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Complementary feeding practices and nutritional status of children 6-23 months old: formative study in Aceh, Indonesia

Aripin Ahmad[1,2§], Siti Madanijah[2], Cesilia Meti Dwiriani[2] and Risatianti Kolopaking[3]

[1]Department of Nutrition, Health Polytechnic, Aceh Health Ministry, Jl. Soekarno Hatta, Darul Imarah Aceh Besar 23231, Indonesia
[2]Department of Community Nutrition, Bogor Agricultural University, Jl. Lingkar Kampus, Babakan, Dramaga, Bogor, Jawa Barat 16680, Indonesia
[3]Department of Psychology, Syarif Hidayatullah State Islamic University, Jakarta 15412, Indonesia

BACKGROUND/OBJECTIVES: The 6-23 months for infants is the longest period in the "first 1,000 days" of life. This period is very important for child development, so complementary feeding (CF) practices should be optimized to maximize children's potential for growth and development. The aim of this study was to analyze the CF practices and nutritional status of children aged 6-23 months.
SUBJECTS/METHODS: For this cross-sectional study, 392 children aged 6-23 months were selected using stratified random sampling. Socio-demographic data were collected through interviews. CF practices, collected by interviews and repeated 24-hour food recall method, were the timely introduction of CF, minimum meal frequency, dietary diversity and minimum acceptable diet, consumption food rich in proteins and vitamin A. Nutritional status was assessed using the indicators of underweight, wasting and stunting. To analyze the association between socio-demographic indicators and CF with nutritional status, the chi-square test with a confidence interval of 95% was used.
RESULTS: Results showed that 39% were exclusively breastfed, only 61% received prolonged breastfeeding and 50% received timely introduction of CF. Minimum meal frequency was met by 74% of subjects, but dietary diversity and minimum acceptable diet were only realized in 50% and 40% of the children, respectively. The prevalence of underweight, wasting, and stunting were 26%, 23%, and 28%, respectively. Age of the child, birth order, birth weight, parents' education level, family size and incidence of fever and diarrhea during the previous two weeks were associated with underweight, while child's birth order, fathers' education level, mother's age, family size, completion of the age-appropriate vaccination and fish consumption frequency were associated with wasting. Age of the child, incidence of fever and acute respiratory infection, and fortified food consumption were associated with stunting.
CONCLUSIONS: Suboptimal CF practices and high prevalence of underweight, wasting and stunting were found among children aged 6-23 months old in Aceh. These results highlight the need to improve CF and nutritional status.

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INTRODUCTION

The age of 6-23 months old is the longest period in the "first 1,000 days" of life. This period is called the window of opportunity and is the important stage to optimize child growth and development in order to prevent malnutrition, including wasting, underweight and stunting, as well as the negative consequences in adulthood [1].

The prevalence of stunting and underweight remain high in developing countries. In Indonesia, the prevalence of underweight increased from 17.9% (2010) to 19.65% (2013) and stunting from 35.6% to 37.2%, respectively. Aceh province has the 7th highest prevalence of underweight and stunting in Indonesia, with underweight increasing from 23.7% to 26.3% and stunting from 38.9% to 41.5% [2,3]. The high number of malnourished children aged 6-23 months is strongly related to improper feeding practice since from age 6 months breast milk is no longer able to completely meet energy and nutrient requirements so that the nutrition gap must be fulfilled by complementary feeding (CF) [4].

Improper feeding practices remain a common problem in developing countries. WHO found that only less than one-fourth of children aged 6-23 months met the minimum acceptable diet (MAD), dietary diversity and meal frequency standards in these countries [5]. Feeding practices might affect the nutritional status of the children; about 32% of children under five were stunted and 10% were wasted due to poor breastfeeding and CF [6].

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§ Corresponding Author: Aripin Ahmad, Tel. 62-651-46121, Fax. 62-651-46129, Email. aripinahmad@poltekkesaceh.ac.id
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Inadequate feeding is caused primarily by poor macro- and micronutrient quality due to poor diversity, as well as energy and nutrient density; second by improper frequency, consistency, and quantity of food; and third by the poor safety of food and water, including contamination, poor hygiene practice, unsafe food storage and preparation [7]. These conditions cause inadequate energy and nutrient intake among children.

The poor quality of CF is also seen in its energy and nutrient content. The Total Diet Study Indonesia Year 2014 showed that the proportions of children under-five in Aceh with energy and protein intake lower than the recommended dietary allowance were still high, namely 60.4% and 24.7%, respectively [8].

