.05).

Mean breastfeeding scores (1.7±0.7) were highest in the 6-8-month-old group, and it was found that breastfeeding scores decreased as the age increased. While the breastfeeding score did not differ significantly between 6-8 months and 9-11 months, the breastfeeding score of the 12-24 month age group was statistically lower than both groups (p=0.000). The ICFI scores were 7.7±1.9 in the 6-8 month group; it was calculated as 9.3±1.6 in the 9-11 month group and 9.10±1.6 in the

12-24 month group. While there was no difference in the 9-11 and 12-24 month age groups, the mean ICFI score in the 6-8 month group was significantly lower than the other age groups (p=0.000). The ICFI components for all age categories are presented in Table 4.

Table 4 – Comparison of Infant and Child Feeding Index components by age.

ICFI Components	6-8 months (n=41)		9-11 months (n=41)		12-24 months (n=59)		Total (n=141)		*p*
	n (%)	x̄±SD	n (%)	x̄±SD	n (%)	x̄±SD	n (%)	x±SD	
Breastfeeding									
Yes	35 (85.4)	1.7±0.7[a]	34 (82.9)	1.6±0.7[a]	36 (61.0)	0.6±0.4[b]	105 (74.5)	1.2±0.8	0.000*
No	6 (14.6)		7 (17.1)		23 (39.0)		36 (25.5)		
Bottle feeding									
Yes	14 (34.1)	0.6±0.4	9 (22.0)	0.7±0.4	18 (30.5)	0.6±0.4	41 (29.1)	0.7±0.4	0.457
No	27 (65.9)		32 (78.0)		41 (69.5)		100 (70.9)		
Dietary diversity score									
Avarage (1)	20 (48.8)	1.5±0.5[a]	1 (2.4)	1.9±0.1[b]	2 (3.4)	1.9±0.1[b]	23 (16.3)	1.8±0.3	0.000*
High (2)	21 (51.2)		40 (97.6)		57 (96.6)		118 (83.7)		
Food group frequency score									
Low (0-2)	28 (68.3)	1.9±1.24[a]	17 (41.5)	2.9±1.08[b]	2 (3.4)	4.1±1.1[c]	47 (33.3)	3.1±1.5	0.000*
Avarage (3-4)	25 (29.3)		22 (53.7)		29 (49.2)		63 (44.7)		
High (5-6)	1 (2.4)		2 (4.9)		28 (47.5)		31 (22.0)		
Feeding frequency score									
Low (0)		1.8±0.3[a]		1.9±0.1[a]	2 (3.4)	1.6±0.5[b]	2 (1.4)	1.8±0.4	0.000*
Avarage (1)	5 (12.2)		1 (2.4)		17 (28.8)		23 (16.3)		
High (2)	36 (87.8)		40 (97.6)		40 (67.8)		116 (82.3)		
Total score									
Low (0-4)	3 (7.3)	7.7±1.9[a]		9.3±1.6[b]	1 (1.7)	9.10±1.6[b]	4 (2.8)	8.7±1.8	0.000*
Avarage (5-8)	23 (56.1)		10 (24.4)		20 (33.9)		53 (37.6)		
High (9-12)	15 (36.6)		31 (75.6)		38 (64.4)		84 (59.6)		

Note: *p<0.05. Since it was determined that the ICFI total score and its components did not show normal distribution, the significance of the means between the groups was analyzed with the Kruskal-Wallis test. The group that caused the difference was determined by post-hoc Tamhane's T2 and shown with different characters ("a", "b" and "c"). ICFI: Infant and Child Feeding Index.

No correlation was found between the ICFI scores of infants and young children and the age, BMI, education, and employment status of the mother; only a positive significant correlation was determined between the ages of infants and young children and ICFI scores (r=0.289, p=0.001) (not shown in the table).

When the relationship between different ICFI components and LAZ is examined; the mean LAZ scores of 6-8 and 9-11-month-old children were not associated with any ICFI component. On the other hand, a positive and significant correlation was found between WLZ and DDS (r=0.237, p=0.005), FGFS (r=0.237, p=0.010), and ICFI scores (r=0.204, p=0.015) for 6-24 months old infants and young children (not shown in the table). No difference was found between LAZ and WAZ scores for all children on feeding indicators, only those who met the MDD criteria had higher WLZ scores (0.8±1.4, p=0.048) (not shown in the table).

