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1 Improving knowledge, attitude, and practices of complementary feeding using practical intervention training for parents living in stunting villages in Central Lombok, Indonesia: A community-based study

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Abstract

Background

Stunting is one of the major child public health concerns in Indonesia. West Nusa Tenggara (WNT) province, specifically, is still struggling to reduce its stunting prevalence as it is still higher than the average national prevalence, accounted for 31.4% in 2018. Ensuring knowledge, attitude, and practices (KAP) of complementary feeding among parents is relevant to succeeding in the implementation of stunting reduction programs. This study aimed to assess the effectiveness of interventions in the form of seminar and workshop on preparing complementary feeding in stunting villages in Central Lombok, Indonesia.

Methods

This is a quasi-experimental community-based study, held in three stunting villages of Central Lombok, WNT, from June until August 2019. Three villages were chosen randomly from ten stunting-villages in Central Lombok District and divided into three groups, i.e., control group, seminar group and seminar and workshop group. We assessed KAP before and after intervention with a four-week interval.

Results

A total of 205 participants were enrolled in this study, consisting of 67, 70, and 68 participants for the control group, the first intervention group, and the second intervention group, respectively. Most participants had poor knowledge (75.1%) of complementary feeding in the baseline assessment. We found an insignificant change in knowledge, but notable alterations in attitudes and practices after intervention. Seminar intervention could increase practice, while complete intervention (seminar and workshop) could increase both practices and attitudes significantly ($p = 0.015$ dan $p = 0.014$). We found that complete intervention was more effective in increasing attitudes compared to the control group ($p = 0.039$). In contrast, practices in both seminar and complete intervention was increased effectively than controls ($p = 0.006$ vs. $p = 0.008$), and no differences between seminar and complete intervention group ($p = 0.943$).

Conclusions

Complementary feeding KAP among parents in stunting villages in Central Lombok was inadequate. Our study showed that the combination of seminar and workshop increased parents' attitudes and practices, while the seminar only increased parents' practices. We suggest further prospective study to assess how long the effectivity of such interventions could impact and last; and obtain any cultural concerns.

Trial registration: 376/UN18.8/ETIK/2018

Introduction

Globally, stunting prevalence had been successfully reduced from 47% in 1980 to 33% in 2000, yet this did not occur equally for all countries.¹ In 2015, Indonesian government decided to prioritize stunting reduction program due to its high prevalence in 2013 (37.2%).¹⁻³ However, despite the government efforts and decreased of stunting national prevalence into 30.8% in 2018, West Nusa Tenggara (WNT) province had their number higher than the average national prevalence, accounted for 31.4% in 2018.⁴

Considering the short term and long term consequences of stunting, Indonesia has been actively participating in stunting reduction programs – such as Scaling Up Nutrition (SUN) and *Gerakan 1000 Hari Pertama Kehidupan* (First 1000 days of Life Movement) – to accelerate the prevalence reduction.^{3,5} As one of the programs in both movements, improving complementary feeding practices are essential to serving as stunting-specific interventions. After the first six months of life, breast milk falls shorts on providing full nutritional requirements for infants; and complementary feeding plays a critical role in providing sufficient nutrition for growing infants.

The World Health Organization (WHO) (2001) describes the main principles of appropriate complementary feeding practices as *timely* (foods starts being introduced from 6 months), *adequate* (foods should provide sufficient energy, protein, and micronutrien for child's nutritional needs), *safe* (foods are hygienically stored, prepared, and fed), and *properly fed* (foods are given consistent with a child's signal of appetite and satiety, and that meal frequency and feeding method are suitable for age).⁶ However, complementary feeding in Indonesian children above six months of age was less than ideal,⁶ in terms of: introduction time, frequency, texture, feeding methods, sanitation and hygiene, dietary quality (lack of animal-based protein), and adequacy of essential vitamin, minerals, and calories.^{7,8,9}

Although promoting appropriate complementary feeding practices has been addressed as an important strategy to combat stunting, the practical promotion program is still lack and scarce. Health promotion through community platform is an effective and potential way to

reach all segments with nutrition interventions and health services.¹⁰ Despite its effectiveness in increasing positive attitudes and lift detrimental beliefs and perceptions, no seminar or workshop is available to improve mothers' knowledge.¹¹

Based on the facts as mentioned earlier, ensuring knowledge, attitude, and practices (KAP) of complementary feeding among parents in stunting villages in Central Lombok are relevant to succeeding the implementation of stunting reduction programs. As we argue that there is lack of practical education program for complementary feeding practices in Indonesia, we also aim to deliver interventions in form of seminar and workshop on preparing complementary feeding and compare the effectiveness of such programs by measuring mother's KAP after the intervention. As far as we know, there is no existing similar study in Indonesia that assess and deliver the same intervention as what we have planned. Therefore, this study would be a significant reference for future studies in order to support the reduction of stunting prevalence programs in Indonesia.

Methods

Research Design

This is a quasi-experimental community-based study, held in three stunting villages of Central Lombok, West Nusa Tenggara, from June until August 2019. Three villages were chosen randomly from ten stunting-villages in Central Lombok District, and divided into three groups:

- A. No intervention : control group
- B. One intervention : one-day seminar regarding stunting and complementary feeding
- C. Two interventions: one-day seminar along with cooking session workshop regarding stunting and complementary feeding.

Population and Subjects

Population of this study consists of parents with children aged 6-12 months living in three stunting-villages enlisted by the Department of Health Central Lombok, West Nusa Tenggara. All parents from 6-12 months children in those selected villages were invited to participate and provided a plain language statement and an inform-consent form. Those who agreed to participate were prescreened and interviewed for their baseline data, and recruited.

Inclusion Criteria

1. Parents living and registered in 3 stunting villages, Central Lombok, West Nusa Tenggara. Parents could be represented as mother, father, or guardians who take care of the child.
2. Parents of children aged 6-12 months living in stunting villages.
3. Parents who agree to participate in the research by signing informed-consent.

