

Complementary feeding indicators and determinants of poor feeding practices in Indonesia: a secondary analysis of 2007 Demographic and Health Survey data

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Abstract

Objective: The present study aimed to assess complementary feeding practices and identify the potential risk factors associated with inappropriate complementary feeding in Indonesia for a nationally representative sample of births from 2004 to 2007.

Design: The data source for the analysis was the 2007 Indonesia Demographic and Health Survey. Multiple logistic regression was performed to analyse the factors associated with complementary feeding, using individual-, household- and community-level determinants.

Setting: Indonesia.

Subjects: Children (n 4604) aged 6–23 months.

Results: Multivariate analysis revealed that infants from poor households were significantly less likely to be introduced to complementary feeding (adjusted odds ratio, AOR = 4.32; 95% CI 1.46, 12.80) and meet the minimum dietary diversity (AOR = 1.76; 95% CI 1.16, 2.68). Mother's education (AOR for no education in dietary diversity = 1.92; 95% CI 1.09, 3.38; AOR for no education in meal frequency = 2.03; 95% CI 1.13, 3.64; AOR for no education in acceptable diet = 3.84; 95% CI 2.07, 7.12), residence and decreased age of the infant were negatively associated with minimum dietary diversity, minimum meal frequency and an acceptable diet. Infants aged 6–11 months were also significantly less likely to meet minimum dietary diversity (AOR = 6.36; 95% CI 4.73, 8.56), minimum meal frequency (AOR = 2.30; 95% CI 1.79, 2.96) and minimum acceptable diet (AOR = 2.27; 95% CI 1.67, 3.09). All geographical regions compared with Sumatra were more likely to give the recommended meal frequency and an acceptable diet to breast-fed children.

Conclusions: Public health interventions to improve complementary feeding should address individual-, household- and community-level factors which significantly influence the introduction of complementary feeding. Complementary feeding intervention programmes in Indonesia should ensure that restraints on families with low socio-economic status are addressed. Infants aged 6–11 months and mothers with low education levels may also need special focus. Promotion strategies should also target the health-care delivery system and the media.

Keywords

Complementary feeding indicators
Infant feeding
Young child
Indonesia

When breast milk alone is no longer nutritionally sufficient for an infant after 6 months of age, the initiation of complementary feeding allows the child to transition gradually to eating family foods. It is estimated that 6% of deaths among under-5s could be prevented through the achievement of universal coverage with improved complementary feeding alone^(1,2). The WHO infant feeding guidelines recommend that infants should be exclusively breast-fed for the first 6 months of life, after which complementary foods may be introduced in conjunction with continued breast-feeding to achieve optimal growth, development and

health^(3–5). In many developing countries, complementary foods consist of cereals or starchy roots that have been prepared as a thin gruel. Coupled with very few feeds per day, the lack of energy and nutrient content of the complementary foods further increases the risk of child growth retardation and malnutrition⁽⁶⁾. With approximately one-third of all children in developing countries under the age of 5 years having low height-for-age and many more being deficient in one or more micronutrients, child undernutrition is a major public health problem in many resource-poor communities in the world^(7,8).

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Since the first definitions of infant and young child feeding indicators were proposed by WHO in 1991, there have been important developments in scientific knowledge about what constitutes optimal breast-feeding and complementary feeding practices. In particular, the 1991 infant and young child feeding indicators included only one indicator for complementary feeding – timely complementary feeding. This indicator provided information about the consumption of complementary foods but not about the quantity or quality of those foods. In response to concerns about the lack of adequate indicators of complementary feeding, WHO in 2002 began a process to review and develop new indicators of complementary feeding practices⁽⁹⁾. The new indicators of complementary feeding allowed for the calculation of four outcome variables which in turn provided much more comprehensive definitions.

The present paper focuses on the Republic of Indonesia, the fourth most populated country in the world. Despite a majority of all Indonesian children being breast-fed and receiving some form of complementary foods, at the current mortality levels, out of 1000 live births, thirty-one infants die before reaching 5 years of age and 28% of children in the same age bracket are underweight. With 44% of all children being stunted and a further 9% of infants having low birth weight, childhood undernutrition is a significant problem that continues to need to be addressed^(10,11).

However, there are few reports about complementary feeding practices within Indonesia, and there are no previous reports examining complementary feeding using the new WHO recommended complementary feeding indicators.

Therefore the present study aims to describe patterns of complementary feeding in Indonesia using the new WHO complementary feeding indicators by analysing the 2007 Indonesia Demographic and Health Survey data. The study also seeks to identify factors associated with inappropriate complementary feeding practices in Indonesia.

Methods

Data sources

The data examined were from the 2007 Indonesia Demographic and Health Survey (IDHS), which was conducted in all thirty-three provinces of Indonesia. The survey aimed to gather information about child mortality and maternal and child health, as well as on family planning and other reproductive health issues.

It is a useful and valid source of information on infant and child feeding practices from a representative national household sample of 40 701 households. The data collection was based on three main questionnaires: the Household Questionnaire (HQ), the Ever-Married Women's Questionnaire (EMWQ) and the Married Men's Questionnaire (MMQ).

Census blocks were used as the primary sampling unit and the sampling was stratified by urban and rural areas

within each province. Systematic random sampling was used to select census blocks followed by a random selection of twenty-five households. Further details of the sampling design and survey methodology are available in the IDHS 2007 report⁽¹²⁾.

In this IDHS, 99% of the 41 131 available households were successfully interviewed, and 32 895 women were interviewed which comprised 96% of the 34 227 eligible women. Of the 9716 eligible men identified, 8758 were successfully interviewed, yielding a response rate of 90%. The present analysis includes a weighted total (numbers adjusted by the sampling weights) of 4604 children aged 6–23 months.

Conceptual framework

Figure 1 presents the framework used in the current analysis, along with the selected possible predictors of complementary feeding in Indonesia. The individual-level factors include variables from attributes of the parents, infant and mother–infant dyad. Household environmental factors include the household wealth index and community-level factors include type of residence and geographical region^(13,14).

Complementary feeding indicators and explanatory variables

Complementary feeding practices were assessed using the key indicators recommended by WHO in 2007⁽⁹⁾, which are based on 24 h recall data and are defined as follows.