Aceh was one of the provinces with the most severe health and nutrition problem in Indonesia, due to a severe conflict for 30 years. However, after the 2004 tsunami, many rehabilitation and reconstruction activities were conducted via health and nutrition aid from many countries and international NGOs. One of the NGO-conducted programs in nutritional improvement was building the capacity of the community, particularly the community health workers, in educating the importance of proper feeding practice for children. Breastfeeding and CF counseling training for the cadres and counseling for the mothers/caregivers of children aged 6-23 months were conducted. Nevertheless, no study has yet examined the impact of the program and intervention on improved feeding practices of the children. Therefore, this study analyzed the CF practice based on WHO indicators and the associated factors of the nutritional status of children aged 6-23 months in Aceh Besar District, Aceh Province, Indonesia.

MATERIALS AND METHODS

Study design and participants

This cross-sectional study was conducted in May-June 2016 in 3 sub-districts in Aceh Besar District, and data were collected for 392 children aged 6-23 months. The sample was chosen using cluster random sampling technique with the following inclusion criteria: 1) child aged 6-23 months, 2) the mother agreed to be interviewed, and 3) the child was apparently healthy, not experiencing chronic/congenital diseases, such as heart abnormality, and not having experienced acute conditions such as fever, diarrhea and respiratory infections in the previous 2 weeks. The minimum sample size was calculated using the formula for the survey by Lwanga and Lemeshow [9,10].

The study was conducted according to the Helsinki declaration and all procedures involving human subjects were approved by the University of Indonesia (UI)'s Ethics Committee of the Faculty of Medicine: 452 / UN.2.F1 / ETIK / 2016. At least one of the parents of all the infants participating in this study provided written informed consent prior to enrolment in the study.

Measurement of variables

Data on child characteristics and family socio-demography included the age of the child, sex, birth weight, birth order, family size, education of the parents, occupation of the parents and family income. The data were collected through interview. Body weight and length measurement were conducted to determine the nutritional status of the child, body weight was measured using a portable Tanita digital scale (Tanita Corporation of America, Arlington Heights, Illinois, USA) with a precision of 0.1 kg, and the recumbent length was measured using an infant length board with a precision of 0.1 cm. In terms of nutritional status, underweight was defined as a weight for age z-score less than 2 standard deviation (SD) below the mean, wasting as weight for length z-score less than 2 SD below the mean and stunting as length for age less than -2. This analysis was conducted using WHO Anthro 2005 v.2.0.4 software (Nutrition department of WHO, Geneva, Switzerland) [11].

CF practices adopted the following recommendation of WHO and Pan American Health Organization/WHO/UNICEF for infant and young child feeding (IYCF) [4,12]. 1) Early breastfeeding initiation (EBI), the child was breastfed until 1 hour after birth. 2) Exclusive breastfeeding (EBF), the child was given only breastmilk until the age of 6 months. 3) Prolonged breastfeeding (PBF), the child was still breastfed. 4) A timely introduction to CF, the child was given solid, semi-solid and liquid food at the age of 6 months. 5) Minimum dietary diversity (MDD), the child aged 6-23 months received CF with $\geq$ 4 out of 7 food groups. 6) Minimum meal frequency (MMF), the child aged 6-23 months received a meal with standard frequency taking account the breastfeeding status. 7) MAD, the child aged 9-23 months received a meal meet standard for dietary diversity and frequency [4,13]. 8) Iron-rich or iron-fortified and vitamin A-rich green leafy and orange vegetables consumption. The data on EBI, EBF and PBF were collected through interview using structured questionnaire. MDD was calculated as the mean of 3 repeated 24-hour recall results. The dietary diversity was categorized as good when the child consumed 4 out of the following 7 food groups: cereals and tubers, legumes, dairy products (milk, yoghurt, cheese), flesh food (meat, fish, poultry, organ meat), eggs, vitamin A-rich fruits and vegetables, and other fruits and vegetables [4,13]. MMF was calculated through an interview on the frequency of meals and snacks. The recommended standard was only breastfeeding for infants, meal 2 times/day or more for children aged 6-8 months, meal 3 times/day or more for children aged 9-23 months, and meal 4 times/day or more for non-breastfed children [4,13]. To ensure the internal validity of the questionnaire, an expert nutritionist performed content and language checking of questionnaire and field trials were carried out.

