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Complementary Feeding Practices and Nutritional Status Among Infants Aged 6–12 Months in An Indonesian Primary Health-Care Setting: A Cross-Sectional Study

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ABSTRACT: Adequate complementary feeding is important for infant growth and nutritional status. However, the relationship between caregiver-reported feeding practices and anthropometric nutritional status remains unclear in primary health care settings. We investigated complementary feeding practices and their association with nutritional status among infants (6–12 months) attending a primary health care facility in Indonesia. Cross-sectional study of 58 mother–infant pairs with complete feeding questionnaires and anthropometric records from Puskesmas Maradekaya, South Sulawesi, Indonesia. Complementary feeding practices were measured using a 23-item questionnaire with four-point response options. Total scores were categorized into researcher defined categories. Nutritional status was determined by World Health Organization weight-for-length Z-scores (WLZ). Associations were tested using Fisher–Freeman–Halton exact test. Mean complementary feeding score was 63.78 (SD = 11.12). Feeding practices were poor (36.2%), good (37.9%) and very good (25.9%). Most infants (77.6%) had normal WLZ, 15.5% wasting or severe wasting and 6.9% overweight or obesity; the proportion of infants with WLZ outside normal range increased from 9.5 % in poor feeding to 22.7% and 40.0% in good and very good feeding respectively (p = .088). Complementary feeding practices differed among participating mothers; undernutrition and excess weight-for-length were present although no statistically significant association was found between feeding categories and nutritional status. These results indicate that feeding assessments should be combined with anthropometric monitoring and questionnaire categories interpreted cautiously.

KEYWORDS: Anthropometric assessment; Complementary feeding; Infant nutritional status; Primary health care; Weight-for-length Z-score.

1. INTRODUCTION

Adequate nutrition in infancy is essential for healthy growth, physiology and long-term health. The transition from exclusive breastfeeding to complementary feeding is a critical period because infants' nutritional needs increase as breast milk alone cannot meet them; around six months of age complementary foods need to be introduced along with continued breastfeeding (to meet increasing energy and nutrient needs) but also because they are more vulnerable to growth faltering, micronutrient deficiency and feeding-related illnesses. WHO (WHO, 2023) says that complementary feeding is not just about food introduction at the right time but dietary diversity, nutrient-rich food choices, meal frequency and responsive feeding so complementary feeding should be seen as multidimensional caregiving practice rather than just provision of foods other than breast milk.

Child malnutrition remains a public health problem despite improvements in maternal and child health services: UNICEF, WHO and World Bank Group (UNICEF, WHO and World Bank Group, 2025) Joint Child Malnutrition Estimates show global stunting, wasting and overweight in children younger than five years reflect different but potentially overlapping challenges related to inadequate nutrient intake, illness, feeding environments and broader socioeconomic circumstances. Malnutrition cannot therefore be understood as insufficient body weight alone (excessive weight relative to size is also a bad nutritional condition). Under-nutrition and over-weight coexist so anthropometric assessment needs to distinguish between these two nutritional outcomes in early childhood.

Complementary feeding practices are particularly relevant to these concerns because the quantity, quality and composition of foods offered during infancy may affect growth and nutritional well-being (WHO 2023). The WHO (2023) guideline recommends diversity of diets that include nutrient dense foods (animal source foods, fruits and vegetables and other foods appropriate to

children's development needs), but this may not happen if households have little food access, inadequate feeding knowledge, competing caregiving responsibilities or cultural expectations regarding infant foods. Feeding decisions therefore interact between maternal knowledge, household resources, social influences and readiness of children.

It follows that feeding practices cannot be assessed adequately through food introduction timing or meal frequency alone (Indonesia example above). In a nationally representative survey of 4,804 children aged 6–23 months, Nurokhmah et al. (2022) found that only 54.3% achieved minimum dietary diversity; 71.8% minimum meal frequency and only 37.6% minimum acceptable diet. They also found variation by parental education, household economic status, maternal media exposure and location. This means feeding frequency does not necessarily develop in tandem with dietary adequacy. More recently, Nurokhmah et al. (2025) found inequalities in complementary feeding practices along dimensions of women's empowerment but stressed that social independence and related socioeconomic characteristics are important too. Taken together these studies show that complementary feeding practice in Indonesia is shaped by circumstances beyond individual maternal behaviour.

Complementary feeding and anthropometric outcomes are also more complex than a simple association between favourable feeding practices and normal growth. A systematic review of dietary diversity and growth outcomes found that lower dietary diversity was frequently associated with stunting but evidence on wasting and underweight was less clear (Association of Dietary Diversity With Growth Outcomes, 2022). A systematic review and meta-analysis of complementary feeding interventions in low- and middle-income countries also showed small improvements in growth outcomes (Effectiveness of Complementary Feeding Interventions in Low- and Middle-Income Countries, 2023) so nutritional outcomes cannot always be predicted from a single feeding related measure and it is also important to distinguish reported feeding practices from actual dietary intake, nutrient adequacy and subsequent growth.