1. Introduction of solid, semi-solid or soft foods: the percentage of infants 6–8 months of age who received solid, semi-solid or soft foods.
2. Minimum dietary diversity: the percentage of children 6–23 months of age who received foods from four or more food groups. There were only six food groups in the IDHS data instead of seven recommended in the WHO guidelines because eggs and flesh foods were combined as one group. The combined food group of eggs and meat was arbitrarily assigned a weight of two when calculating the dietary diversity index. This is likely to have produced slightly over-optimistic estimates for the minimal dietary diversity index.
3. Minimum meal frequency: the percentage of breast-fed and non-breast-fed infants 6–23 months of age who received solid, semi-solid or soft foods the minimum number of times or more. For breast-fed infants aged 6–8 months, the minimum was two times or more during the previous day and this was increased to at least three times for infants aged 9–23 months. For non-breast-fed infants aged 6–23 months, this was established as being fed solid, semi-solid or soft foods for at least four times or more during the previous day.
4. Minimum acceptable diet: the percentage of children 6–23 months of age who received a minimum acceptable diet apart from breast milk. This includes

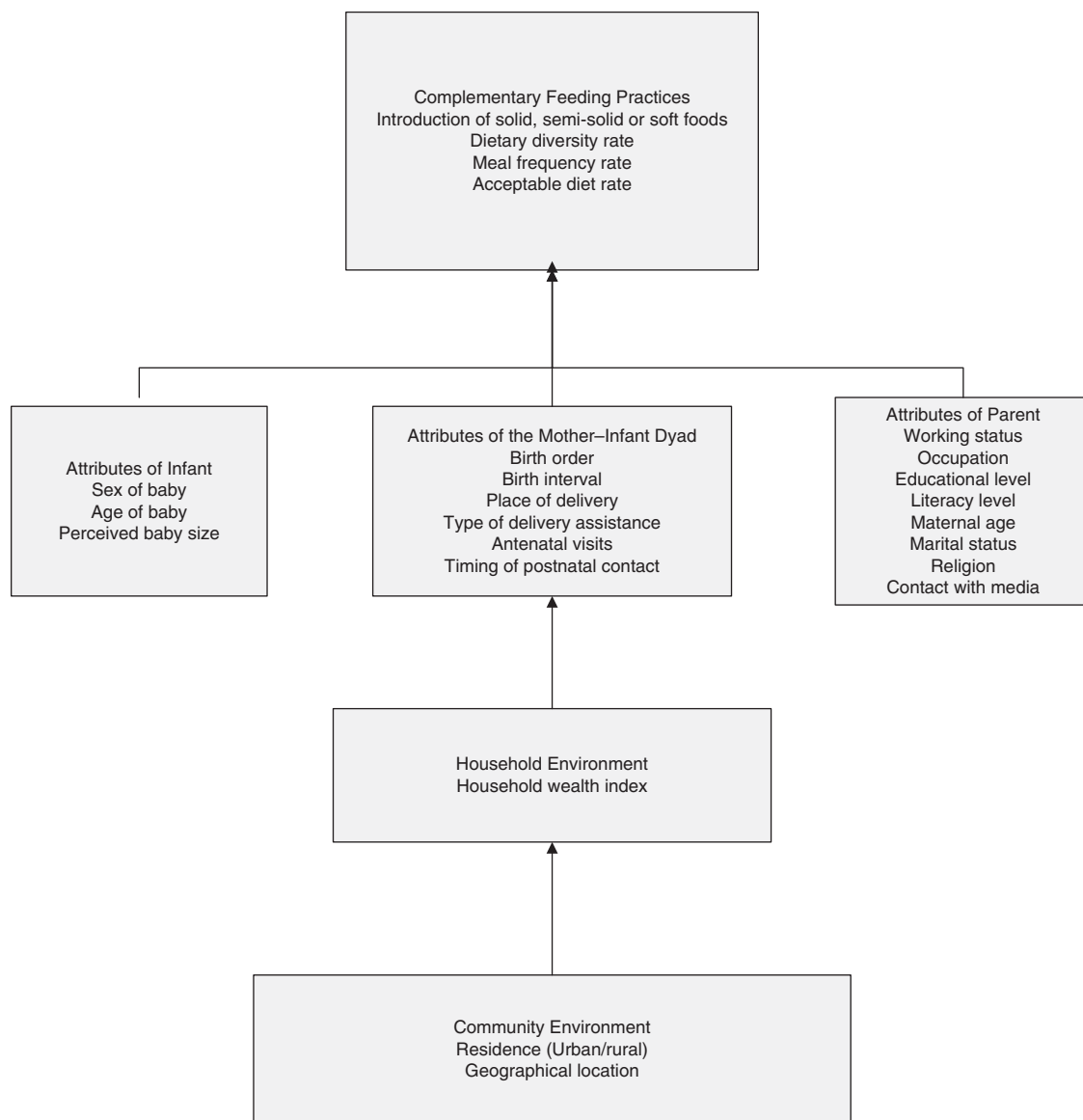


Fig. 1 Conceptual framework of factors influencing complementary feeding practices in Indonesia. Adapted from Mosley and Chen⁽¹³⁾

breast-fed and non-breast-fed children 6–23 months of age who had at least the minimum dietary diversity and minimum meal frequency during the previous day with the addition of at least two milk feedings for the non-breast-fed infants. There were no variables available in the IDHS data sets for non-breast-fed children; therefore results presented for this indicator pertain to breast-fed children.

The consumption of Fe-rich or Fe-fortified foods was not examined in this analysis because these data were not collected in IDHS.

Complementary feeding was examined by:

1. individual-level factors, which included mother’s working status, father’s occupation, mother’s working

at home or away, mother’s education, father’s education, mother’s literacy, mother’s age, mother’s marital status, mother’s religion, birth order, birth interval, sex of infant, age of child, size of baby, place of delivery, type of delivery assistance, antenatal clinic visits, timing of postnatal check-up, and mother having interaction with the media (newspaper, radio, television);

2. household-level factors, which included the household wealth index; and
3. community-level factors, such as the place of residence and geographical region.

The household wealth index was calculated as score of household assets such as ownership of transportation devices, ownership of durable goods and household

facilities, which was weighted using the principal components analysis method⁽¹⁵⁾.

Data analysis

Analyses were confined to the youngest child 6–23 months of age living with the respondent (ever married women aged 15–49 years), although some of the indicators were applicable to different age categories within this range.