Data management and analyzed

Data were processed through editing, coding, entry and analysis using SPSS version 21 (International business machines corporation, Armonk, New York, USA). Bivariate analysis was conducted to analyze the association of child characteristic and family socio-demography as well as CF practice with nutritional status. Chi-square test with a confidence level of 95% was conducted to analyze the association of socio-demography and CF practice with underweight, wasting and stunting.

RESULTS

Child characteristic and family socio-demography

The families' socio-demography data and the health status

Table 1. Socio-demographic characteristics and health outcomes of subjects

Socio-demographic and characteristics	n	%
Sex of the child		
Female	190	48.5
Male	202	51.5
Age of the child		
6-11 months	149	38.0
12-23 months	243	62.0
Birth order of the child		
1 to 2	229	58.4
3 to 4	135	34.4
≥ 5	28	7.1
Birth weight status[1]		
Low birth weight	53	13.5
Normal	339	86.5
Age of the father (yr)		
< 25	11	2.8
25-35	188	48.0
≥ 36	193	49.2
Employment status of the father		
Government employee	58	14.8
Entrepreneur and seller	176	44.9
Farmer/fisherman	48	12.2
Labor/driver/service	110	28.1
Education level of the father		
≤ Elementary school	44	11.2
Junior high school	80	20.4
Senior high school	218	55.6
University	50	12.8
Age of the mother (yr)		
< 25	75	19.1
25-35	234	59.7
≥ 36	83	21.2
Employment status of the mother		
Housewife	361	92.1
Working	31	7.9
Education level of the mother		
≤ Elementary school	37	9.4
Junior high school	87	22.2
Senior high school	191	48.7
University	77	19.6
Family size (person)		
3-4	214	54.6
5-6	149	38.0
7 and above	29	7.4
Family income (IDR/month)[2]		
< 1.9 million	169	43.1
1.9-3.5 million	187	47.7
> 3.5 million	36	9.2
Fever in the last 2 weeks		
Yes	138	35.2
No	254	64.8
Acute respiratory infection in the last 2 weeks		
Yes	88	22.4
No	304	77.6
Diarrhea in the last 2 weeks		
Yes	44	11.2
No	384	88.8
Completion of age appropriate vaccination		
Complete	200	51.0
Incomplete	123	31.4
Not at all	69	17.6

IDR: Indonesian Rupiah
[1] Low birth weight = < 2,500 g and normal = ≥ 2,500 g
[2] Classification by Aceh province minimum regional wage 2017

of the study subjects are listed in Table 1. It shows that about half (51.5%) of the children were boys and almost two thirds (62%) of them were aged 12-23 months and only 13.5% of them had low birth weight (LBW). More than half (51.0%) of the children completed the age-appropriate vaccination, and some

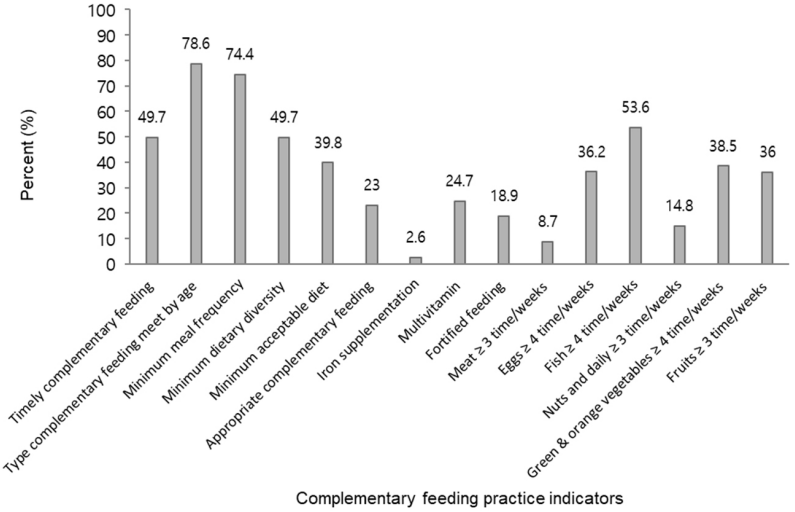

Fig. 1. Complementary feeding practice by indicators among children 6-23 months old

Table 2 Prevalence of malnutrition among children aged 6-23 months in Aceh by sex and age