Anthropometric indicator selection is particularly important when studying nutrition status during infancy. WLZ calculated using WHO Child Growth Standards measures body weight relative to recumbent length and is used to identify wasting and excessive weight-for-length in children <2 years of age (unlike weight-for-age which does not use chronological age in the reference calculation accurate weight, length and sex measurements are still needed). Moreover, WLZ only measures one aspect of nutritional status and does not identify linear growth faltering or micronutrient deficiencies. Thus, normal WLZ cannot be taken as an indication of adequate dietary quality while abnormal WLZ may reflect several nutrition and health factors.

Research on complementary feeding and nutritional status must also take these differences into account: WHO/UNICEF infant and young child feeding indicators measure aspects of dietary diversity, meal frequency and adequacy; questionnaires based on self-reported feeding behaviours may measure how often caregivers do certain practices (frequency). These instruments can give information about everyday feeding behaviours but the composite scores do not necessarily equate to thresholds for adequate dietary quality; higher scores are interpreted differently if items included consistently represent recommended practice. This distinction is especially important when questionnaire categories are compared with anthropometric outcomes because conceptual differences between the measurements could influence the associations observed. Primary health care settings provide a context in which to study such relationships.

Community health services routinely monitor infant growth, counsel breastfeeding and teach complementary feeding but keep anthropometric records that might inform local nutritional assessments. In Indonesia, Mardani et al. (2024) showed that a structured nutrition education programme could improve maternal feeding knowledge, self-efficacy, complementary feeding practices and some child growth indicators but intervention results do not necessarily translate into associations in routine primary care populations. Local observational evidence remains useful for spotting variation in reported feeding practices and nutritional status (if source and limitations of anthropometric records are transparent).

Even though national surveys and intervention studies exist how researcher defined complementary feeding practice scores relate to weight for length classifications in individual primary health-care settings is unclear. Evidence often focuses on standardised dietary indicators or specific forms of undernutrition or intervention effectiveness; less attention is paid to the interpretation of composite feeding-practice categories alongside the full range of weight for length outcomes, undernutrition as well as excess weight, in small facility-based samples.

Addressing this may help make more cautious use of what questionnaire derived feeding scores can tell us about infant nutritional status. Therefore, this study aimed to describe complementary feeding practices and nutritional status among infants aged 6–12 months in the service area of Puskesmas Maradekaya Indonesia and to investigate whether researcher-defined complementary feeding categories were associated with WHO weight-for-length Z-score classifications. By differentiating self-reported feeding practice from anthropometrically assessed nutritional outcomes, it aimed to provide context specific evidence for interpreting infant feeding and nutrition assessment in primary health care research.

2. METHOD

2.1 Study design and participants

This cross-sectional study investigated the relationship between complementary feeding practices and nutritional status in infants aged 6–12 months in an Indonesian primary health care setting using data collected at Puskesmas Maradekaya where maternal feeding information and infant anthropometric records were available for analysis. The analytical sample comprised 58 mother–infant pairs who had completed the 23-item complementary feeding questionnaire and anthropometric measurements as well as records that contained information required for both feeding-practice assessment and nutritional-status classification only. This ensured that the questionnaire and anthropometric datasets were consistent but the sample was not a probability sample of the wider infant population. Since observational design was used feeding practices and nutritional status were measured without changing participants' behaviours or introducing an intervention; thus, the study aimed to describe patterns and statistical associations rather than establish causality.

2.2 Measurements and data collection

Complementary feeding practices were measured by using a structured questionnaire (P1–P23) with 23 items in terms of behavioural responses to maternal feeding scoring on a four-point Likert type scale from never (1) to very often (4). All items were positively worded by the research team and no reverse scoring was applied. Questionnaire responses were linked to infants' anthropometric information via participant identifiers: body weight, recumbent length and sex were recorded in primary health-care dataset. Anthropometric measurements were secondary clinical records only (not new anthropometric observations), the research team did not repeat the measurements nor independently check the measuring procedure. Questionnaire responses and anthropometric records were checked for completeness before analysis. The two complementary data sources enabled feeding related behaviours to be assessed alongside an objective anthropometric indicator although the reliability of the original clinical measurements could not be independently established.