Exclusion Criteria

1. Non-cooperative parents.
2. Parents who do not complete the questionnaire according to the given

Sampling

Sample of participants determined by this following formula:

$$N_1 = N_2 = \frac{(Z\alpha + Z\beta)^2 \pi}{(P_1 - P_2)^2}$$

in which z is the score of normal deviate for two-tailed alternative hypothesis at level of significance 1.96 for $Z\alpha$ and 0.84, π is the discordant proportion (0.3), and $P_1 - P_2$ is the hypothetical percentage of two different groups (20%). After adding loss to follow-up 10%, eventually the minimum sample size is 66 for each group.

Research Procedures

Ethics statement

The study protocol and all amendments were reviewed and approved by the Health Research Ethics Committee of the Faculty of Medicine, Mataram University, in compliance with local law. Prior to the study, informed consent was obtained from all subjects, i.e. parents or guardians of the children (6-12 months old).

Subject allocation

The allocation of intervention were performed randomly using SPSS software. Due to the nature of the study, all participants were aware of their allocation, however they did not know what were the intervention given to other villages.

Research protocols and data collection

The selection of study sites were assisted by the local authority, i.e. the Department of Health Central Lombok to ensure the selection of villages with high-stunting prevalence which have similar baseline characteristics. Furthermore, the selection of participants were conducted during the held of Integrated Service Post (*Pos Pelayanan Terpadu/Posyandu*) in each subvillages. Each villages usually have 15-20 subvillages, and there would be an Integrated Service Post performed for every month.

The eligibility assessment was conducted for every parents that came to the Integrated Service Post. Subsequently, every eligible participant would undergo several assessment including baseline survey, containing details of the parent-child information, and family characteristics; and anthropometric measurement for both children and parent. Interview was performed similarly among all participants by a trained research personnel using a validated questionnaire built specifically for this study. Anthropometric measurements were conducted with calibrated measuring instrument, using Omron weight scale and Omron length board for baby, and measurement tape designed by the Indonesian Ministry of Health to measure upper arm length circumference, and measurement tape for head circumference. The anthropometric measurement for parent was performed using digital scale for weight, and stature meter for height, and measurement tape designed by the Indonesian Ministry of Health to measure mid-upper arm circumference.

The first knowledge, attitudes, and practices (KAP) assessment was also performed in this session. The KAP questionnaire consisted of 10 items for knowledge, 6 items for attitude, and 7 items for practices, with 1, 3, and 5 score for a correct answer for knowledge, attitude, and practices respectively. After all eligible participants had been assessed and provided their inform-consent, research team scheduled the upcoming intervention sessions for the two intervention groups, and scheduled the appointment for the second KAP assessment for the control group. The second KAP assessment was conducted for all villages, with a 4 week interval from the first KAP assessment. (Figure 1)

As there were two intervention arms in this trial, we prepared two interventions consisting of seminar session for group 1 and seminar and workshop session for group 2. Interventions were delivered similarly to both arms by the same team consisting of general practitioners and a paediatrician. The detail for interventions are as followed: (Figure 1)

1. Seminar session

Seminar is aimed to increase knowledge, attitude, and practices theory on complementary feeding practices. We delivered two major lectures, i.e. stunting and complementary feeding practices. Materials include: complementary feeding principles, planning of complementary feeding, food safety and hygiene, complementary-feeding menu arrangement (focus on animal-source protein), food processing and handling, complementary feeding preparation and administration. All materials were excerpted from guidelines published by the Indonesian Ministry of Health, the Indonesian Paediatric Society (IPS), and WHO. Each participants also received a booklet of complementary feeding practice published by IPS and a stunting pamphlet published by the Indonesian Ministry of Health.

2. Practical session

Practical session is aimed specifically to make sure that parents can prepare and serve complementary feeding according to recommended practices. We divided participants into several small groups, provided complete sets of food and tools, and performed a cooking demonstration. Participants were also given hands-on time to try and practice: proper food handling; food safety and hygiene; types of food source, emphasizing on animal-protein source; right texture and amount of complementary feeding; and responsive feeding. (Additional File 2)

Blinding

No blinding was done in this study.

Statistical Analysis

Collected data was analyzed with IBM SPSS Statistics version 22.0. Double entry was performed before the analysis, to avoid data entry errors. Primary outcomes include the knowledge, attitudes, and practices from participants, before and after intervention, i.e. in four-week interval. We classified the KAP score into three categories, i.e. poor (0-4), fair (5-7), and good (8-10) for knowledge; poor (3-8), fair (9-13), and good (14-18) for attitudes; and poor (7-17), fair (18-26), and good (27-35) for practices. The primary analysis was by intention to treat. The mean differences from pre and post-test are determined using Wilcoxon test, while the inter-group comparisons were calculated using ANOVA test. Analyses were done at a two-sided α level of 0.05.

Results

Socio-demographic characteristics

A total of 205 participants were enrolled in this study, consisting of 67, 70, and 68 participants for control group, 1st intervention group, and 2nd intervention group respectively. (Fig. 2) The mean of mother's age was similar across the groups, with the mean of age for all participants of 27.86 years old. Most of the participants in the three groups (> 60%) were categorized as having low education, i.e. total education time of less than 9 years. More than two-thirds of the participants (78.0%) had income under provincial minimum wage in that area, that is less than IDR 1.850.000. Exclusive breastfeeding rate in our study (50.2%) was found to be lower than national rate of 74.5%. Furthermore, in our study setting, the introduction of complementary feeding was performed mostly at 6 months (77.1%). (Table 1)