The prevalence of infant and young child feeding indicators was estimated across different explanatory variables, and the χ^2 test was used to test the statistical significance. Confidence intervals were calculated for prevalence estimates using the survey (SVY) commands to allow for adjustments for the sampling weight and cluster sampling design used in the surveys when estimating confidence intervals around prevalence estimates.

Univariate associations were examined by unadjusted odds ratios for all four selected indicator variables, namely introduction of solid, semi-solid or soft foods, minimum dietary diversity, minimum meal frequency and minimum acceptable diet. Multiple logistic regression analysis was used in a stepwise backward regression model to estimate the adjusted odds ratios and 95% confidence intervals which allows for identification of the factors significantly associated with complementary feeding practices. Only the variables with statistical significance of $P \leq 0.05$ were retained in the final step of modelling and are presented in the results tables of multivariate analyses. Data analysis was performed using the STATA statistical software package version 10.0 (2007; Stata Corporation, College Station, TX, USA).

Results

Characteristics of the sample

Table 1 presents the distribution of the individual-, household- and community-level characteristics of 4604 (weighted total) children aged 6–23 months. The sample had a low percentage of working mothers and a very high percentage of literate mothers, with more than half having completed secondary or higher education. More than half of the surveyed mothers had more than one child, and more than half had a preceding birth interval of more than 24 months. According to the mothers' perception of birth size, which has been shown to be a good population-level indicator of birth weight^(16,17), about one in seven of the infants was of small size at birth. Of the total births, half were home deliveries and slightly more than half had received trained health professional assistance during delivery. Nearly all mothers had made at least one antenatal clinic visit during their pregnancy.

Complementary feeding indicators

Of the breast-fed and non-breast-fed children aged 6–23 months, a high percentage (87.3%) of those aged

6–8 months had been given solid, semi-solid or soft foods (Table 2). The percentage of infants who had received foods from four or more food groups increased with age from 47.7% at 6–11 months to 84.2% at 18–23 months. For non-breast-fed children, the percentage meeting the minimum dietary diversity criterion was 60.2% for children aged 6–11 months, 79.6% for children aged 12–17 months and 88.4% for children aged 18–23 months.

More than half (53.0%) of infants aged 6–23 months received food 2–4 times or more on the day prior to the survey, but the percentage meeting the minimum meal frequency criterion decreased with increasing age. For non-breast-fed children, the prevalence of minimum meal frequency was 5.7% for children aged 6–11 months, 13.7% for children aged 12–17 months and 13.5% for children aged 18–23 months.

The prevalence of minimum acceptable diet in infants aged 6–23 months was only 44.9%, indicating that a greater proportion were either not given food from four or more of the recommended food groups in their diet or the meal frequencies were less than the recommended 2–4 times daily.

Determinants of complementary feeding indicators: univariate analyses

Table 3 shows the prevalence of complementary feeding indicators across Indonesia and reveals that the percentage of those introduced to solid, semi-solid or soft foods remained relatively high across all the factors examined. There was a significantly lower percentage of introduction of complementary feeds to infants aged 6–8 months for mothers or fathers with no formal education, illiterate or formerly married mothers, no use of antenatal care services or postnatal check-ups, and residence in outer islands especially Kalimantan.

The minimum dietary diversity prevalence was significantly lower in non-working mothers and fathers, including fathers who worked in agriculture, mothers or fathers with no formal education, mothers who were illiterate, younger mothers, mothers of Christian religion, younger infants, home delivered infants, deliveries attended by traditional birth attendants, mothers who did not read newspapers/magazines, listen to the radio or watch television, infants from the poorest households and those who lived in rural areas.

The prevalence of children meeting the minimum meal frequency criterion varied less across the factors examined compared with the other indicators. Minimum meal frequency was significantly lower in mothers with no formal education, illiterate and formerly married mothers, older infants, small sized infants, and in infants from selected geographic areas, especially Sumatra and Kalimantan.

The prevalence of infants meeting the minimum acceptable diet criterion was low in each of the individual-, household- and community-level factors examined. The percentage of infants currently being fed from four or more

Table 1 Individual-, household- and community-level characteristics of infants 6–23 months of age, Indonesia, 2007 (*n* 4604)

Characteristic	<i>nt</i>	%
Individual-level factors		
Mother's working status (<i>n</i> 4603)		
Non-working	2765	60.1
Working (past 12 months)	1838	39.9
Father's occupation		
Non-agricultural	3057	66.4
Agricultural	1453	31.6
Not working	94	2.0
Mother works at home or away (<i>n</i> 1980)		
At home	563	28.4
Away	1417	71.6
Mother's education (<i>n</i> 4501)		
No formal education	102	2.2
Completed primary	1821	39.6
Completed secondary and above	2680	58.2
Father's education (<i>n</i> 4593)		
No formal education	105	2.3
Completed primary	1711	37.3
Completed secondary and above	2777	60.5
Mother's literacy (<i>n</i> 4587)		
Cannot read at all	253	5.5
Able to read only part of sentence	196	4.3
Able to read whole sentence	4138	90.2
Mother's age (years)		
15–24	1346	29.2
25–34	2322	50.4
35–49	936	20.3
Marital status (<i>n</i> 4603)		
Currently married	4520	98.2
Formerly married (divorced/separated/widow)	83	1.8
Mother's religion		
Muslim	3960	86.0
Christian	525	11.4
Other	119	2.6
Birth order		
First-born	1608	34.9
2nd–4th	2573	55.9
5th or more	423	9.2
Preceding birth interval		
No previous birth	1622	35.2
<24 months	362	7.9
≥24 months	2620	56.9
Sex of baby		
Male	2409	52.3
Female	2195	47.7
Age of child (months)		
6–11	1678	36.5
12–17	1499	32.6
18–23	1427	31.0
Size of baby (<i>n</i> 4466)		
Small	645	14.4
Average	2350	52.6
Large	1471	32.9
Place of delivery		
Home	2322	50.4
Health facility	2282	49.6
Type of delivery assistance (<i>n</i> 4596)		
Health professional	2551	55.5
Traditional birth attendant	1137	24.7
Other untrained	908	19.8
Antenatal clinic visits (<i>n</i> 4603)		
None	168	3.7
1–3	639	13.9
4+	3780	82.1
Don't know	17	0.4
Timing of postnatal check-up (<i>n</i> 4181)		
Immediate (hospital birth)	2503	59.9
Day 1–2	834	19.9
Day 3–6	275	6.6