Nutritional status indicator	Sex		Age (Month)		Total (%)
	Male (%)	Female (%)	6-11 (%)	12-23 (%)	
Weight-for-age z-score					
Underweight (< -2 SD)	20.9	15.6	14.1	21.0	18.4
Severe underweight (< -3 SD)	7.3	8.6	4.7	9.9	7.9
Weight-for-height z-score					
Wasting (< -2 SD)	17.0	15.1	16.8	15.6	16.1
Severe wasting (< -3 SD)	5.3	7.5	6.7	6.2	6.4
Overweight/Obesity (> 2 SD)	2.9	3.8	4.0	2.9	3.3
Length-for-age z-score					
Stunting (< -2 SD)	16.5	14.0	8.1	19.8	15.3
Severe stunting (< -3 SD)	14.1	10.8	4.7	17.3	12.5

SD: standard deviation

Table 3. Bivariate analysis of nutritional status by complementary feeding and socio-demographic indicators[1]

Complementary feeding and socio-demographic indicator	Wasting n (%)	*P*	Underweight n (%)	*P*	Stunting n (%)	*P*
Sex of the child						
Female	45 (22.3)	0.933	57 (28.2)	0.368	63 (31.2)	0.124
Male	43 (22.6)		46 (24.2)		46 (24.2)	
Age of the child						
6-11 months	35 (23.5)	0.699	28 (18.8)	0.009**	19 (12.8)	< 0.001**
12-23 months	53 (28.1)		75 (30.9)		90 (37.0)	
Birth order of the child						
1 to 2	38 (16.6)	0.003**	52 (22.7)	0.027*	60 (26.2)	0.569
3 to 4	39 (28.9)		38 (28.1)		42 (31.1)	
≥ 5	11 (39.3)		13 (46.4)		7 (25.0)	
Birth weight status						
Low birth weight	14 (26.4)	0.458	23 (43.4)	0.003**	17 (32.1)	0.456
Normal	74 (21.8)		80 (23.6)		92 (27.1)	
Age of the father (yr)						
< 25	1 (9.1)	0.141	0 (0.0)	0.291	3 (27.3)	0.997
25-35	36 (19.1)		44 (23.4)		52 (27.7)	
≥ 36	51 (26.4)		59 (30.6)		54 (28.0)	
Employment status of the father						
Government employee	8 (13.8)	0.184	12 (20.7)	0.572	16 (27.6)	0.842
Entrepreneur and seller	37 (21.0)		47 (26.7)		49 (27.8)	
Farmer/fisherman	12 (25.0)		11 (22.9)		11 (22.9)	
Labor/driver/service	31 (28.2)		33 (30.0)		33 (30.0)	
Education level of the father						
≤ Elementary school	14 (31.8)	0.016*	16 936.4)	0.040*	11 (25.0)	0.523
Junior high school	26 (32.5)		28 (35.0)		20 (25.0)	
Senior high school	37 (17.0)		50 (22.9)		67 (30.7)	
University	11 (22.0)		9 (18.0)		11 (22.0)	
Age of the mother (yr)						
< 25	10 (13.3)	0.002**	60 (25.6)	0.142	22 (29.3)	0.776
25-35	48 (20.5)		15 (20.0)		62 (26.5)	
≥ 36	30 (36.1)		28 (33.7)		25 (30.1)	
Employment status of the mother						
Housewife	80 (22.2)	0.641	98 (27.1)	0.188	105 (29.1)	0.063
Working	8 (25.8)		5 (16.1)		4 (12.9)	
Education level of the mother						
≤ Elementary school	13 (35.1)	0.094	13 (35.1)	0.047*	11 (29.7)	0.447
Junior high school	13 (27.6)		31 (35.6)		29 (33.3)	
Senior high school	36 (18.8)		42 (22.0)		52 (27.2)	
University	15 (19.5)		17 (22.1)		17 (22.1)	