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Table 1

Socio-demographic characteristics

Variables	Total		Control		Group 1 (seminar)		Group 2 (seminar + WS)	
	n	%	n	%	n	%	n	%
Overall	205	-	67	32.7	70	34.1	68	33.2
Mother's age (mean ± SD)	27.86 ± 7.01		28.12 ± 6.71		27.46 ± 6.55		28.03 ± 7.81	
17–25	84	41.0	28	41.8	30	42.9	26	38.2
26–30	56	27.3	17	25.4	23	32.9	16	23.5
31–35	28	13.7	12	17.9	5	7.1	11	16.2
36–40	26	12.7	7	10.4	9	12.9	10	14.7
41–45	10	4.9	3	4.5	3	4.3	4	5.9
Mother's education								
Low (9 years/less)	131	63.9	43	64.2	46	65.7	42	61.8
Middle (High sc)	54	26.3	17	25.4	22	25.4	15	22.1
High (Dipl/Bach)	20	9.8	7	10.4	2	10.4	11	16.2
Household's income								
Low	160	78.0	60	89.5	50	71.4	50	73.5
Middle low	29	14.1	5	7.5	12	17.1	12	17.6
Middle high	16	7.8	2	3.0	8	11.4	6	8.8
Child's age (mean ± SD)	9.77 ± 1.99		10.48 ± 2.08		9.34 ± 1.82		9.52 ± 1.89	
Sex								
Male	89	43.4	30	44.8	26	37.1	33	48.5
Female	116	56.6	37	55.2	44	62.9	35	51.5
Breastfeeding								
Exclusive	103	50.2	30	44.8	37	52.9	36	52.9
Partial	99	48.3	36	53.7	32	45.7	31	45.6
Not at all	3	1.5	1	1.5	1	1.4	1	1.4
Immunization status								
Complete	157	76.6	53	79.1	46	65.7	58	85.3
Incomplete	48	23.4	14	20.9	24	34.3	10	14.7
First complementary feeding								
< 6 month	16	7.8	8	11.9	5	7.1	3	4.4
6 month	158	77.1	45	67.2	56	80.0	57	83.8
> 6 month	31	15.1	14	20.9	9	12.9	8	11.8

Most of participants (> 60%) in the three study sites have given complementary feeding in the right time (6 months), in which the control group has the lowest proportion compared to other sites. The food texture given to the children according to children's age are still in low proportion, and still not following any existing guidelines. In the aspects of hygiene and the administration of food, most of participants are in accordance with guideline and have a high proportion. (Table 2)

Table 2. Complementary feeding profile

Parameters		Proportions (%)				
		Control	Group 1	Group 2		
Time of administering complementary feeding	<6 months	11	7.1	4.4		
	6 months	67	90	83.8		
	>6 months	20.9	12.9	11.8		
Food texture	6-9 months	Watery	19.4	32.9	12	
		Crushed	40.3	47.1	52.2	
		Mushy	14.9	17.1	26.9	
	Adults texture	25.3	2.9	9		
		9-12 months	Watery	0	3.1	0
			Crushed	10.9	15.6	25.7
	Mushy		26.1	25	34.3	
	Adults texture	63	56.3	40		
		Hygiene	Always wash hands but without soap	26.9	21.4	13.2
Always wash hands with soap			26.9	21.4	13.2	
Always wash raw foods	79.1		84.2	95.5		
Always boil water	82.1		97.1	92.6		
Food administration	Feeding while playing	98.5	97.1	100		
	Feeding with forced	0	1.4	0		

Results from baseline and follow-up knowledge, attitudes, and practices (KAP) are presented in Table 3. The majority of participants had poor knowledge (75.1%) of complementary feeding. Each answer of the questions given regarding knowledge, attitudes, and practices are shown in Table 4. It could be observed that in general, the KAP results in the follow-up assessment showed an insignificant change in knowledge, but notable alterations in attitudes and practices aspects (Table 5).

Table 3. Respondents' baseline and follow-up knowledge, attitude, and practice

of complementary feeding

	Total		Control		Group 1		Group 2	
	n (%)				(seminar)		(seminar + WS)	
	205 (100%)		67 (32.7%)		70 (34.1%)		68 (33.2%)	
Variables	Baseline	FU	Baseline	FU	Baseline	FU	Baseline	FU
Knowledge								
Poor (0-4)	154 (75.1)	150 (73.2)	44 (65.7)	49 (73.1)	56 (80.0)	56 (80.0)	54 (79.4)	45 (66.2)
Fair (5-7)	43 (21.0)	52 (25.4)	23 (34.3)	18 (26.9)	10 (14.3)	13 (18.6)	10 (14.7)	21 (30.9)
Good (8-10)	8 (3.9)	3 (1.5)	0 (0)	0 (0)	4 (5.7)	1 (1.4)	4 (5.9)	2 (2.9)
Attitude								
Poor (3-8)	29 (14.1)	22 (10.7)	15 (22.4)	12 (17.9)	4 (5.7)	6 (8.6)	10 (14.7)	4 (5.9)
Fair (9-13)	128 (62.4)	119 (58)	43 (64.2)	40 (59.7)	42 (60.0)	41 (58.6)	43 (63.2)	38 (55.9)
Good (14-18)	48 (23.4)	64 (31.2)	9 (13.4)	15 (22.4)	24 (34.3)	23 (32.9)	15 (22.1)	26 (38.2)
Practice								
Poor (7-17)	1 (0.5)	1 (0.5)	1 (1.5)	1 (1.5)	0 (0)	0 (0)	0 (0)	0 (0)
Fair (18-26)	106 (51.7)	76 (37.1)	39 (58.2)	33 (49.3)	34 (48.6)	22 (31.4)	33 (48.5)	21 (30.9)
Good (27-35)	98 (47.8)	128 (62.4)	27 (40.3)	33 (49.3)	36 (51.4)	48 (68.6)	35 (51.5)	47 (69.1)