2.3 Operational Definition of Complementary Feeding Practices

Complementary feeding practices were operationalised as total score obtained from the 23 questionnaire items. Individual responses were numbered from 1 to 4 so that theoretical total score ranged from 23 to 92 in which higher scores indicated more frequently reporting the behaviours in the questionnaire. Descriptive analysis was based on categories defined by the researchers using equal interval scores, that is very poor 23–39; poor 40–57; good 58–74; very good 75–92. These categories are intended only for analytical purposes and should not be interpreted as internationally validated indicators of dietary adequacy. Internal consistency was tested with Cronbach's alpha and corrected item–total correlations were examined to check for possible inconsistencies among questionnaire items. Exclusive breastfeeding history was treated conceptually separately from complementary feeding practices and not included in the total questionnaire score in which this was done to avoid conflating first six months feeding experiences with subsequent complementary feeding behaviour.

2.4 Anthropometric assessment and nutritional status

Infant nutritional status was assessed using weight-for-length Z-scores (WLZ) according to WHO Child Growth Standards; body weight, recumbent length and sex were obtained from existing primary health-care records. Sex-specific WHO reference parameters were used to recalculate WLZ (with adjustment for extreme values beyond three standard deviations recommended); five categories of nutritional status were then defined: severe wasting (WLZ below −3), wasting (−3 to below −2), normal (−2 to +2), overweight (above +2 to +3), and obesity (above +3). For association testing these categories were regrouped into normal and outside-normal WLZ because low and high weight-for-length conditions were clinically different outcomes. Statistical significance was set at a two-sided $p < 0.05$ threshold. Because of the small sample size and number of non-normal observations no multivariable regression analysis was performed.

2.5. Statistical Analysis

Data analysis covered descriptive statistics, questionnaire reliability, and exploratory tests of association. Frequencies and percentages were given for complementary feeding categories and nutritional-status classifications; mean and standard deviation summarized total questionnaire scores; Cronbach's alpha and corrected item–total correlations were used to assess internal consistency. The association between complementary feeding practices and nutritional status was tested by contingency table analysis comparing the three observed feeding categories with normal and outside-normal WLZ. Since very poor category had no participants and several cells in the contingency table had small frequencies Fisher–Freeman–Halton exact test was chosen instead of asymptotic chi-square approximation. A second Fisher exact test compared poor with combined good and very good categories.

Significance was set at two-sided $p < 0.05$. Due to the small sample size and limited number of non-normal observations multivariable regression analysis was not performed.

2.6 Ethical Considerations

Maternal questionnaires and infant anthropometric records were collected in primary health-care settings. The analysis was relevant to the research objectives covering complementary feeding responses and measurements needed for nutritional status classification. Participant identifiers were used to match questionnaire and anthropometric records when preparing data. When reporting results, we presented them as aggregate numbers so as not to identify individual mothers or infants. Because secondary clinical records were used in the study, ethical documentation should state the institutional authorization for access to those records and how participant confidentiality was protected. In the final manuscript the name of approving ethics committee must be reported, approval number and date and informed-consent or consent-waiver procedures. These administrative details have to be confirmed by the research team before submission and should not be inferred from availability of the dataset.

3. FINDINGS

3.1. Complementary Feeding Practices

The total mean complementary feeding score was 63.78 (SD = 11.12). Of the 58 respondents, 21 (36.2%) were classified as poor; 22 (37.9%) as good and 15 (25.9%) very good; none were very poor that can be seen Table 1; so 37 (63.8 %) were combined good/very good. Overall internal consistency was moderate (Cronbach's $\alpha = .855$), but P1–P3 had negative corrected item–total correlations which should be taken into account when interpreting composite scores.

Table 1. Distribution of complementary feeding practice categories (N = 58)

Category	Score range	N	%
Very poor	23–39	0	0.0
Poor	40–57	21	36.2
Good	58–74	22	37.9
Very good	75–92	15	25.9
Total	—	**58**	**100.0**

3.2. Nutritional Status

After recalculation from the recorded anthropometric measurements, 45 infants (77.6%) had normal WLZ; seven (12.1%) wasting; two (3.4%) severe wasting; two (3.4%) overweight and two (3.4%) obesity as shown in Table 2. Thirteen infants (22.4%) were outside of normal WLZ range. Two original anthropometric-sheet classifications differed from recalculated categories (participant IDs 21 and 56). The recalculation checks classification consistency but does not validate original clinical measurements.

Table 2. WHO weight-for-length nutritional status (N = 58)

WLZ category	N	%
Severe wasting	2	3.4
Wasting	7	12.1
Normal	45	77.6
Overweight	2	3.4
Obesity	2	3.4
Total	**58**	**100.0**

3.3. Association between Feeding Practices and Nutritional Status

Normal WLZ was seen in 19 of 21 infants (90.5%) in the poor category, 17 of 22 (77.3%) in the good and nine of 15 (60.0%) in the very good category shown in Table 3; outside-normal proportions were 9.5%, 22.7% and 40%. The association across the three observed categories was not significant (Fisher–Freeman–Halton exact test: $p = .088$). The binary comparison was also not significant (Fisher exact test: $p = .106$).