Table 3. continued

Complementary feeding and socio-demographic indicator	Wasting n (%)	*P*	Underweight n (%)	*P*	Stunting n (%)	*P*
Family size (person)						
3-4	36 (16.8)	0.012*	49 (22.9)	0.018*	59 (27.6)	0.991
5-6	42 (28.2)		40 (26.8)		42 (28.2)	
7 and above	10 (34.5)		14 (48.3)		8 (27.6)	
Family income (IDR/month)						
< 1.9 million	44 (26.0)	0.311	46 (27.2)	0.885	49 (29.0)	0.867
1.9-3.5 million	36 (19.3)		47 (25.1)		51 (27.3)	
> 3.5 million	8 (22.2)		10 (27.8)		9 (25.0)	
Fever in the last 2 weeks						
Yes	58 (22.8)	0.804	49 (35.5)	0.002**	54 (39.1)	< 0.001**
No	30 (21.7)		54 (21.3)		55 (21.7)	
Acute respiratory infection in the last 2 weeks						
Yes	68 (22.4)	0.934	28 (31.8)	0.181	37 (42.0)	0.001**
No	20 (22.7)		75 (24.7)		72 (23.7)	
Diarrhea in the last 2 weeks						
Yes	74 (21.3)	0.579	19 (43.2)	0.008**	16 (36.4)	0.181
No	14 (31.8)		84 (24.1)		93 (26.7)	
Completion of age-appropriate vaccination						
Complete	34 (17.0)	0.032*	44 (22.0)	0.123	60 (30.0)	0.608
Incomplete	35 (28.5)		36 (29.3)		31 (25.2)	
Not at all	19 (27.5)		23 (33.3)		18 (26.1)	
Early initiation breastfeeding						
Yes	44 (24.6)	0.354	47 (26.3)	0.994	47 (26.3)	0.530
No	44 (20.7)		56 (26.3)		62 (29.1)	
Exclusive breastfeeding						
Yes	35 (22.9)	0.871	61 (25.5)	0.672	67 (28.0)	0.900
No	53 (22.2)		42 (27.5)		42 (27.5)	
Prolonged breastfeeding						
Yes	66 (24.4)	0.160	73 (27.0)	0.610	75 (27.8)	0.985
No	22 (18.0)		30 (24.6)		34 (27.9)	
Timely introduction to complementary feeding						
< 6 months	42 (21.5)	0.667	50 (25.6)	0.776	55 (27.9)	0.960
Start at 6 months	46 (23.4)		53 (26.9)		54 (27.7)	
Minimum meal frequency						
Met	69 (23.6)	0.339	74 (25.3)	0.474	78 (26.7)	0.409
Not met	19 (19.0)		29 (29.0)		31 (31.0)	
Minimum dietary diversity						
Met	46 (23.4)	0.667	53 (27.2)	0.686	55 (28.8)	0.816
Not met	42 (21.5)		50 (25.4)		54 (27.4)	
Minimum acceptable diet						
Good	32 (20.5)	0.455	39 (25.0)	0.641	42 (26.9)	0.751
Poor	56 (23.7)		64 (27.1)		67 (28.4)	
Iron or multivitamin supplement intake in the last 3 months						
Yes	21 (21.0)	0.687	24 (24.0)	0.549	35 (35.0)	0.063
No	67 (22.9)		79 (27.1)		74 (25.3)	
Fortified food consumption in the last 3 months						
Yes	13 (17.6)	0.264	20 (27.0)	0.870	29 (39.2)	0.015*
No	75 (23.6)		83 (26.1)		80 (25.2)	
Meat consumption (time/week)						
≥ 3	9 (26.5)	0.772	14 (41.2)	0.128	11 (32.4)	0.720
1-2	18 (20.5)		22 (25.0)		26 (29.5)	
Never	61 (22.6)		67 (24.8)		72 (26.7)	

Table 3. continued

Complementary feeding and socio-demographic indicator	Wasting n (%)	*P*	Underweight n (%)	*P*	Stunting n (%)	*P*
Eggs consumption (time/week)						
≥ 4	34 (23.9)	0.805	44 (31.0)	0.276	43 (30.3)	0.711
1-3	33 (22.4)		34 (23.1)		39 (26.5)	
Never	21 (20.4)		25 (24.3)		27 (26.2)	
Fish consumption (time/week)						
≥ 4	39 (18.6)	0.012*	54 (25.7)	0.499	63 (30.0)	0.575
1-3	26 (35.6)		23 (31.5)		18 (24.7)	
Never	23 (21.1)		26 (23.9)		28 (25.7)	
Legumes consumption (time/week)						
≥ 3	15 (25.9)	0.542	21 (36.2)	0.174	19 (32.8)	0.618
1-2	37 (24.0)		39 (25.3)		43 (27.9)	
Never	36 (20.0)		43 (23.9)		47 926.1)	
Green leafy and orange vegetables consumption (time/week)						
≥ 4	31 (20.5)	0.542	39 (25.8)	0.969	44 (29.1)	0.491
1-3	31 (25.2)		32 (26.0)		37 (30.1)	
Never	26 (22.0)		32 (27.1)		28 (23.7)	
Fruits consumption (time/week)						
≥ 3	28 (19.9)	0.356	37 (26.2)	0.995	43 (30.5)	0.623
1-2	42 (26.1)		42 (26.1)		41 (25.5)	
Never	18 (20.0)		24 (26.7)		25 (27.8)	

IDR: Indonesian Rupiah
* $P < 0.05$, ** $P < 0.01$
[1] Bivariate analysis with chi-square test

of the children had been reported ill in the previous 2 weeks preceding the study (32.5% experienced fever, 22.4% ARI and 11.2% diarrhea). Based on family socio-demography, almost half (49.2%) of the fathers were aged ≥ 36 years and worked as entrepreneurs (44.9%), and more than half (55.6%) had graduated from senior high school. More than half (59.7%) of the mothers were aged 25-35 years, the majority were housewives and had graduated from senior high school (48.7%). The family size of the children was mostly 3-4 people with income between Indonesian Rupiah (IDR) 1.9 million and IDR 3.5 million per month.