FU = Follow-up

1
Table 4

Respondents' knowledge, attitude, and practice of complementary feeding

Correct Knowledge	Control		Group 1 (seminar)		Group 2 (seminar + WS)	
	Baseline	FU	Baseline	FU	Baseline	FU
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
1 Age to introduce CF	25 (37.3)	22 (32.8)	32 (45.7)	32 (45.7)	28 (41.2)	38 (55.9)
Adequate amount of macronutrients	16 (23.9)	15 (22.4)	10 (14.3)	21 (30)	17 (25)	13 (19.1)
Choice of CF	7 (10.4)	1 (1.5)	8 (11.4)	3 (4.3)	1 (1.5)	1 (1.5)
Fat component in CF	23 (34.3)	37 (55.2)	21 (30)	33 (47.1)	33 (48.5)	54 (79.4)
Food safety	40 (59.7)	37 (55.2)	41 (58.6)	29 (41.4)	34 (50)	37 (54.4)
1 Introduction of additional component in CF	22 (32.8)	21 (31.3)	20 (28.6)	10 (14.3)	16 (23.5)	14 (20.6)
Duration of feeding practice	39 (58.2)	39 (58.2)	50 (71.4)	42 (60)	45 (66.2)	35 (51.5)
Formula milk feeding practice	19 (28.4)	12 (17.9)	30 (42.9)	16 (22.9)	24 (35.3)	25 (36.9)
Appropriate protein intake	36 (53.7)	38 (56.7)	18 (25.7)	28 (40)	22 (32.4)	30 (44.1)
Appropriate amount of vegetables in CF	18 (26.9)	11 (16.4)	10 (14.3)	14 (20)	13 (19.1)	10 (14.7)
Good Attitude	1 Control		Group 1 (seminar)		Group 2 (seminar + WS)	
	Baseline	FU	Baseline	FU	Baseline	FU
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
1 Age to introduce CF	43 (64.2)	54 (80.6)	53 (75.7)	61 (87.1)	50 (73.5)	60 (88.2)
Maintenance of breastfeeding	30 (44.8)	39 (58.2)	37 (52.9)	43 (61.4)	34 (50)	49 (72.1)
Responsive feeding attitude	17 (25.4)	22 (32.8)	43 (61.4)	39 (55.7)	31 (45.6)	43 (63.2)
Duration of feeding attitude	20 (29.9)	20 (29.9)	28 (40)	19 (27.1)	15 (22.1)	21 (30.9)
Nutrient content of CF	5 (7.5)	17 (25.4)	10 (14.3)	15 (21.4)	11 (16.2)	10 (14.7)
Food diversity	14 (20.9)	20 (29.9)	20 (28.6)	21 (30)	18 (26.5)	28 (41.2)

1
FU = Follow-up

CF = complementary feeding

Correct Knowledge	Control		Group 1 (seminar)		Group 2 (seminar + WS)	
	Baseline	FU	Baseline	FU	Baseline	FU
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Good Practice	Control		Group 1		Group 2	
			(seminar)		(seminar + WS)	
	Baseline	FU	Baseline	FU	Baseline	FU
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Meal frequency	37 (55.2)	23 (34.3)	34 (48.6)	32 (45.7)	31 (45.6)	31 (45.6)
Continued breastfeeding	53 (79.1)	43 (64.2)	55 (78.6)	44 (62.9)	59 (86.9)	44 (64.7)
Responsive feeding practice	20 (29.9)	25 (37.3)	36 (51.4)	33 (47.1)	20 (29.4)	33 (48.5)
Hygiene practice	34 (50.7)	35 (52.2)	42 (60)	37 (52.9)	31 (45.6)	45 (66.2)
Food preparation safety	34 (50.7)	39 (58.2)	46 (65.7)	49 (70)	46 (67.6)	53 (77.9)
Appropriate duration of feeding	7 (10.4)	11 (16.4)	7 (10)	9 (12.9)	10 (14.7)	6 (8.8)
Adequate macronutrient intake	8 (11.9)	4 (6)	6 (8.6)	9 (12.9)	4 (5.9)	5 (7.5)
1	FU = Follow-up					
	CF = complementary feeding					

Table 5
Mean difference between baseline and follow-up

	Total		Control		Group 1 (seminar)		Group 2 (seminar+ WS)	
Overall	205	100	67	32.7	70	34.1	68	33.2
Variables	n	(%)	n	(%)	n	(%)	n	(%)
Knowledge Differences			0.409 (-0.61;0.25)		0.476 (-0.65;0.31)		0.151 (-0.13; 0.84)	
P-value (95% CI)								
Decrease	80	(39)	29	(43.3)	26	(37.1)	25	(36.8)
Stable/Increase	125	(61)	38	(56.7)	44	(62.9)	43	(63.2)
Attitude Differences			0.013 (0.21;1.67)		0.524 (-0.94;0.49)		0.003 (0.39;1.79)	
P-value (95% CI)								
Decrease	72	(35.1)	22	(32.8)	28	(40)	22	(32.4)
Stable/Increase	133	(64.9)	45	(67.2)	42	(60)	46	(67.6)
Practice Differences			0.174 (-0.32;1.76)		0.041 (0.04;1.99)		0.006 (0.37;2.13)	
P-value (95% CI)								
Decrease	75	(36.6)	30	(44.8)	26	(37.1)	19	(27.9)
Stable/Increase	130	(63.4)	37	(55.2)	44	(62.9)	49	(72.1)
WS = Workshop								

1 Effectivity of intervention within each group

The mean differences in KAP between baseline and follow-up assessments were analyzed using t-test analysis (Table 5). Wilcoxon analysis of baseline and follow-up knowledge showed slight increase after intervention compared to control group, but not statistically significant. Seminar intervention could increase practice, while complete intervention (seminar and workshop) could increase both practice and attitude significantly. (Fig. 3)

Effectivity of intervention between groups

Figure 4 shows no significant difference between control and intervention groups. Complete intervention was shown to be more significant than control or seminar intervention group in increasing respondents' attitude. Complete intervention group and seminar group were more effective significantly in increasing respondents' practice compared to control group.

Factors associated with respondents' baseline complementary feeding knowledge, attitude, and practice

Fisher exact test showed no significant association between mothers' complementary feeding knowledge, attitude, and practice with mothers' age, education, and income (Additional File 1).

Correlations between knowledge, attitude, and practice

Using Spearman correlation test, it is found that attitude correlated with knowledge (P = 0.004; 99% CI) and practice (P = 0.002; 99% CI) significantly, while knowledge is not correlated with practice (P = 0.949).

Discussion

Studies on Knowledge, Attitude, and Practice of Complementary Feeding

Complementary feeding is starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infant, therefore other foods are needed while continuing to breastfed¹². Knowledge, attitude, and practice of parents towards complementary feeding is important role to make successful complementary feeding process. WHO recommends to introduce complementary feeding at 6 months.