The association of the mean ICFI scores of infants and young children by months with MDD, MMF, and MAD, which are the components of IYCFI, is given in Table 5. Accordingly, for 6-24 months old infants and young children, the difference between the mean ICFI scores of those who met and did not meet MDD, MMF, and MAD was statistically significant (p=0.000). When evaluated according to age groups, the mean ICFI scores of infants and young children (excluding the 9-11 month group for MDD) who met and did not meet all three IYCFI components differed significantly (p<0.05).

Table 5 – Comparison of Infant and Child Feeding Index scores of infants and children meeting Minimum Acceptable Diet, Minimum Diet Diversity, and Minimum Meal Frequency.

IYCFI Indicators	Infant and Child Feeding Index							
	6-8 months (n=41)		9-11 months (n=41)		12-24 months (n=41)		Total (n=141)	
	x̄±SD	*p*	x̄±SD	*p*	x̄±SD	*p*	x̄±SD	*p*
Minimum Diet Diversity								
Met	8.6±1.6	0.005*	9.3±1.6	0.697	9.0±1.4	0.019*	9.1±1.5	0.000*
Not met	6.7±1.8		9.0±0.1		7.3±2.0		6.9±1.8	
Minimum Meal Frequency								
Met	8.3±1.5[a]	0.000*	9.5±1.6[b]	0.024*	9.3±1.4[b]	0.035*	9.1±1.6	0.000*
Not met	5.5±1.6[a]		8.1±1.3[b]		7.8±1.9[b]		7.1±2.0	
Minimum Acceptable Diet								
Met	8.7±1.6	0.003*	9.7±1.4	0.002*	9.3±1.4	0.035*	9.3±1.5	0.000*
Not met	6.8±1.7		7.9±1.5		8.1±1.9		7.4±1.8	

Note: *$p<0.05$. YCFI: Infant and Young Child Feeding Indicator

DISCUSSION

In this study, the appropriateness of complementary feeding practices of mothers of 6-24 months old infants and children were evaluated using WHO indicators and ICFI, and its relationship with nutritional status was examined.

According to the 2021 Global Nutrition Report, the rate of early initiation of breastfeeding is 71.3%; the rate of continuation to breastfeeding under 1 year of age was 65.6%; the rate of continuation to breastfeeding under the age of 2 has been reported as 33.5% in our country [11]. In our study, the rate of children who started to take breast milk immediately after birth (78%) was quite high compared to these data, but it is consistent with the data of our country. We thought that the high level of education of the mothers participating in the study, the fact that their infants/children have regular health check-ups, and the widespread use of baby-friendly hospital practices in our country may have been important at this point.

According to the 2021 Global Nutrition Report data, the rate of infants aged 6-8 months who were introduced into solid, semi-solid or soft foods in Western Asia is 84.3%, it has been reported as 85.4% in Turkey, and 72.6% globally. This rate is reported as 90.3% in Georgia, 84.8% in Iraq, 76.9% in Azerbaijan, 74% in Qatar, among countries with similar socioeconomic levels [11]. In our study, this rate for 6-8 month-old infants was 100%, which is above the global data. It was determined that 70.7% of 6-8-month-old infants started complementary foods within the recommended time intervals. Similar results were found in the studies conducted in Ghana (%61,2) [12], in Eastern Ethiopia (%66,9) [13]. Accordingly, it is seen that the timing of complementary feeding is appropriate among the children of our country. This may be related to the high rate of educated mothers.

It is recommended that infants' complementary foods be varied and nutritious, represented by at least 4 food groups in meals served in 24 hours [3]. In accordance with the recommendations, in this study, it was seen that the majority of children consumed at least 4 food groups [dairy products, non-citrus fruits, eggs, bread/cereals and other vegetables (excluding leafy greens)] according to their 24-hour diet recall.

Nutritional diversity emerges as a sustainable strategy to reduce micronutrient deficiencies. It is very important to provide a diverse diet to meet nutritional requirements and reduce the risks of malnutrition in this early period of life [14]. In the 2021 Global Nutrition Report, the MDD for the Asia region (including Turkey) is 28.9%; MMF 54.5%; MAD 19.2%; globally MDD is 28.9%; MMF 51.7%; MAD is determined as 18.2% [11]. In studies, the rates of meeting MMF, MAD, and MMD

were found to be lower in 6-23 month old children [15, 16]. In our study, it was determined that the rate of meeting with MDD, MFF and MAD in children was quite high compared to the Asian region and global data. Although the rate of initiation of complementary feeding in infants and young children evaluated in this study lagged behind the global data, the variety, frequency of meals, and acceptable diet ratio of the nutrients provided are sufficient when switching to complementary feeding. The mean scores of ICFI were significantly higher (p=0.000) in infants and young children who met the IYCFI components MDD, MMF and MAD. Looking at these rates, it is possible to say that the parents participating in our study have appropriate complementary feeding practices.