Table 3. Complementary feeding category by normal versus outside-normal WLZ

Practice category	Normal, n (%)	Outside normal, n (%)	Total
Poor	19 (90.5)	2 (9.5)	21
Good	17 (77.3)	5 (22.7)	22
Very good	9 (60.0)	6 (40.0)	15
Total	**45 (77.6)**	**13 (22.4)**	**58**

To further illustrate the distribution of nutritional status across complementary feeding practice categories, Figure 1 shows proportions of infants with normal and non-normal WLZ. The visualization compares nutritional outcomes for infants whose feeding practices were classified as poor, good or very good (very poor was not included because no participants were classified in that group).

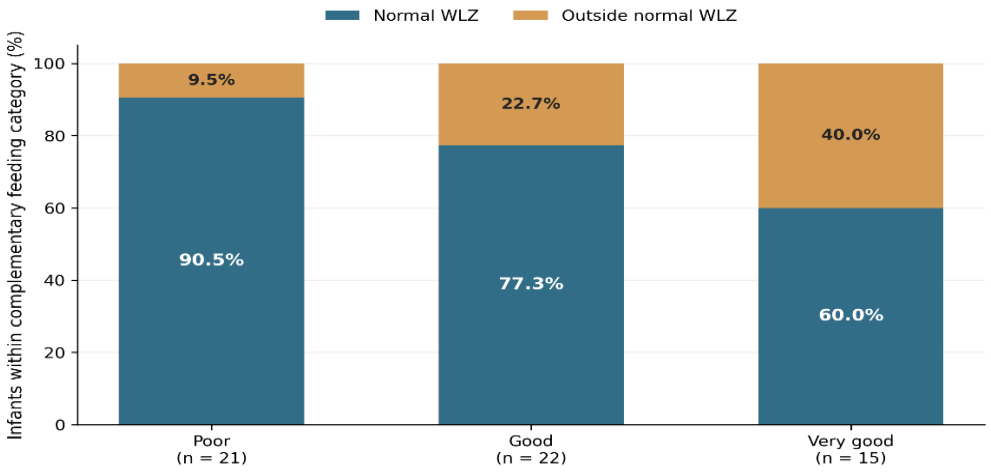


Figure 1. Distribution of Normal and Non-Normal Weight-for-Length Z-Scores across Complementary Feeding Practice Categories

As Figure 1 shows, the proportion of infants with weight-for-length outside the normal range increased from 9.5% in poor complementary feeding to 22.7% in good and 40.0% in very good category but overall association was not significant (Fisher–Freeman–Halton exact test: p=.088). Hence the pattern should be taken descriptively rather than as evidence for a statistically established relationship.

4. DISCUSSION

4.1. Complementary Feeding Practices among Infants

The present study showed that complementary feeding practices among infants 6–12 months old attending Puskesmas Maradekaya varied greatly. Of the 58 mother–infant pairs participating in the study 36.2% were poor in complementary feeding practices, 37.9% and 25.9% good and very good respectively. Even though the combined proportion of good and very good practices was 63.8%, it should not be interpreted as evidence that most infants received nutritionally adequate complementary foods; categories were defined by researchers from intervals on a behavioural questionnaire (not internationally validated dietary indicators), so they represent distribution of reported feeding behaviour within the population studied rather than WHO recommendations being followed.

This distinction is important when thinking about evidence from Indonesia. Nurokhmah et al. (2022) using nationally representative data found large gaps in recommended complementary feeding practices among children aged 6–23 months - minimum meal frequency was not associated with adequate dietary diversity or minimum acceptable diet. So, feeding frequency may not be a good measure of dietary quality. The present results should therefore be interpreted within this wider context because mothers who frequently reported certain feeding behaviours may not have provided sufficiently diverse or nutrient dense foods.

The WHO (2023) guideline makes clear that complementary feeding is multi-factorial (timely introduction of foods, dietary diversity, nutrient density, meal frequency, food safety and responsive feeding). Components may not develop uniformly in households: caregivers may cook meals regularly but only have a limited range of ingredients available or offer diverse foods but

do not meet age-appropriate feeding requirements. These differences show why we cannot summarize complex feeding behaviours into one composite score.

The social context of infant feeding is also relevant. Nurokhmah et al (2025) studied inequalities in complementary feeding practices in Indonesia with regard to women empowerment and their results show that household and social circumstances should be taken into account when feeding behaviors are interpreted: caregivers' access to food, control over household resources, family support, education opportunities and competing responsibilities may affect decisions made; mothers may have adequate nutritional knowledge but still not implement feeding recommendations.