Knowledge of timing to start complementary feeding was varied among some studies. In our study, parent's knowledge of timely complementary feeding before intervention was 37.3% in control, 45.7% in group 1, and 41.2% in group 2. This number was found lower compared to other studies, such as in Pakistan (54%), Karachi (57.2%), and Ghana (60%).¹³ Another study in South Ethiopia showed that 72.5% mothers of children aged 6–23 months knew the initiation time of complementary feeding, which is less when compared to study in South India in 2011 (77.5%).^{13,14} Aggarwal et al observed that only 17.5% mothers had started complementary feeding at recommended time and in a study held in slums of Delhi observed 16.6% of parents had initiated feed at the right time. Those studies showed lower level of mothers knowledge of initiation complementary feeding time than our study. After intervention, our study showed that the knowledge of timing to start complementary feeding was increased from 41.2–55.9% in group 2 (seminar and workshop intervention). In a contrary, our study found that the mean of parent's attitude of timely complementary feeding was good with 64.2% in control group, 75.7% in group 1, 73.5% in group 2 before intervention and 80.6% in control group, 87.1% in group 1, and 88.2% in group 2 after intervention.

The recommended feeding frequency from WHO is two to three times at 6–8 months and three to four times at 9–12 months, with once to twice additional meal per day. Study in Nigeria showed only half of the responden knew the correct frequency, however another study in Ghana showed that almost all of the responden knew the correct frequency. In a similar study in Allahabad, only 38.7% of children received proper complementary feeding.¹⁴ Our study found that 55.2% in control, 48.6% in group 1, and 45.6% in group 2 parents have been given the correct meal frequency before intervention and 34.4% in control, 45.7% in group 1, and 45.6% in group 2 after intervention. This finding was similar with the study finding in slums areas of Bahir Dar City, Ethiopia (47%),¹⁵ India (48.6%)¹⁶ and Pakistan (62%)¹⁷

Besides minimum meal frequency, the adequacy of micronutrients and macronutrients are important. Complementary food should be varied and include adequate macronutrients and micronutrients. Micronutrient needs are high during the first 2 years of life due to rapid rate of growth and development.^{6,18} In our study, parent's knowledge, attitude, and practice of adequate macronutrients and micronutrients in complementary food was poor before intervention. After intervention, parent's attitude of adequate amount of macronutrient was raised into 25.4% in control, 21.4% in group 1, and 14.7% in group 2. However, this attitude was still in low level. Other study held in 2018 showed that 27.3% mothers were aware that adding oil enriches children's porridge nutritionally and 31.8% of mothers knew that children's meal should be balanced.¹⁹ Another study in Sri Lanka showed that oil had been introduced to 84.9% of infants by the end of 12 months.²⁰ In our study, only 34.3% parents in control group, 30% in group 1, and 48.5% in group 2 had the correct knowledge of fat component in complementary feeding before intervention but increased by 55.2% in control group, 47.1% in group 1, and 79.4% in group 2 after intervention. A study conducted in Uganda reported that majority of children were given cereals in the last 24 hours. Only 0.5% mother gave meat and milk products. Cereal based foods alone are not sufficient.²¹ WHO recommended mother to feed their children with locally available foods which contain calories, proteins, mineral, and vitamins. Our study reported parent's knowledge of source of protein was low to moderate before intervention (53.7% in control group, 25.7% in group 1, 32.4% in group 2). A increase knowledge of source of protein intake was noted after intervention (56.7%, 40%, and 44.1% in control, group 1, and group 2 respectively). The use of fortified complementary food may be necessary to ensure adequacy of nutrient intakes.¹² Hasnain et al¹⁷ reported that 82% respondents of their study knew that homemade food is good, but only 42% were giving them home made food. Our study found that only 10.4% in control group, 11.4% in group 1, and 1.5% in group 2 knew that fortified food can be used as complementary food.

Food diversity recognized as a key of high quality diets. WHO guideline recommend that child should eat meat, poultry, fish, or eggs as often as possible. Vitamin A rich fruits and vegetables also should be eaten daily. In our study, food diversity among parents attitude was low (20.9% in control group, 28.6% in group 1, and 26.5% in group 2) before intervention. The percentage increased after intervention but still in low level (29.9% in control group, 30% in group 1, and 41.2% in group 2). Another study showed that majority of the children had eaten food from grain, tubers, roots like porridge, rice, bread, and cassavas. The study also found that consumption of iron rich foods was low, because animal protein are most likely out of financial reach for the majority participants. According to study in Sri Lanka, animal product protein intake was very low, fish and eggs were consumed by 25% and 18% of infants. However, the other study in one area in Sri Lanka, Galle reported that introduction rates of fish and eggs were high, 75% and 63%. Consumption rates of pro vitamin A rich food (carrot and pumpkin) were also high (97% and 90%).²⁰ Senarath et al²² reported the variation of food was increased as the age of the child increased (40.1% in 6–8 month age group and 82.5% in 18–23 month age group).

Safe preparation and storage of complementary feeding are also play important role. Washing parents' and children's hands before eating is recommended by WHO. In our study, practices of hand washing with water and soap was moderate before intervention (50.7%, 60%, and 45.6% in control, group 1, and group 2 respectively). A increase in parent's attitude was notable in control and group 2 after intervention. Mihreite²³ also found the same result that majority of mothers in their study had high knowledge on hand hygiene practices; washing hands before preparing food (44.5%) and treating of water used for preparing food for a child (46.4%). Madhu et al²¹ reported from 200 participants in their study, 96% clean hands and utensils before feeding, 66% wash hands of children before feeding, and 61% boiling of drinking water.

Responsive feeding is one of complementary feeding practice principle recommended by WHO, including sensitive to children hunger and satiety cues, feed slowly and patiently, experiment with different food combination, taste, texture, minimize distractions during meal time, and talk to children during feeding. Inappropriate feeding practices are an important role of stunting. Parents are unaware of the importance of responsive feeding.²⁴ Less than half of mothers reported the need for responsive feeding of complementary food to ensure optimal intakes (45.5%).¹⁹ In our study, parent's knowledge of recommended feeding duration was poor, 58.2% in control group, 71.4% in group 1, and 66.2% in group 2 didn't know the recommended feeding duration. The percentage was decreased after intervention, which is the knowledge of recommended feeding duration was increased. This findings were followed by poor responsive feeding practice in all groups, only 29.9% in control group, 51.4% in group 1, and 29.4% in group 2 practiced responsive feeding before intervention.