Table 1 *Continued*

Characteristic	<i>nt</i>	%
Day 7 or later	89	2.1
No check-ups (including missing)	481	11.5
Reads newspaper or magazine (<i>n</i> 4592)		
Not at all	2269	49.4
Less than once weekly	1759	38.3
At least once weekly	342	7.4
Almost every day	222	4.8
Listens to radio (<i>n</i> 4592)		
Not at all	1720	37.5
Less than once weekly	1712	37.3
At least once weekly	338	7.4
Almost every day	822	17.9
Watches television (<i>n</i> 4595)		
Not at all	357	7.8
Less than once weekly	678	14.8
At least once weekly	261	5.7
Almost every day	3298	71.8
Household-level factors		
Household wealth index		
Poorest	984	21.4
Poorer	837	18.2
Middle	951	20.7
Wealthy	958	20.8
Wealthiest	874	19.0
Community-level factors		
Residence (<i>n</i> 4603)		
Rural	2699	58.6
Urban	1904	41.4
Geographical region (<i>n</i> 4339)		
Sumatra	935	21.6
Java and Bali	2493	57.5
Eastern part – NTB and NTT	245	5.7
Kalimantan	303	7.0
Sulawesi	363	8.4

NTB, Nusa Tenggara Barat; NTT, Nusa Tenggara Timur.
 †Weighted total was 4604 unless stated otherwise in parentheses.

food groups, 2–4 times daily was 36.4% in infants from the 'poorest' wealth index compared with 54.7% in infants from the 'wealthiest' wealth index. The prevalence of minimum acceptable diet was significantly lower for infants whose parents had a lower level of education, whose mothers did not work, for younger infants, delivered by a traditional birth attendant, whose mother did not attend antenatal care services, whose mothers did not read newspapers/magazines, listen to the radio or watch television, and infants from rural settings.

Within each region, the prevalences of complementary feeding and minimum dietary diversity were better than both the minimum meal frequency and minimum acceptable diet.

Determinants of complementary feeding indicators: multivariate analyses

Unadjusted and adjusted odds ratios were calculated to estimate the strength of association between independent variables and the four key complementary feeding outcomes: (i) not being introduced to solid, semi-solid or soft foods; (ii) not meeting minimum dietary diversity; (iii) not

Table 2 Percentage of children who did not reach minimum criteria for complementary feeding indicators among breast-fed and non-breast-fed children 6–23 months of age, Indonesia, 2007 (*n* 4604)

Indicator	Sample size, <i>N</i> (weighted)	Number of children, <i>n</i> (weighted)	Percentage of children	95% CI
Introduction of solid, semi-solid or soft foods (6–8 months)	899	784	87.3	83.65, 90.15
Minimum dietary diversity†				
Minimum dietary diversity (6–11 months)	1678	800	47.7	44.04, 51.31
Minimum dietary diversity (12–17 months)	1499	1149	76.7	73.31, 79.68
Minimum dietary diversity (18–23 months)	1427	1201	84.2	80.85, 86.98
Minimum dietary diversity (6–23 months)	4604	3149	68.4	66.13, 70.60
Minimum meal frequency‡				
Minimum meal frequency (6–11 months)	1678	1046	62.3	58.78, 65.73
Minimum meal frequency (12–17 months)	1499	785	52.4	48.39, 56.33
Minimum meal frequency (18–23 months)	1427	610	42.8	38.44, 47.20
Minimum meal frequency (6–23 months)	4604	2441	53.0	50.75, 55.27
Minimum acceptable diet§,				
Minimum acceptable diet (6–11 months)	1434	507	35.4	31.73, 39.14
Minimum acceptable diet (12–17 months)	1185	584	49.3	44.80, 53.80
Minimum acceptable diet (18–23 months)	815	450	55.2	49.36, 60.91
Minimum acceptable diet (6–23 months)	3434	1541	44.9	42.17, 47.60

†Minimum for dietary diversity: received foods from four or more food groups, consumption of any amount from each food group.

‡Minimum for meal frequency: two meals for breast-fed infants aged 6–8 months, three meals for breast-fed children aged 9–23 months, four meals for non-breast-fed children aged 6–23 months.

§Minimum for acceptable diet: combination of dietary diversity and meal frequency.

||Calculated only for breast-fed children.

meeting minimum meal frequency; and (iv) not meeting minimum acceptable diet.

As shown in Table 4, delay in initiating complementary feeding at 6–8 months was significantly associated with decreased age of the child and with a poor household wealth index.

As expected, mother's education had a positive impact on dietary diversity (Table 4). Women from wealthier households or urban areas reported significantly higher dietary diversity than those from poorer households or rural areas. Increasing child's age also had a positive association with dietary diversity. Infants whose mothers read newspapers/magazines and watched television every day were significantly less likely to be fed with four or more food groups. As compared with the Sumatra region, only Kalimantan was significantly more likely to meet minimum dietary diversity criterion.

As seen in Table 4, adequate meal frequency was significantly associated with older age of the child, home delivered or male infants, higher educated mothers and all the regions other than Sumatra. In contrast, meal frequency was significantly lower in women who were divorced, separated or widowed and who had more contact with the media.

Meeting minimum acceptable diet was significantly associated with mothers who were working, mothers with higher levels of education, increasing infant's age, urban residence, and in Kalimantan and Sulawesi.

Discussion

The present analysis of complementary feeding in Indonesia, which used recent nationally representative data

and the new WHO indicators, has revealed that overall the level of the indicators were above 50% except for the acceptable diet indicator. This is the first report describing complementary feeding indicators in Indonesia using the new WHO indicators.

The study has several strengths. First, the 2007 IDHS was a nationally representative survey using standardised methods that achieved high individual and household response rates. Second, the analyses used the recently recommended WHO infant feeding indicators⁽⁹⁾. These new indicators have never been analysed for Indonesia and should help guide the development of appropriate programmes to improve complementary feeding in Indonesia. Finally, the analyses used appropriate adjustments for the complex sampling design of the IDHS.

The study has several potential limitations that should be noted when interpreting the results. First, several variables in the study were not specific to the infants included in the analysis because they reflected only the most recent conditions or birth, such as maternal and paternal occupation, which represented the employment status within the last 12 months preceding the survey. Second, there are limited variables available to measure household- and community-level factors. Third, the cross-sectional design of the study means that causal factors for inappropriate complementary feeding could not be established.