The age range studied in the present study is also relevant. Infants aged 6–12 months are moving from milk-based feeding to progressively more varied foods and textures. Feeding practices may be very different between an infant who has just started complementary feeding and one approaching her first birthday so questionnaire scores could partly reflect developmental differences in feeding routines rather than caregiver competence alone in which age-specific feeding patterns were not analysed separately in our analysis. However, since age was not separately analysed in our analysis this interpretation remains tentative and requires further investigation.

The systematic review by Molani-Gol et al. (2023) also shows why dietary diversity and nutritional adequacy cannot be treated as equivalent constructs: dietary diversity may be a useful proxy for micronutrient adequacy but this depends on population, dietary assessment method and nutrients considered; a behavioural questionnaire that does not directly measure food groups or nutrient intake is even less suited to establish nutritional adequacy independently of the diet.

Taken together these results show that complementary feeding behaviour varied widely among participating mothers. Their main relevance is that they identified variation which might be worthy of further investigation rather than showing that a certain proportion of infants received adequate or inadequate diets. Studies in the future should use standardised infant and young child feeding indicators, detailed dietary information and age-specific analyses to establish how reported practices compare with recommended standards.

4.2. Nutritional Status and the Coexistence of Undernutrition and Excess Weight

The anthropometric results showed that most infants (77.6%) had weight-for-length Z-scores within the normal range; 15.5% were classified as wasting or severe wasting and 6.9% were overweight or obese. Thus different nutritional conditions were present in the same primary health care population. Most of the infants were normal but low and excessive weight-for-length indicated that nutritional monitoring should cover more than one form of malnutrition.

The presence of undernutrition and excess weight is consistent with the general view that childhood malnutrition includes more than one nutritional state (UNICEF, WHO & World Bank Group 2025 Joint Child Malnutrition Estimates). Wasting and overweight are still major problems worldwide. These results should not be interpreted as population prevalence estimates because only 58 complete records were used from a single health-care setting; proportions instead describe nutritional classifications in this analytical sample.

An important point is the meaning of the anthropometric indicator used. WLZ measures body weight relative to recumbent length and can be used to detect wasting and excessive weight-for-length in infants but does not describe linearly faltering growth, micronutrient deficiency or adequacy of diet intake independently; an infant with normal WLZ may still have nutritional deficiencies or impaired linear growth whereas abnormal WLZ could represent several interacting biological and environmental factors so nutritional status should not be interpreted from one anthropometric measurement alone.

Indonesian evidence also demonstrates the multidimensionality of early childhood malnutrition. Jokhu and Syauqy (2024) looked at concurrent wasting and stunting among 6–23-month-olds and found associations with early life characteristics and health service use; these results are relevant because they show that nutritional vulnerability cannot be fully explained by current feeding practices alone but instead by two dimensions: wasting and stunting. However, their result was different from ours. Concurrent wasting and stunting are a two-dimensional construct whereas infants were classified in our study only using WLZ. Direct comparisons of prevalence or risk factors would thus not be appropriate.

Having wasting and excessive weight-for-length also complicates analysis. These can be grouped as departures from the normal WLZ range but they cannot be treated as biologically equivalent: wasting may reflect inadequate intake, illness or other causes of acute nutritional deficits; excessive weight-for-length could involve different dietary patterns, growth trajectories or circumstances underlying it all. Putting them together into one category might be useful for describing the overall frequency of non-normal classifications but not so much in identifying condition specific relationships.

This limitation applies specifically to the present sample because only 13 infants were classified outside normal WLZ range. Breaking these observations into several nutritional categories would yield very small groups and unstable comparisons. So, using

a binary outcome for exploratory association testing was statistically defensible but necessarily clinical specificity limited. The descriptive findings should therefore be taken alongside the original five-category nutritional distribution.

Second, secondary anthropometric records complicate matters. When WLZ was recalculated using WHO reference parameters consistency in classification improved and discrepancies in the original records became evident but recalculation cannot tell us whether body weight and recumbent length were measured correctly at health-care facility. Small errors in measurement of length can influence WLZ (especially infants near thresholds). So, findings should be taken as classifications based on recorded measurements not independently verified anthropometric assessments.

In summary, the nutritional-status findings highlight how important it is to keep malnutrition forms separate and show how useful it is to present WLZ categories before doing simplified association analyses. Larger samples with repeated measurements could look at wasting and excessive weight-for-length separately in which more clinically informative evidence about their relationship with infant feeding practices.

4.3. Association between Complementary Feeding Practices and Nutritional Status

The main analysis did not show an association between complementary feeding practice categories and nutritional status in which Fisher–Freeman–Halton exact test $p = .088$. The additional comparison between poor and combined good/very good feeding categories also failed to reach significance in which Fisher exact test $p = .106$. This means that under the analytical procedure used there was insufficient evidence to conclude that there is an association between complementary feeding practices and nutritional status. But a non-significant result does not mean that complementary feeding practices and nutritional status are unrelated; small sample size and few infants outside normal WLZ range limit precision of findings.