CF practices of children aged 6-23 months

The CF practices of the children aged 6-23 months are shown in Fig. 1. It shows that the majority of the children was inappropriate CF, almost half of the children received a timely introduction to CF and met the MDD (49.7%), and more than one third (39.8%) fulfilled the MAD. Almost three out of four (74.4%) children met the recommended MMF. The result of the study also shows that less than 25% of the children received iron or multivitamin syrup supplementation and fortified food, consumed meat ≥ 3 times/week, nuts and dairy products ≥ 3 times/weeks. More than a quarter consumed eggs ≥ 4 times/week, vegetables ≥ 4 times/weeks and fruits ≥ 3 times/weeks. More than half of the children consuming fish ≥ 4 times/week.

Nutritional status of 6-23 months old children

The study shows that the average weight-for-age, weight-for-height and height-for-age z-scores were -1.22 ± 2.36, -1.12 ± 1.95 and -0.84 ± 3.19, respectively. While about one-fourth of the children were underweight (26.3%), wasting (22.5%) and stunting (27.8%). The prevalence of underweight and stunting were higher among boys at the age of 12-23 months while wasting was higher among girls at the age of 6-11 months, as listed in Table 2.

Association of social-demography and CF practices with underweight, wasting and stunting.

The analysis results (Table 3) showed that birth order ($P = 0.003$), father and mother's education level ($P = 0.016$ and $P = 0.002$), family size ($P = 0.012$), completion of the age-appropriate vaccination ($P = 0.032$) and fish consumption frequency ($P = 0.012$) were associated with wasting. The age of the child ($P = 0.009$), birth order ($P = 0.027$), birth weight ($P = 0.003$), father and mother's education level ($P = 0.040$ and $P = 0.047$), family size ($P = 0.018$) and incidence of fever and diarrhea during the previous two weeks ($P = 0.002$ and $P = 0.008$) were associated with underweight. The factors associated with stunting were the age of the child ($P < 0.001$), the incidence of fever and ARI during the previous two weeks ($P < 0.001$ and $P = 0.001$) and fortified food consumption during three months ago ($P = 0.015$).

DISCUSSION

Referring to the indicators of CF practices set by IYCF for children aged 6-23 months recommended by WHO [6], all the indicators of CF practices in this study were sub-optimal. The study results (Fig. 1) showed that among eight main indicators of CF practices, only food consumption was close to the

standard. The other indicators, namely timely introduction to CF, EBF, MDD, MAD, and consumption of iron and vitamin A-rich food, were still low. This result was similar with a study conducted by Blaney *et al*. [14] in Indonesia finding that CF practices for children aged above 6 months were sub-optimal, particularly on the indicator of MDD, iron-rich food consumption and hygiene practice.

The proportions of children receiving EBI and EBF were still very low at 45.7% and 39.0%, respectively. This was in line with the data on EBF in Aceh in the last decade, which was lower than the national average. Sharp reductions were seen in 2007, 2009 and 2010 with proportions of 11.4%, 8.5% and 4.3%, respectively [15,16]. Moreover, the prevalence of EBI and EBF found by this study were higher than those of a study conducted by the UI and UNICEF in 3 districts in Aceh in 2012. The EBI proportion was 30.5% in Aceh Besar, 34.7% in Aceh Timur and 76.3% in Aceh Jaya, while the EBF proportion was 16.9% in Aceh Besar, 0% in Aceh Jaya and 8.2% in Aceh Timur [17]. When also compared to the analysis result found by the International Baby Food Action Network (IBFAN) in 2008-2012 in Indonesia, the EBI proportion was lower (29.3%), while the EBF proportion was higher (41.5%) [18].