Complementary feeding indicators

Introduction of solid, semi-solid or soft foods

The household wealth index emerged as one of the strongest predictors of poor initiation of solid, semi-solid or soft foods. In a number of studies, household wealth

Table 3 Percentage of children with appropriate introduction of solid, semi-solid or soft foods, minimum dietary diversity, minimum meal frequency and minimum acceptable diet by individual-, household- and community-level characteristics, Indonesia, 2007

Characteristic	Sample <i>n</i> (weighted)	Introduction of solid, semi-solid or soft foods		Minimum dietary diversity		Minimum meal frequency		Minimum acceptable diet (1 year)†		
		%	95% CI	%	95% CI	%	95% CI	%	95% CI	
Individual-level factors										
Mother's working status (<i>n</i> 4603)										
Non-working	2765	87.5	83.05, 90.92	66.5	63.64, 69.26	54.4	51.31, 57.48	42.2	38.89, 45.67	
Working (past 12 months)	1838	86.7	80.15, 91.35	71.3*	67.88, 74.45	50.9	47.67, 54.16	49.3*	45.10, 53.43	
Father's occupation										
Non-agricultural	3057	91.0	87.22, 93.81	71.6	68.67, 74.27	53.3	50.44, 56.18	47.0	43.48, 50.48	
Agricultural	1453	80.7	72.85, 86.61	62.1	58.49, 65.49	53.0	49.45, 56.49	41.0	36.90, 45.22	
Not working	94	51.0**	21.13, 80.12	64.4**	50.70, 76.01	43.8	30.05, 58.53	43.4	25.98, 62.57	
Mother works at home or away (<i>n</i> 1980)										
At home	563	85.0	66.39, 94.18	70.8	64.29, 76.58	51.9	46.31, 57.50	46.9	38.79, 55.16	
Away	1417	89.4	83.68, 93.24	70.8	67.18, 74.21	52.3	48.48, 56.00	49.7*	45.38, 54.11	
Mother's education (<i>n</i> 4501)										
No formal education	102	65.8	29.11, 90.02	46.4	33.68, 59.66	40.6	29.83, 52.35	22.3	14.01, 33.45	
Completed primary	1821	84.2	77.14, 89.39	65.8	62.27, 69.13	54.0	50.38, 57.55	40.7	36.69, 44.85	
Completed secondary and above	2680	89.7	85.39, 92.84	71.0**	68.15, 73.73	52.8	49.99, 55.65	49.1**	45.69, 52.60	
Father's education (<i>n</i> 4593)										
No formal education	105	73.9	50.71, 88.60	43.7	32.12, 55.91	52.1	40.42, 63.58	31.6	20.90, 44.57	
Completed primary	1711	86.8	79.84, 91.64	64.9	61.50, 68.14	53.3	49.54, 56.97	38.6	34.46, 42.97	
Completed secondary and above	2777	88.2	83.43, 91.66	71.6**	68.76, 74.28	52.9	50.08, 55.62	49.7**	46.37, 53.10	
Mother's literacy (<i>n</i> 4587)										
Cannot read at all	253	78.2	59.02, 89.97	54.7	45.62, 63.39	46.0	37.79, 54.49	29.5	21.82, 38.51	
Able to read only part of sentence	196	96.6	88.40, 99.07	64.1	53.91, 73.14	55.5	46.18, 64.41	45.5	34.28, 57.27	
Able to read whole sentence	4138	87.3	83.47, 90.41	69.4*	67.00, 71.70	53.4	50.92, 55.78	45.8*	43.01, 48.69	
Mother's age (years)										
15–24	1346	86.9	79.06, 92.11	64.5	59.98, 68.84	53.6	49.77, 57.46	41.8	37.08, 46.85	
25–34	2322	86.1	81.02, 89.96	71.0	68.38, 73.53	51.4	48.43, 54.43	47.0	43.54, 50.49	
35–49	936	90.7	82.15, 95.37	67.5*	62.77, 71.89	56.1	51.24, 60.80	44.1	38.36, 49.98	
Marital status (<i>n</i> 4603)										
Currently married	4520	87.5	83.88, 90.41	68.5	66.17, 70.64	53.3	51.06, 55.61	44.9	42.20, 47.68	
Formerly married (divorced/separated/widow)	83	63.3	28.85, 88.03	66.1	50.02, 79.19	35.6*	23.60, 49.68	40.2	24.61, 58.15	
Mother's religion										
Muslim	3960	88.1	83.94, 91.25	69.1	66.62, 71.41	53.2	50.63, 55.75	44.9	41.94, 47.92	
Christian	525	80.9	72.12, 87.44	63.6	57.82, 68.92	51.1	46.56, 55.58	43.1	36.68, 49.73	
Other	119	88.8	76.53, 95.06	67.9	58.68, 75.85	55.7	47.98, 63.12	51.3	42.34, 60.16	
Birth order										
First-born	1608	86.9	79.00, 92.11	68.1	63.89, 71.95	52.7	48.81, 56.51	47.5	42.69, 52.44	
2nd–4th	2573	87.5	82.97, 91.02	69.3	66.46, 72.00	52.6	49.71, 55.48	44.3	40.84, 47.71	
5th or more	423	86.7	76.31, 92.91	64.3	57.72, 70.43	56.9	51.03, 62.49	40.0	33.31, 47.00	
Preceding birth interval										
No previous birth	1622	87.2	79.39, 92.28	68.0	63.87, 71.90	52.7	48.83, 56.50	47.5	42.62, 52.34	
<24 months	362	81.4	69.23, 89.54	69.3	62.41, 75.37	51.9	44.91, 58.88	43.1	34.88, 51.71	
≥24 months	2620	88.1	83.78, 91.43	68.5	65.75, 71.18	53.4	50.46, 56.28	43.7	40.42, 47.03	
Sex of baby										
Male	2409	87.1	82.09, 90.91	69.4	66.58, 72.08	55.1	52.07, 58.11	47.1	43.37, 50.82	
Female	2195	87.4	81.95, 91.35	67.3	63.80, 70.65	50.7	47.55, 53.90	42.5	38.83, 46.29	