What was most striking was the descriptive distribution of nutritional status across feeding categories. The percentage of infants with non-normal WLZ increased from 9.5% in poor to 22.7% in good and 40.0% in very good as seen Table 2. At first sight, this does not fit the expectation that better feeding practices should lead to better nutrition. However, interpretation is difficult because questionnaire categories do not directly represent nutrient intake, and non-normal outcome combines undernutrition and excessive weight-for-length.

One reason is that reported feeding behaviours are not necessarily indicative of actual dietary adequacy. Mothers may report frequently performing recommended feeding activities but not provide enough food, enough diversity or enough nutrient density. Molani Gol et al (2022) found relationships between dietary diversity and growth outcomes varied across studies and anthropometric indicators. This indicates even standardized measures of dietary intake do not always show consistent associations with anthropometric outcomes. The relationship may be harder to interpret if feeding practices are represented by an unvalidated composite score.

Another point is the temporal sequence between feeding practices and nutritional status. Anthropometric measurements are influenced by things that may have accumulated before the questionnaire was given: illness, feeding difficulties, early growth patterns etc could influence WLZ independently of recently reported feeding practices whereas mothers whose infants had problems with growth may have been counselled or changed their feeding routines before joining the study so higher feeding-practice scores could coexist with abnormal nutrition status without implying that the reported practices caused it. These explanations remain hypothetical because cross-sectional data do not establish order of events.

The combined nutritional-status outcome may also have affected the distribution. Wasting and excessive weight-for-length are likely to be related differently to dietary intake and feeding behaviour so if different mechanisms operate across these conditions grouping them together can hide associations that would otherwise be apparent in separate analyses. But there were too few cases per abnormal WLZ category to perform meaningful condition specific statistical testing.

The findings should also be seen in the context of Indonesian research that child nutritional outcomes are multi-dimensional. Jokhu and Syauqy (2024) showed how early life and health service factors were relevant when considering concurrent wasting and stunting; although their anthropometric outcome was different from the present study it supports a broader interpretation in which nutritional status is not determined by current feeding practices alone.

In sum, the present analysis found an unexpected descriptive pattern but could not establish a statistically significant relationship so its contribution is exploratory. Larger longitudinal studies using validated feeding indicators, separate anthropometric outcomes and repeated measurements are needed to see if the distribution reflects measurement characteristics (e.g., variation in timing), infant health histories or other contextual factors.

4.4 Measurement and Instrument Considerations

The interpretation of complementary feeding practices in the present study needs special consideration regarding measurement instrument. There were 23 items on the questionnaire (four point response scale) and total scores were grouped into four categories defined by the researcher from very poor to very good. This allowed descriptive comparison but the categories should not be interpreted as clinical or nutritional classes. They depend on the content coherence and validity of questionnaire items.

The instrument had an overall Cronbach's alpha of .855 which indicates relatively high internal consistency at the aggregate level but corrected item–total correlations for P1–P3 were negative so responses to those items did not sum positively to the rest of the questionnaire score (this leads one to question whether all 23 items measure a single underlying construct). Having a good overall alpha coefficient does not mean that individual item performance need not be considered — after all, this is an instrument used to create categories which are then used in statistical comparisons.

The research team confirmed that all questionnaire items were positively worded and no reverse scoring was done. But positive wording is not conceptual appropriateness — an item may describe a good feeding activity but measure a dimension different from other questionnaire items or it could be interpreted differently depending on the infant's age, food offered or context in which behaviour occurs etc. Without content review and dimensionality assessment it would be premature to conclude that higher total scores mean better nutritional practice for all items.

The distinction between behavioural frequency and dietary adequacy is also important. The WHO and UNICEF (2021) framework for infant and young child feeding contains indicators such as minimum dietary diversity, minimum meal frequency and minimum acceptable diet but these are defined based on specific information about foods and feeding patterns not a general total score. Therefore the current questionnaire cannot be used interchangeably with standardised infant and young child feeding measures.

More recent work highlights this point. Molani-Gol et al. (2023) systematically reviewed the relationship between dietary diversity scores and micronutrient adequacy in young children — even dietary diversity measures need to be interpreted carefully when used as proxies for nutritional adequacy. A questionnaire which asks about reported feeding behaviour might capture other aspects of caregiving but cannot tell us whether nutrient requirements have been met or not.