Continuing breastfeeding until two years of age or beyond make an important contribution to maximize child's growth, because of its energy and essential fatty acids content. Breast milk also provides substantial amount of micronutrient.²⁴ In this study, parent's attitude of continuing breastfeeding before intervention were 44.8% in control group, 52.9% in group 1, and 50% in group 2 respectively. Parent's attitude was increased in all group to 58.2% in control group, 61.4% in group 1, and 72.1% in group 2. This finding is lower than other study in Ethiopia, about 92% and 94% of mothers have continued to breastfeed their children at age one and two respectively.¹⁵ The majority of women participated in that study were housewives which increases the likelihood of continuing to breastfeed.¹⁵ Meanwhile, our study found that parents had continued breastfed in 79.1% (control), 78.6% (group 1), and 86.9% (group 2) before intervention.

Factors Affecting Complementary Feeding Knowledge, Attitude, and Practice

Our study found no correlation between mother's age, mother's education, and household income with parent's knowledge, attitude, and practice of complementary feeding ($p > 0.05$) (Additional File 1). Nonetheless, some similar studies reported different findings with our study.

Education is one of important determinants of children's growth and development, such as association between parents' education level and appropriate infant feeding. Mother's education plays a significant role on proper infant feeding after a comparative study involving five Asian countries.²² However, Seram et al²⁵ found no correlation between parents education and knowledge on complementary feeding. The result was in line with other study in rural Bangladesh that maternal education was not associated with timing of introduction of complementary food based on study in rural Bangladesh. Maternal knowledge or education may not be the foremost driver of child complementary feeding practice.¹⁹ Seranath et al²² in their study observed a linear correlation between meal frequency and maternal education, but it was not associated with others complementary feeding indicator i.e timely introduction of complementary feeding, food diversity, and minimal acceptable diet. Compared with mothers with higher levels of education, those who had completed secondary education or had not attended any level of education reported a higher risk for low diversity (OR 1.97 and 1.48).²² This result is in accordance to study in Kenya which found that level of education and knowledge of forbidden foods had a positive correlation.²⁶

Economic status play role in fulfilling household resource including component of complementary food. Poverty was one of factor for inappropriate complementary feeding practice. Study in Wollo found that rich households had improved complementary feeding practice due to dietary diversity.²⁷ Several studies also reported that the low income was a major constraining factor to food security. It may have contributed to inability to achieve minimum meal frequency and meal diversity.^{27,28} The study showed that diets of infant and young children in low income countries are iron, zinc, and B6 deficiency.²⁴ This finding was confirmed by other study in Sri Lanka, the result showed that dietary diversity gradually declined with lower income.²²

Study in Wanogo District, South Ethiopia in 2017 showed that culture plays a major role in feeding practices. Feeding culture in community is not in favor of recommended feeding guideline and was responsible for increasing the odds of inappropriate complementary feeding practice by 2.4%. Most of participant in that study revealed that elders especially husbands was priority during feeding practice and the leftover was served for the child.²⁷ Another study held in China found that mother introduced complementary food before six months, most offent at three months. They believed that there were some benefits to introduce Chinese traditional food earlier, included strengthening bone development, children learning to swallow food, prolonged satiety, accelerated growth, and improved digestive system.²⁶ Similar to that studies, study in Lubao, Kenya reported that most of parents gave porridge to their child as early as the first month because they explained that porridge was good to make their child strong. The result of this study reported that culture was the reason of 54% parents to forbid their child to consume some foods. This study also reported that various diet restrictions and food taboos affected to infant feeding. A common taboo in the area were not fed children with eggs as they believe that eggs made speech delay. Some parts of meats especially organ meats also could not be eaten by children or women because it just served to men and some local belief to feed their children a small amount of ashes along with burning fish to help soothe the baby to sleep.²⁶

Impact of Educational Interventions for Improving Parent's KAP on complementary feeding

Although having a similar general aim compared to other researches, our study strived to show a different parameter on the effectiveness of educational interventions in form of seminar and workshop by measuring the immediate change of parent's KAP in four weeks interval. It could be observed that the implementation of seminar have promoted a positive result in parent's practice, although it might not be in significant improvement. Furthermore, better improvements are also shown by the implementation of seminar and workshop, in which it encourages increased scores in parent's attitudes and practices.

The inadequate improvement in parent's knowledge observed in both first and second intervention groups raise an inquiry on the reason that might explain this drawback. It might be argued that this could be due to parent's education level that mostly (> 60%) are at low level (less than 9 years education time) and the short interval to the second assessment. Improvements found in the first and second intervention groups might be appeared as the results of direct replication from the given intervention. Furthermore, a study by Shi et al. in China which gathered their second follow-up data at 6 months successfully showed that the intervention group had a significant improvement in parent's complementary feeding practices.²⁹ However, in this study, the intervention was slightly different with ours in which home visits were performed as an additional approach to the combination of group training, demonstration, and booklet administration.

In the implementation of the intervention, the involvement of the local health workers along with the community cadres and leaders are important to assure a successful intervention for the community. We managed to collaborate with the local primary health cares in the villages. However, several aspects could still be improved, such as implementing additional interpersonal session with the participants by having an individual counseling and home visit. This method was implemented by Hotz and Gibson in Malawi and resulted in improved knowledge and behavior on food selection and preparation of parents.³⁰ Other study by Shi et al also noted that the involvement of family members mainly husband and parents-in-law are also essential to create a supportive environment for the improvement of parents in complementary feeding.²⁹ This study showed a significant result in parent's practice and also in children's anthropometry such as in increased weight gain and length.

Limitation

As blinding was not performed in this study, this research is prone to selection bias performed by trainers in the interventions. We have attempted to minimise the bias by having a training for all the trainers prior to the interventions in order to give a standardised and similar intervention for both the intervention groups. We were also unable to perform an individual consultation, assess any cultural concerns, and home-visit with the participants, and this might play a role on consolidating participant's knowledge on the new given information. Furthermore, we only included one parent for every children, thus other family members that might have influence on the parents such as husband and mother-in-law were not enclosed in the intervention. We also noted that a longer interval follow-up, such as three and six months, should be incorporated in the study design to capture the longer change in parent's KAP.

Conclusion

Complementary feeding knowledge, attitude, and practice among parents in stunting village in Central Lombok were inadequate. Our study showed that the combination between seminar and workshop significantly increased parents attitude and practice, while seminar only increased parents practice. Differences between control group and complete intervention group (seminar and workshop) also statistically more significant in increasing parents attitude and practice. Improving complementary feeding knowledge, attitude, and practice requires multi dimensional approaches. We suggest further study to obtain cultural information and address, if any, all the cultural concerns regarding complementary feeding. We also recommend future prospective study to assess how long the effectivity of such interventions could impact and last.