Table 3 Continued

Characteristic	Sample <i>n</i> (weighted)	Introduction of solid, semi-solid or soft foods		Minimum dietary diversity		Minimum meal frequency		Minimum acceptable diet (1 year)†	
		%	95% CI	%	95% CI	%	95% CI	%	95% CI
Age of child (months)									
6–11	1678			47.7	44.03, 51.32	62.3	58.75, 65.76	35.4	31.71, 39.16
12–17	1499			76.7	73.31, 79.68	52.4	48.39, 56.33	49.3	44.78, 53.82
18–23	1427			84.2**	80.83, 86.99	42.8**	38.43, 47.21	55.2**	49.36, 60.91
Size of baby (<i>n</i> 4466)									
Small	645	81.8	67.34, 90.73	64.2	58.34, 69.61	48.4	42.44, 54.36	40.1	33.68, 46.84
Average	2350	89.6	84.67, 93.07	68.8	65.69, 71.81	53.7	50.65, 56.68	44.8	41.16, 48.56
Large	1471	86.1	79.80, 90.64	71.2*	67.64, 74.58	53.5	49.69, 57.28	47.6	43.04, 52.19
Place of delivery									
Home	2322	84.4	79.51, 88.30	66.0	63.12, 68.80	54.6	51.49, 57.76	43.5	39.88, 47.14
Health facility	2282	90.1	84.30, 93.87	70.8*	67.44, 74.02	51.4	48.14, 54.59	46.5	42.66, 50.34
Type of delivery assistance (<i>n</i> 4596)									
Health professional	2551	89.6	84.58, 93.18	71.1	68.06, 73.88	52.4	49.55, 55.25	47.4	43.98, 50.80
Traditional birth attendant	1137	83.5	75.62, 89.21	65.0	60.80, 68.95	52.5	47.88, 57.10	39.4	34.61, 44.30
Other untrained	908	84.0	76.71, 89.33	65.5*	60.36, 70.25	55.5	50.45, 60.42	45.8*	39.91, 51.87
Antenatal clinic visits (<i>n</i> 4603)									
None	168	78.2	60.91, 89.15	56.4	47.07, 65.34	45.7	37.10, 54.51	32.9	24.25, 42.94
1–3	639	79.7	67.93, 87.91	62.8	56.94, 68.37	55.4	50.36, 60.34	40.4	34.11, 46.99
4+	3780	89.0	85.14, 91.88	69.9	67.38, 72.29	53.1	50.53, 55.60	46.3	43.26, 49.41
Don't know	17	74.3*	22.44, 96.67	65.3*	46.61, 80.27	25.1	13.13, 42.57	28.4*	12.75, 51.86
Timing of postnatal check-up (<i>n</i> 4181)									
Immediate (hospital birth)	2503	89.0	84.10, 92.47	68.4	65.25, 71.39	53.5	50.36, 56.58	43.6	40.04, 47.24
Day 1–2	834	88.2	79.34, 93.58	69.6	64.69, 74.01	53.6	48.55, 58.49	49.0	43.31, 54.67
Day 3–6	275	84.1	62.07, 94.44	65.4	55.25, 74.39	55.7	46.68, 64.35	41.5	31.86, 51.84
Day 7 or later	89	82.9	46.97, 96.37	75.9	61.02, 86.39	51.5	35.59, 67.09	53.7	33.67, 72.52
No check-ups (including missing)	481	75.2	63.62, 84.08	62.4	56.67, 67.79	48.7	43.88, 53.56	39.3	33.82, 45.12
Reads newspaper or magazine (<i>n</i> 4592)									
Not at all	2269	87.3	82.10, 91.14	63.5	60.22, 66.64	52.9	49.69, 56.14	39.6	35.98, 43.27
Less than once weekly	1759	85.6	78.69, 90.48	71.3	68.01, 74.39	55.2	51.64, 58.73	49.6	45.33, 53.77
At least once weekly	342	86.8	75.38, 93.43	78.5	71.95, 83.90	43.7	37.00, 50.68	50.0	41.27, 58.67
Almost every day	222	98.7	93.44, 99.77	80.2**	71.86, 86.53	51.7	43.07, 60.31	61.7**	50.34, 71.95
Listens to radio (<i>n</i> 4592)									
Not at all	1720	84.5	77.56, 89.62	64.0	60.55, 67.30	51.5	47.86, 55.16	40.0	36.04, 44.07
Less than once weekly	1712	86.6	79.98, 91.21	69.6	65.86, 73.12	52.6	49.06, 56.14	47.6	43.20, 52.01
At least once weekly	338	91.6	80.73, 96.62	76.1	69.08, 81.95	58.3	50.66, 65.52	52.7	43.36, 61.79
Almost every day	822	92.0	84.90, 95.95	72.1*	66.95, 76.78	54.7	49.70, 59.70	46.8*	40.87, 52.81
Watches television (<i>n</i> 4595)									
Not at all	357	88.3	79.91, 93.49	50.0	42.70, 57.24	56.1	49.28, 62.60	33.6	26.30, 41.73
Less than once weekly	678	86.9	78.47, 92.40	64.2	58.61, 69.49	54.4	49.19, 59.44	41.3	35.21, 47.75
At least once weekly	261	90.7	78.20, 96.34	65.5	57.33, 72.80	52.7	41.09, 57.32	38.0	29.63, 47.20
Almost every day	3298	86.9	82.07, 90.61	71.5**	69.12, 73.74	52.7	49.98, 55.41	47.6*	44.48, 50.67
Household-level factors									
Household wealth index									
Poorest	984	80.0	72.00, 86.21	57.4	53.19, 61.43	52.6	48.84, 56.30	36.4	32.18, 40.75
Poorer	837	85.6	75.84, 91.79	67.0	61.82, 71.70	52.8	48.24, 57.29	42.2	37.10, 47.52
Middle	951	89.9	81.45, 94.77	69.8	64.81, 74.29	54.2	48.67, 59.63	46.9	40.82, 53.05
Wealthy	958	87.1	76.59, 93.32	70.7	65.03, 75.71	54.2	48.92, 59.32	47.1	40.89, 53.46
Wealthiest	874	95.3	87.89, 98.24	78.3**	73.62, 82.36	51.2	45.96, 56.41	54.7**	48.09, 61.10