The four score categories are another methodological point. Equal interval classification is a transparent way to group questionnaire scores but the boundaries between categories are defined mathematically not empirically (an infant whose caregiver scores immediately above a category threshold may not be meaningfully different from one whose caregiver scores immediately below it). Categorization reduces information and can exaggerate differences between participants who have similar underlying scores.

Future research should focus on instrument development and validation. Expert review of item relevance; cognitive testing with caregivers; item distribution analysis; exploratory or confirmatory factor analysis where sample size allows; evaluation against standardised dietary indicators. Age-specific content should also be considered since appropriate complementary feeding practices change rapidly during the first year of life.

For the present study, the most defensible interpretation is that the questionnaire measured frequency of selected self-reported feeding behaviours. The score categories remain useful for describing this sample but their nutritional meaning is not well established to make stronger conclusions about feeding quality. Recognizing these limitations makes the analysis more transparent and prevents overinterpretation of the relationship with WLZ.

4.5. Implications for Primary Health-Care Services

The findings have implications for the interpretation of complementary feeding assessments within primary health-care services. Although the present study did not establish a statistically significant association between questionnaire-derived feeding categories and nutritional status, it identified variation in reported feeding behaviors and documented both undernutrition and excessive weight-for-length among participating infants. These observations suggest that feeding assessments and anthropometric monitoring provide different types of information and should be considered together rather than used interchangeably.

Primary health-care facilities occupy an important position in supporting infant nutrition because they provide opportunities for routine growth monitoring, caregiver education, and early identification of nutritional concerns. In the Indonesian context, community-based health services may also facilitate communication between health workers and families regarding age-appropriate feeding. However, a favourable questionnaire score should not be interpreted as sufficient evidence that an infant's nutritional needs are being met. Similarly, an abnormal anthropometric classification should not automatically be attributed to inappropriate complementary feeding without considering other relevant clinical and contextual information.

The WHO (2023) complementary feeding guideline provides a framework for counselling that extends beyond the frequency of feeding behaviours. Recommendations emphasize nutrient-rich foods, dietary diversity, appropriate feeding practices, and

responsive caregiving. In practical terms, health workers may need to assess not only how frequently infants are fed but also what foods are provided, how meals are prepared, and whether feeding practices are appropriate for the child's developmental stage. These dimensions are particularly important during the transition from six to twelve months, when food textures, meal patterns, and dietary variety change rapidly.

Evidence from intervention research supports the potential value of structured nutritional education. Mardani et al. (2024) conducted a randomized controlled trial in an Indonesian community health-care setting and reported improvements in maternal knowledge, self-efficacy, complementary feeding practices, and selected child anthropometric indicators following a nutritional education programme. Their findings suggest that appropriately designed education can contribute to improvements in feeding-related outcomes. Nevertheless, the present study was observational and did not evaluate counselling effectiveness. Therefore, recommendations for strengthening education should be understood as evidence-informed implications rather than effects demonstrated by the current dataset.

The observed coexistence of wasting and excessive weight-for-length also indicates the importance of individualized nutritional assessment. These conditions differ in their clinical meaning and may require different forms of evaluation. Infants with low WLZ may need assessment of feeding adequacy, recent illness, and growth history, while those with excessive weight-for-length may require examination of growth patterns and feeding practices appropriate to their age. The present study cannot identify the causes of either condition, and its findings should not be used to prescribe a uniform intervention for all infants outside the normal WLZ range.

Another implication concerns the use of questionnaire scores in routine services. Short behavioural questionnaires may help initiate discussions with caregivers, but their usefulness depends on item clarity and demonstrated validity. The negative item–total correlations observed in this study indicate that the current instrument requires further evaluation before being recommended as a standardized screening tool. Health workers should therefore avoid using its score categories as substitutes for established dietary indicators or clinical assessment.

Finally, primary health-care services may benefit from consistent anthropometric recording and periodic review of classification procedures. The discrepancies identified during WLZ recalculation demonstrate the value of checking recorded measurements against recognized reference standards. However, improving classification procedures must be accompanied by attention to the quality of the underlying measurements.

Overall, the study supports an integrated approach in which caregiver-reported feeding behaviors, dietary information, anthropometric monitoring, and relevant health circumstances are interpreted together. Such an approach may provide a more informative basis for nutritional counseling than reliance on any single indicator.

4.6. Strengths and Limitations

The present study has several methodological strengths that enhance the transparency of its findings. First, complementary feeding questionnaire responses were linked to anthropometric records for the same 58 mother–infant pairs so feeding information could be analysed alongside an anthropometric indicator rather than just caregiver perceptions about infant nutritional status; matched records also reduced ambiguity over which feeding responses corresponded to individual nutritional classifications.