In our study, the mean scores of ICFI was found to be highest in children aged 9-11 and 12-24 months, and lowest in children aged 6-8 months. On the contrary, studies in India and Maldives reported better mean ICFI scores for 6-8-month-old children than for other age groups [17, 18]. In a study conducted in Nigeria, the highest mean scores of ICFI were observed in 9-11 months old and the lowest 6-8 months old children, and these results are similar to our study. Both FGFS and DDS were highest among 12-24-month-old children and lowest among 6-8-month-old children [19]. In our study, while the mean breastfeeding scores among the five components of ICFI were highest in 6-8 months old children; both mean FGFS and DDS were lowest among 6-8-month-old children. We think that the fact that the transition to complementary feeding started in these months is a factor in this situation.

In a recent study conducted in Thailand, when ICFI and its components (DDS, FGFS, and meal frequency score) were evaluated, it was determined that feeding practices improved with age, while breastfeeding scores decreased with age, similar to our study [20]. However, the children with the lowest mean meal frequency score were in the 12-24 month group. It has also been observed by researchers in India that [21] FGFS differs between 6-12 months children and older than 12 months, revealing that younger children are at greater risk for malnutrition. Both the WHO IYCF and ICFI reflect complementary feeding practices more holistically than one or more practices examined separately. Based on this information, we think it may be useful to measure nutritional practices so that it is possible to simultaneously evaluate various aspects of complementary feeding. It can be thought that the variety of food consumed by children after 12 months of age is increased as a result of factors such as including all complementary foods in their diet, increased stomach capacity, developed intestines, and having had a certain number of teeth.

In our study, we found no association between both ICFI scores and the WHO IYCF indicators MAD, MDD, or MMF and stunting (LAZ), probably due to the low prevalence of stunting in our study. However, a statistically significant positive correlation was found between ICFI scores and MDD,only WLZ scores. Similarly, no relationship was found in some studies reported in the literatüre [22-25]. In such cross-sectional studies, it is emphasized that ICFI may not show any relationship with nutritional status in regions with low prevalence of malnutrition, and longitudinal follow-up is required to clearly demonstrate this relationship [20]. It has also been reported that WHO IYCF indicators may be better than LAZ in the WLZ explanation and are more associated with acute malnutrition [23].

It has been shown that some ICFI components may affect the risk of stunting in children aged 6-23 months more than other components [26,27]. One study showed that LAZ scores were not associated with DDS, but were positively associated with higher meal frequency [27]. In contrast, another study reported that both DDS and feeding/meal frequency were associated with LAZ [26]. In our study, however, a negative correlation was found between LAZ and DDS in children older than 1 year of age, and no correlation was found with other components of ICFI in any age group. However, a significant positive correlation was found between WLZ and DDS, FGFS, and ICFI scores.

CONCLUSION

This is the first study we know to provide information that holistically evaluates the current complementary feeding practices of 6-24 month-old children in Turkey. Our findings reveal a high prevalence of breastfeeding practices among mothers. The current study did not show any clear association between ICFI and nutritional status, and it is difficult to draw any conclusions about the benefit of ICFI in the absence of a high prevalence of malnutrition. Therefore, further prospective evaluation among healthy children is required to determine the ICFI's prediction of children's nutritional status, particularly length for age. When there is a deficiency in complementary feeding practices, training of primary health care workers and counseling with mothers by community health dietitians can be provided. It is thought that these practices may help to improve mothers' knowledge and thus improve children's feeding practices.

When the limitations of our study are evaluated, firstly, the evaluation of infant and child nutrition is based on the mothers' remembering the foods that their infants consume. Therefore, there may be a recall bias; This may cause some mothers to overestimate or underestimate their children's food consumption. Secondly, it can be stated as a limitation that researchers cannot directly measure anthropometric measurements for infants and children.

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CONTRIBUTORS

All authors critically revised the manuscript, agree to be fully accountable for ensuring the integrity and accuracy of the work, and read and approved the final manuscript.