Table 3 Continued

Characteristic	Sample n (weighted)	Introduction of solid, semi-solid or soft foods		Minimum dietary diversity		Minimum meal frequency		Minimum acceptable diet (1 year) [†]	
		%	95% CI	%	95% CI	%	95% CI	%	95% CI
Community-level factors									
Residence (n 4603)									
Rural	2699	84.1	79.06, 88.16	64.5	61.56, 67.28	53.1	50.38, 55.86	41.1	37.86, 44.46
Urban	1904	92.1*	86.93, 95.32	74.0**	70.23, 77.41	52.9	48.94, 56.76	51.1**	46.44, 55.67
Geographical region (n 4339)									
Sumatra	935	87.4	78.93, 92.71	71.4	67.27, 75.19	45.7	42.22, 49.26	42.2	37.95, 46.64
Java and Bali	2493	89.6	83.54, 93.65	68.1	64.34, 71.67	56.2	52.48, 59.88	45.0	40.62, 49.45
Eastern part – NTB and NTT	245	83.2	67.11, 92.33	62.8	55.81, 69.29	54.7	46.95, 62.18	42.7	35.77, 49.98
Kalimantan	303	79.1	69.50, 86.28	70.3	65.86, 74.29	50.3	45.12, 55.38	49.4	43.61, 55.18
Sulawesi	363	81.4	72.87, 87.75	69.6	65.39, 73.52	56.1**	51.40, 60.71	50.2	44.84, 55.49

NTB, Nusa Tenggara Barat; NTT, Nusa Tenggara Timur.
 χ^2 test was applied to test statistical significance.
 * $P < 0.05$; ** $P < 0.001$.
[†]Calculated only for breast-fed children.

index was related to poor infant feeding and was closely associated with low birth weight and stunting^(18,19). Shorter birth intervals of less than 12 months have been reported in earlier literature as a strong predictor of poor infant feeding^(20–24). This could be related to maternal depletion syndrome and resource competition between siblings, in addition to a lack of care and attention experienced by first-born infants^(25–28).

Dietary diversity

A close relationship was observed between the utilisation of media such as newspapers, magazines and television and a lower prevalence of adequate dietary diversity. However, this result suggests that the mass media has the potential to promote dietary diversity, educating and advising parents or caregivers of the benefits of serving a variety of foods. A project undertaken in Indonesia in 1985, which drew on the mass media to improve child feeding practices at home, led to much improvement in infant feeding knowledge and practices among mothers⁽²⁹⁾. It is established that educational interventions can lead to improved feeding practices⁽³⁰⁾. In Peru, a community-based controlled efficacy study assessed the impact of regular nutrition advice in the home on dietary intake in infants 7–11 months of age. The results showed that complementary food intake, and thus intakes of energy and nutrients, increased during the short study period. This was achieved through increasing consumption of certain food groups and recommended food preparations, including foods from animal sources^(31,32).

At the household level, high wealth index demonstrated a significant association with dietary diversity. There was a progressive increase in the prevalence of children meeting the dietary diversity criterion as wealth index increased. Although most mothers or caregivers were aware that dietary diversity plays an important role in the child's health, this knowledge–practice discrepancy appears to imply that lack of resources acts as a barrier for mothers in their efforts to put knowledge into practice⁽³³⁾.

The geographic differences in dietary diversity were significant in the multivariate analysis, with infants living in Java and Bali less likely to be given four or more food groups than those living in Sumatra. This might relate to different food cultures or beliefs about the variety of foods that are suitable for infants or the availability of foods.

Meal frequency and acceptable diet

Feeding patterns such as the timing and number of meals or snacks require close attention⁽²⁾. One of the independent variables likely to interact with the intake of complementary foods is the behaviour of the caregiver, which includes the level of encouragement provided to the child during feeding, the frequency the food is being fed and the environment where feeding takes place^(2,34–36).

Table 4 Survey logistic modelling of a child not currently receiving adequate complementary feeding (unadjusted and adjusted odds ratios), Indonesia, 2007

Outcome variable	Characteristic	Unadjusted			Adjusted		
		OR	95% CI	P	OR	95% CI	P
Not being introduced to solid, semi-solid or soft foods	Age of child (months)	0.57	0.39, 0.84	0.004	0.56	0.38, 0.81	0.002
	Household wealth index						
	Rich	1.00			1.00		
Not meeting minimum dietary diversity	Middle	2.39	0.75, 7.57	0.287	2.57	0.83, 8.01	0.103
	Poor	3.97	1.33, 11.85	0.036	4.32	1.46, 12.80	0.008
	Mother's education						
	Completed secondary and above	1.00			1.00		
	Completed primary	1.27	1.03, 1.57	0.024	1.05	0.81, 1.37	0.709
	No education	2.76	1.48, 5.15	0.001	1.92	1.09, 3.38	0.023
	Age of child (months)						
	18–23	1.00			1.00		
	12–17	1.65	1.21, 2.24	0.002	1.68	1.23, 2.29	0.001
	6–11	5.92	4.41, 7.95	<0.001	6.36	4.73, 8.56	<0.001
	Reads newspaper or magazine						
	Not at all/less than once weekly/at least once weekly	1.00			1.00		
	Almost every day	1.92	1.41, 2.61	<0.001	1.53	1.10, 2.11	0.011
	Watches television						
	Not at all/less than once weekly/at least once weekly	1.00			1.00		
	Almost every day	1.69	1.37, 2.09	<0.001	1.36	1.06, 1.74	0.015
	Household wealth index						
	Rich	1.00			1.00		
	Middle	1.53	1.14, 2.07	0.005	1.37	0.97, 1.95	0.073
	Poor	2.18	1.61, 2.95	<0.001	1.76	1.16, 2.68	0.008
	Residence						
Urban	1.00			1.00			
Rural	1.54	1.22, 1.96	<0.001	1.34	1.00, 1.78	0.047	
Geographical region							
Sumatra	1.00			1.00			
Java and Bali	1.17	0.90, 1.51	0.234	1.42	1.08, 1.86	0.013	
Eastern part – NTB and NTT	1.47	1.04, 2.09	0.030	1.33	0.91, 1.93	0.138	
Kalimantan	1.06	0.80, 1.40	0.686	0.96	0.72, 1.27	0.754	
Sulawesi	1.09	0.83, 1.43	0.536	1.01	0.75, 1.36	0.949	
Not meeting minimum meal frequency	Mother's education						
	Completed secondary and above	1.00			1.00		
	Completed primary	0.97	0.80, 1.17	0.750	1.05	0.85, 1.28	0.673
	No education	1.75	1.01, 3.06	0.047	2.03	1.13, 3.64	0.017
	Marital status						
	Currently married	1.00			1.00		
	Formerly married (divorced/separated/widow)	2.14	1.16, 3.97	0.015	2.12	1.16, 3.87	0.014
	Sex of baby						
	Male	1.00			1.00		
	Female	1.21	1.01, 1.45	0.042	1.24	1.04, 1.49	0.019
	Age of child (months)						
	18–23	1.00			1.00		
	12–17	1.52	1.20, 1.93	<0.001	1.55	1.22, 1.98	<0.001
	6–11	2.24	1.74, 2.86	<0.001	2.30	1.79, 2.96	<0.001