Second, nutritional status was assessed through recalculated weight-for-length Z-scores using sex-specific WHO reference parameters. This allowed for a consistent basis from which to classify wasting, normal weight-for-length, overweight and obesity. Comparison of the recalculated categories with original health-care records also revealed classification discrepancies that otherwise would not have been recognized. Improvement was about consistency of classification rather than independent measurement accuracy verification.

Third, the study used exact statistical methods to test associations in a small sample. Fisher–Freeman–Halton test was appropriate for exploratory contingency-table analysis because some frequencies were small. Reporting both main three-category analysis and supplementary binary comparison made the statistical approach more transparent; non-significant results were interpreted without claiming that association was absent.

Yet these strengths are limited by several weaknesses. The cross-sectional design is the main weakness because feeding practices and nutritional status were assessed within the same observational framework so we cannot tell if reported feeding behaviour preceded observed nutritional classes or whether caregivers changed their practices in response to past growth concerns or nutritional counselling.

The sample size is another important limitation. Only 58 mother–infant pairs had complete questionnaire and anthropometric data; 13 infants were classified outside normal WLZ range. These numbers reduce statistical precision and make subgroup analyses

unstable. The lack of observations in the very poor feeding category further limited the range of comparisons. Finally, the sample consisted of complete records from one primary health-care setting so findings cannot be generalized to other populations.

Measurement limitations need to be mentioned as well. Feeding practices were self-reported and recall problems, interpretation of questionnaire items or socially desirable responses could have occurred. Cronbach's alpha overall was .855 but negative corrected item–total correlations for several items raised questions about dimensional coherence. The researcher-defined score intervals were not externally validated so they should not be interpreted as standardized measures of dietary adequacy.

The anthropometric information was from secondary health-care records. WLZ was recalculated but the original weight and length measurements could not be repeated or independently checked. Errors in recorded measurements may have affected nutritional classifications (especially infants near category thresholds).

Another limitation is that the binary outcome used in association testing was combined. Wasting, severe wasting, overweight and obesity were all lumped into one outside-normal category; this made analysis simpler but grouped conditions with potentially different determinants. This was necessary for exploratory comparison with sparse data but reduced clinical specificity of results.

Finally, several potentially relevant variables (recent illness, birth characteristics, detailed dietary intake, household circumstances and previous growth trajectories) were not included in an adjusted analysis. Therefore, the study could not test whether these factors influenced the observed distribution.

These limitations suggest that the findings should be treated as preliminary context-specific evidence. Future studies should use larger samples, validated feeding measures, repeated anthropometric assessments and designs able to examine temporal relationships.

The study, therefore, highlights the importance of distinguishing reported feeding behaviors from objectively assessed nutritional outcomes. Its principal contribution lies in providing context-specific descriptive evidence while demonstrating the interpretive limitations of composite feeding scores and combined anthropometric categories. Larger prospective studies incorporating validated feeding indicators, repeated anthropometric measurements, and relevant maternal, household, and child health characteristics are needed to clarify these relationships.

5. CONCLUSION

This study looked at complementary feeding practices and nutritional status of infants aged 6–12 months attending Puskesmas Maradekaya, an Indonesian primary health-care facility. Caregiver-reported complementary feeding practices were very variable in which most respondents fell in good or very good category. Although most infants had normal WLZ scores, wasting, severe wasting, overweight and obesity were also found. These results show coexistence of different nutritional conditions within the study population and indicate the need for a comprehensive nutritional assessment during infancy.

The statistical analysis did not find a significant relationship between complementary feeding practice categories and nutritional status ($p=.088$), but the descriptive results showed an unexpected pattern: non-normal WLZ increased with higher feeding-practice category. This should not be taken as evidence that better feeding practices lead to worse nutrition, but rather that relationships between caregiver-reported feeding behaviours and anthropometric indicators are complex. The cross sectional design, small sample size and combination of clinically distinct nutritional conditions further limit interpretation of this pattern.

An important contribution of this study is that we need to distinguish between questionnaire feeding scores and dietary adequacy. The questionnaire asked about reported feeding behaviours but its composite categories were researcher defined and did not directly reflect standardized nutritional indicators. Therefore, favourable questionnaire scores should not be taken as evidence for adequate nutrient intake or optimum nutritional status.

From a practical perspective the results suggest that complementary feeding assessments should be integrated with routine anthropometry in primary health-care services. Nutritional counselling needs to take dietary diversity, age-appropriate feeding, individual growth pattern and relevant infant health circumstances into account rather than solely composite feeding scores.

Future studies should use larger and more representative samples, validated complementary feeding instruments, longitudinal designs and repeated anthropometric measurements. Separate examination of undernutrition and excessive weight-for-length would also be clinically informative evidence. Such research could help improve understanding of the relationship between complementary feeding practices and infant nutritional outcomes and inform context sensitive assessment and counselling strategies in Indonesian primary health-care settings.

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