Abbreviations

ANOVA

Analysis of Variance

CI

Confidence Interval

FU

Follow-Up

IBM

International Business Machines Corporation

IPS

Indonesian Pediatric Society

KAP

Knowledge, Attitude, Practice

OR

Odds Ratio

SPSS

Statistical Package for the Social Sciences

SUN

Scaling Up Nutrition

WHO

World Health Organization

WNT

West Nusa Tenggara

Declarations

Ethics approval

Ethical permission for conducting study was granted by Ethical Committee for Medical Research, Faculty of Medicine, the University of Mataram, Indonesia. Register No: 376/UN18.8/ETIK/2018.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

ZI drafted the manuscript. JT, AAS, TPK, and NEK designed the study. ZI, JT, and AAS wrote the grant application. LN helped assessment quality control, contacted local health department and primary health cares for permission, and gave seminar in local language. All authors are actively involved in the study and approved the final draft of the manuscript.

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Figures

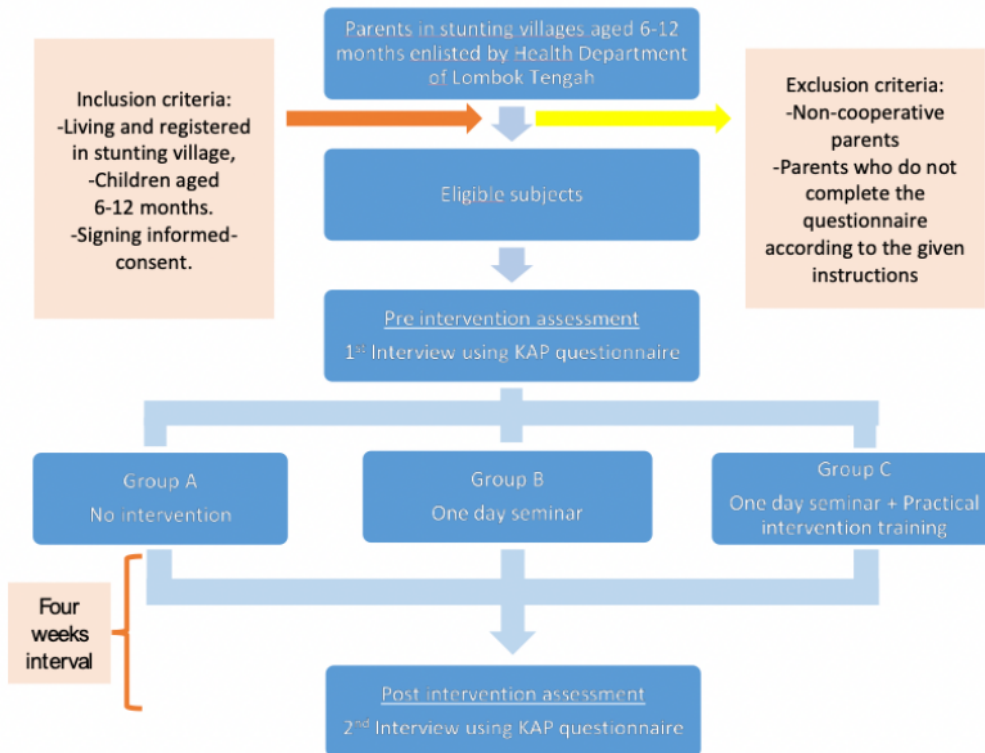


Figure 1

Research protocol overview

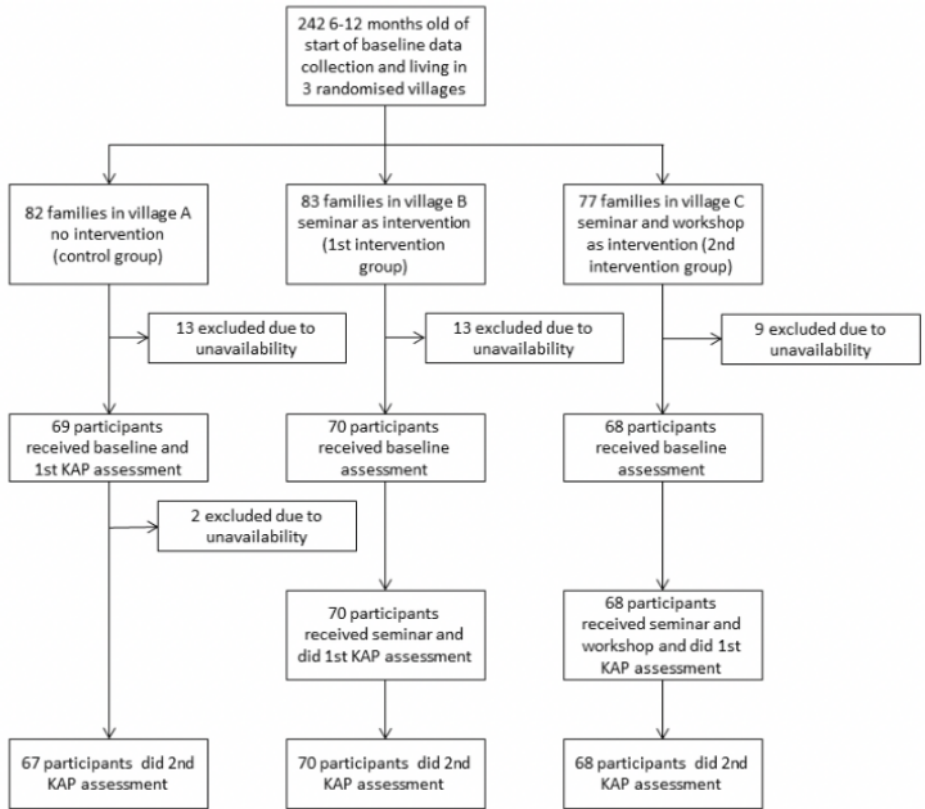


Figure 2

Trial profile of the study

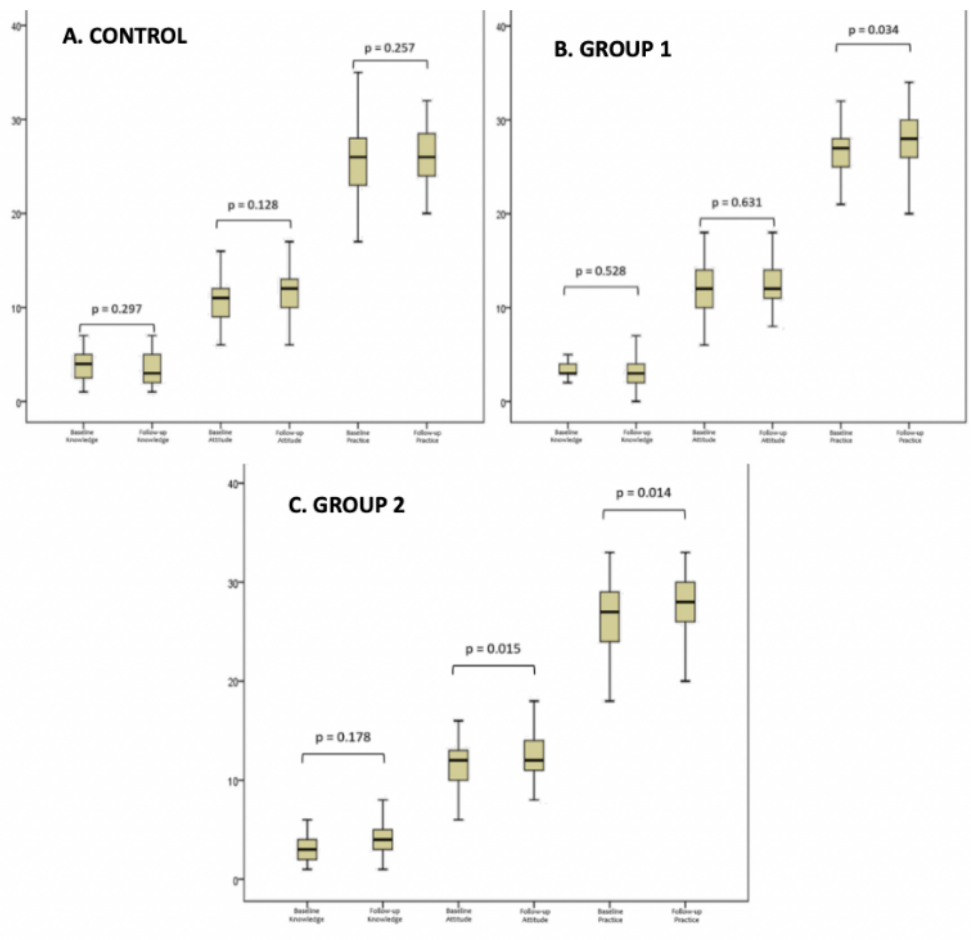


Figure 3

Difference between baseline and follow-up knowledge, attitude, and practice: A) in control group; B) in seminar intervention group (Group 1); and C) in complete (seminar and workshop) intervention group (Group 2)

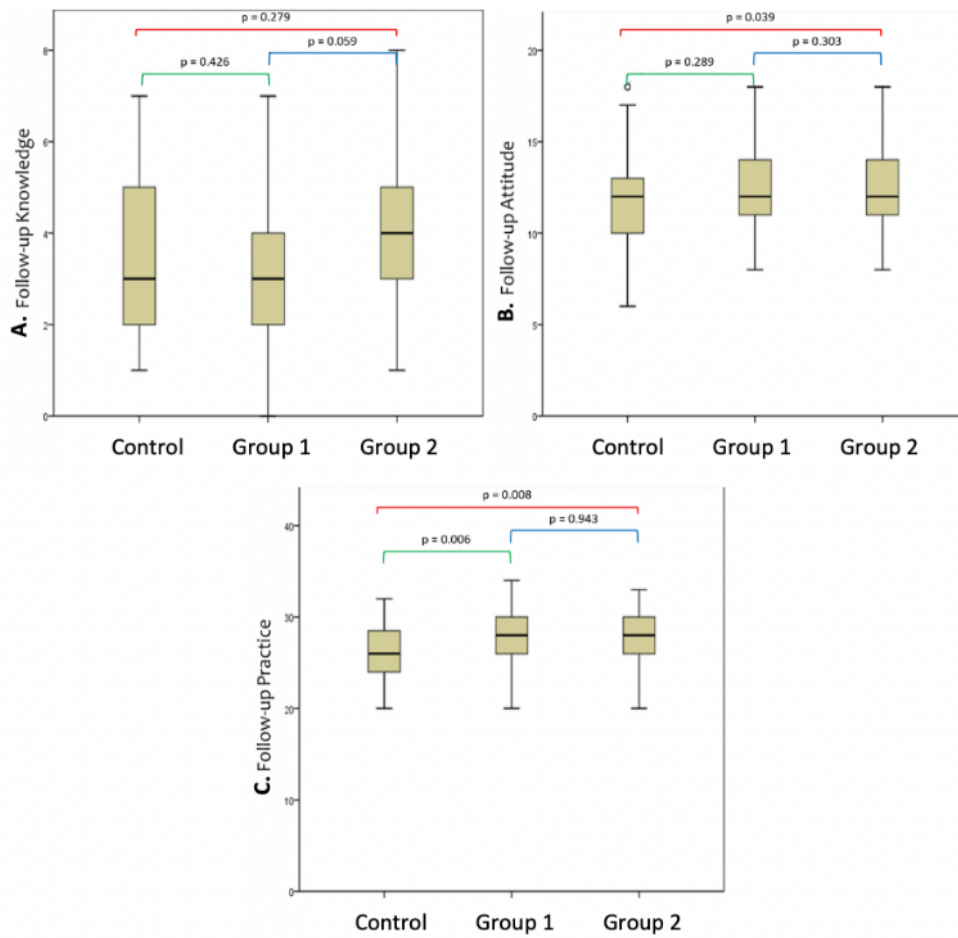


Figure 4

Knowledge (A), attitude (B), and practice (C) difference between control and interventions groups (Group 1 and Group 2)

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