In terms of the timeliness of introduction to CF, this study found less than half (49.7%) of the children received CF timely, while the rest was introduced earlier (4.5% after birth, 8.4% before 1 month old, 37.2% before 6 months old). The finding by UI and UNICEF in Aceh also presented a similar condition, starting from the age of 3 days, the children were given food, namely water, formula milk, fresh milk and other food (grains, pumpkins, sweet potatoes, food made of roots and tubers) [17]. When also compared to the result of IBFAN in Indonesia, the proportion was almost similar, with 43.9% children receiving CF too early [18]. A study in Pakistan mentioned that 67% of infants received solid, semi-solid and liquid food at the age of 6-8 months [19]. Some other studies also showed early solid food feeding. A study in Nigeria found that 73.5% of the mothers fed solid food before their children reached the age of 6 months, with 2.3% of them feeding solid food from after birth up to 1 month old and 12.9% at the age of 2 months [20]. Studies in India and Ethiopia found that 10.2% and 10.5% of children received CF before 6 months old, respectively [21,22]. Another study in Ethiopia obtained a very low proportion, which was 2.1%, while 79.7% of the children received timely CF (6 months old) [23]. A study by Aguayo found a very similar result with 57.4% of children aged 6-23 months in South Asia receiving timely CF [24]. Untimely introduction to CF was the global problem, particularly in Latin America, the Caribbean, and East Asia Pacific, where almost half of the children received CF at the age of 4-5 months [25].

Child feeding should fulfill the criteria of MMF and MAD [6,12,13]. The minimum standard of daily consumption for children was $\geq$ 2 times for children aged 6-8 months, $\geq$ 3 times for age of 9-23 months, and $\geq$ 4 times for those who were not breastfed with a minimal diversity of 4 of out 7 food groups [6,12,13]. Based on this indicator, this study showed that 7 out of 10 children (74.4%) met the MMF, but with poor dietary diversity (49.7%) (Fig. 1). When compared to the standard of MAD with the criteria of both the frequency and diversity, almost 4 out of 10 children (39.8%) met the criteria. Another study in Aceh showed that the proportion of children aged 6-23 months meeting MDD was 55.9%, while in Aceh Besar the proportion was 49.1%. The same study also found 91.7% and 51.6% of the children aged 6-8 months and 9-23 months met MMF, respectively [17]. The present study finding was also higher than that reported by WHO found that less than one-fourth of the children aged 6-23 months in developing countries had good consumption quality [5]. Udoh *et al*. [20] found that consumption quality of Nigerian children was still poor: only 31.5% met MDD, 36.7% met MMF and 23.1% met MAD. A study in Ethiopia found that the MDD was slightly higher (59.9%), but MAD was very low (7%) [22]. Another study conducted by Saaka *et al*. [26] found a very similar result with only 57.3% of the children met MMF, 35.3% met MDD, 25.2% met MAD and 14.3% met appropriate CF criteria (timely introduction to CF, MMF, MDD, and MAD). A lower proportion was found by Mekbib *et al*. [23] and only 17.8% of the children met MDD, 40% of them were fed 2 times a day, 11.9% of them met MAD and 10.75% of them met the appropriate CF practices. Another study showed a very result with 47.7% met MMF, 33.0% met MDD and 20.5% met MAD [24]. A study in Pakistan found that 63% of children aged 6-23 months met the criteria for MMF, 22% met MDD and 15% met MAD [19]. A study done in Southern Ethiopia also found a very similar result, which was MMF 94.5%, MDD 16.5%, MAD 16.3% and appropriate CF practice with 4 indicators (timely introduction to CF, MMF, MDD, MAD) 11.4% [27].

Other recommended indicators were iron supplementation or iron-fortified and iron and vitamin A-rich food consumption [4,6,12,13]. The present study result (Fig. 1) showed that supplementation for children aged 6-23 months was still rare, with only 25.5% and 18.9% of the children receiving iron/multivitamin syrup supplementation and fortified food, respectively. Moreover, consumption of protein and iron-rich food, such as meat, eggs, fish, legumes, green leafy and orange vegetables, in the previous month was also still poor. The analysis result showed that meat was consumed the least, only 8.7% of the children consumed it $\geq$ 3 times/week, followed by 36.2% of $\geq$ 4 times/week of eggs. Fish was consumed slightly more than other food with 53.6% of the children consuming it $\geq$ 4 times/week. Legumes consumption was very low with 14.8% of them consuming $\geq$ 3 times/week. More than one-third (38.5% and 36%) of the children were given vegetables $\geq$ 4 times/week and fruits $\geq$ 3 times/week (Table 3). This result was very similar with a study in South Asia mentioning that 33.2% of the children consumed vitamin A fruits and vegetables, while 17.1% of them consumed CF containing meat, fish, poultry, and eggs [24]. Also, a similar study done in Kenya found that fruits and vegetables consumption frequency among children 6-23 months was less than 25.4% consumed one time in a week [28]. Mbithe *et al*. [29] also found only 20% of the children aged 6-23 months were given vegetables and fruits. Moreover, Na *et al*. [19] mentioned that consumption of legumes, fruits and vitamin A-rich vegetables in Pakistan was very low (6-19%).