Table 4 *Continued*

Outcome variable	Characteristic	Unadjusted			Adjusted		
		OR	95% CI	<i>P</i>	OR	95% CI	<i>P</i>
Not meeting minimum acceptable diet	Place of delivery						
	Home	1.00			1.00		
	Health facility	1.13	0.94, 1.37	0.202	1.25	1.00, 1.56	0.047
	Reads newspaper or magazine						
	Not at all/less than once weekly/at least once weekly	1.00			1.00		
	Almost every day	1.33	1.04, 1.70	0.025	1.36	1.05, 1.75	0.018
	Listens to radio						
	Not at all/less than once weekly/qt least once weekly	1.00			1.00		
	Almost every day	1.15	0.92, 1.44	0.216	1.27	1.01, 1.60	0.044
	Geographical region						
	Sumatra	1.00			1.00		
	Java and Bali	0.66	0.54, 0.81	<0.001	0.63	0.51, 0.78	0.001
	Eastern part – NTB and NTT	0.70	0.50, 0.99	0.043	0.70	0.50, 0.99	0.041
	Kalimantan	0.84	0.65, 1.08	0.167	0.85	0.65, 1.11	0.234
	Sulawesi	0.66	0.52, 0.83	0.001	0.66	0.52, 0.85	0.001
	Mother's working status						
	Working (past 12 months)	1.00			1.00		
	Non-working	1.34	1.07, 1.67	0.010	1.34	1.07, 1.67	0.012
	Mother's education						
	Completed secondary and above	1.00			1.00		
	Completed primary	1.41	1.13, 1.75	0.003	1.42	1.12, 1.79	0.003
	No education	3.80	2.01, 7.16	<0.001	3.84	2.07, 7.12	<0.001
	Age of child (months)						
	18–23	1.00			1.00		
	12–17	1.29	0.94, 1.77	0.119	1.30	0.95, 1.79	0.097
	6–11	2.25	1.66, 3.07	<0.001	2.27	1.67, 3.09	<0.001
	Residence						
Urban	1.00			1.00			
Rural	1.47	1.15, 1.87	0.002	1.46	1.13, 1.89	0.004	
Geographical region							
Sumatra	1.00			1.00			
Java and Bali	0.89	0.69, 1.15	0.379	0.90	0.69, 1.16	0.407	
Eastern part – NTB and NTT	0.98	0.70, 1.38	0.905	0.87	0.62, 1.24	0.453	
Kalimantan	0.75	0.56, 1.00	0.053	0.68	0.50, 0.91	0.011	
Sulawesi	0.73	0.55, 0.96	0.024	0.65	0.48, 0.86	0.003	

NTB, Nusa Tenggara Barat; NTT, Nusa Tenggara Timur.

The categories of explanatory variables have been ordered by placing the category with the lowest risk of the adverse feeding pattern first and this sequence may vary from earlier tables.

Mothers who gave birth in a health facility had a poor association with meal frequency. This is a contradictory finding, with further examination of the data also revealing that the prevalence of bottle-feeding was higher in women who delivered in health facilities (42.9%) than in those who delivered at home (24.2%). This can be explained by wealthier women, who were more likely to bottle-feed, giving birth in health facilities, thus explaining the lower prevalence of adequate meal frequency. This also indicates that women delivering in health facilities may not have been appropriately counselled or given advice about infant feeding, suggesting a need to improve the delivery of infant and young child feeding messages in health facilities.

Mothers who were divorced, separated or widowed also had a negative association with meeting the meal frequency criterion. Studies have shown that single mothers lack support from families or communities, which causes poor infant feeding practices⁽³⁷⁾. This indicates that health institutions and health-care professionals can play a significant role in promoting complementary feeding. Evidence⁽³⁶⁾ shows that infant feeding counselling in health facilities is effective, not only to improve breast-feeding practices, but also to improve complementary feeding. In one population where the duration of breast-feeding was typically short and where complementary foods were introduced early, the provision of counselling in health facilities was attributed to a decline in growth faltering among children older than 6 months. Through improvements to maternal complementary feeding knowledge, increases in energy and nutrient intakes were observed and were qualitatively demonstrated through improved feeding practices such as the timely introduction of complementary foods and the quality of such foods⁽³⁸⁾. Similar findings were observed in a large community-based study in Haryana, India where complementary feeding practices were improved through the provision of appropriate information and support to families and caregivers through the health system and the community⁽³⁹⁾.

However, mother's education demonstrated a significant association with both meal frequency and the acceptable diet criterion. The present analysis revealed that more educated mothers were more likely to feed their child 2–4 times or more on the previous day, which allows higher likelihood of the child consuming at least one animal-source food and at least one fruit or vegetable that day. Similar findings associating infant feeding with education have also been described in studies undertaken in Uganda and Pakistan^(18,40). Higher-educated mothers were associated with more beneficial feeding practices than their less-educated peers, indicating that nutrition and feeding guidance for mothers needs to be especially targeted to lower-educated mothers⁽⁴¹⁾.

The prevalences of adequate meal frequency and acceptable diet were both shown to be positively significant within all geographic regions.

Conclusions

The importance of improving appropriate complementary feeding practices is paramount in reducing undernutrition and excess morbidity and mortality in children in developing countries. There is an urgent need for a collective effort to achieve the Millennium Development Goals for the prevention of undernutrition and to improve child survival. Furthermore, infant feeding recommendations need to be adapted to the specific settings in which they are to be implemented. Previous research has shown that complementary feeding can be improved and one possible method in achieving this goal is through promotion programmes that provide counselling and education to mothers regarding appropriate foods and frequency of feeding of young children.

Most complementary feeding indicators in Indonesia could be improved in order to gain the full benefits of appropriate complementary feeding in reducing undernutrition, morbidity and mortality in young children.

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