Poor CF practice of children aged 6-23 months was caused by many factors. Chandrasekhar *et al*. [30] stated that children from middle and low food security families had low food

diversity score in Maharashtra India. On the other hand, the CF practice of children more than 6 months old was related to the knowledge, perception, attitude, belief, and skill of the mother, health service and home environment [31]. Na *et al.* [19] also found that younger age (6-11 months old), mother's age, low socio-economic status and poor health and nutrition service affected poor CF practice, particularly on MDD and MAD in Pakistan. Areja *et al.* [27] similarly found that CF practice was influenced by health service, namely antenatal care and birth order. In the period of the first child, the mother tends to lack experience in child care, including CF practice. However, cultural factors and social norms in the society also affected CF practice [32]. The low proportion of proper CF practice in Aceh was related to community socio-cultural factors, such as the introduction of food taste to the newborn by giving honey, sugar, salt and fruit extract at the age of 7 days [33].

This study found a significant association between the age of the mother, completion of age-appropriate vaccination, and fish consumption with the odds of wasting. In addition, the age of the child, birth weight, and fever were significantly associated with lower odds of underweight. Similarly, the age of the child and fever were also associated with the odds of stunting. However, this study found no association on indicators of CF, namely MMF, MDD, MAD and timely introduction to CF, with wasting, underweight and stunting.

This result was not in line with Kimiywe *et al.* [28] who found that CF practices were significantly correlated with nutritional status, particularly MDD. Kenya's study also found that low MAD significantly correlated with wasting [34]. Moreover, Krasevec *et al*. [35] stated that MDD was correlated with stunting, mentioning that children aged 6-23 months consuming zero food groups in the previous day had a 1.345-fold higher odds of being stunted compared to children consuming ≥ 5 food groups. Moreover, children not consuming animal food had a 1.436-fold higher risk of stunting than children consuming 3 types of animal food. Similarly, this study found that fish (animal food) consumption was correlated with wasting. Udoh *et al.* [20] found that early (< 6 months old) introduction to CF increased the risk of stunting by 5.15 times, low MDD increased the risk of underweight by 2.07 times, and low MMF raised the risk of stunting by 1.57 times. Chandrasekhar *et al.* [30] found that household food security significantly correlated to stunting and underweight.

In summary, CF practices of children aged 6-23 months were sub-optimal. Among eight indicators of CF practices recommended by WHO, only MMF had a high proportion (74.4%). The other 7 indicators, namely exclusive breastfeeding, timely introduction to complimentary food, MDD, MAD, and iron- and vitamin A-rich food consumption, were still suboptimal. Underweight, wasting and stunting remained crucial problems since the prevalence exceeded the cut-off point of public health problem categorized as acute and chronic malnutrition. The birth order, age of the mother's, education level of father's, family size, completion of age-appropriate vaccine and fish consumption were associated with wasting, while the age of the child, birth order of child, birth weight status, mother and father's education level, fever and diarrhea in the previous 2 weeks were associated with underweight and age of child, fever and ARI in the previous 2 weeks and fortified food consumption in the last 3 months were associated with stunting. An effective nutrition education model based on behavior change theory is necessary for the mother and family to improve CF practices and to prevent nutritional problem among children 6-23 months old.

The results of this study can use as a reference for planning the development of nutritional education programs to improve the CF and nutritional status and can also be used as inter-regional comparisons related to CF practices among children 6-23 months old. The data related to the practice of giving CF in Indonesia are still very limited, so the strength of this study is that the CF practices were analyzed by referring to the WHO recommended IYCF standard for children aged 6-23 months.

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CONFLICT OF INTERESTS

The authors declare no potential conflicts of interests.

ORCID

Aripin Ahmad: https://orcid.org/0000-0001-8663-2751
Siti Madanijah: https://orcid.org/0000-0002-1228-7665
Cesilia Meti Dwiriani: https://orcid.org/0000-0003-2245-310X
Risatianti Kolopaking: https://orcid.org/0000-0003-0969-9295

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