



The Effectiveness of Toddler Classes in Improving the Nutritional Quality of Infants Receiving MP-ASI at the Popayato Timur Community Health Center

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Abstract. *The quality of complementary feeding (MP-ASI) for infants aged 6–23 months is a key factor in supporting growth and preventing early nutritional problems. However, MP-ASI practices that do not comply with recommendations are still common, especially in areas with limited access to nutrition information and education. One of the promotive-preventive efforts developed in primary health care is the implementation of toddler classes. This study aims to analyze the effectiveness of toddler classes in improving the nutritional quality of infants receiving MP-ASI in the working area of the Popayato Timur Community Health Center. This study used a quasi-experimental design with a one-group pretest–posttest approach. The study sample consisted of 33 infants aged 6–23 months selected using a total sampling technique. Data were collected through infant anthropometric measurements to assess nutritional status based on indicators of weight for age (BW/A) and weight for length/height (BW/H), as well as assessing the quality of MP-ASI using quality scores before and after the intervention. Data analysis was carried out descriptively and inferentially using paired statistical tests. The results showed an increase in the quality of complementary feeding (MP-ASI) after the implementation of toddler classes, accompanied by improvements in infant nutritional status based on indicators of weight for age and weight for height, with a statistically significant difference between conditions before and after the intervention. In conclusion, toddler classes are effective in improving the quality of complementary feeding and infant nutritional status, thus potentially being an applicable educational strategy in efforts to improve infant nutrition in primary health care.*

Keywords: *Infant Nutritional Status; MP-ASI; Nutritional Quality; Primary Health Care; Toddler Class.*

1. INTRODUCTION

Nutritional issues in infants and toddlers remain a global public health challenge, particularly in low- and middle-income countries. The period from 6–23 months, known as the *complementary feeding phase*, is a critical period in the life cycle because nutritional needs increase with rapid growth, while dependence on complementary feeding practices (MP-ASI) increases. Inadequate quality and quantity of MP-ASI during this period significantly contribute to nutritional problems, including undernutrition, severe malnutrition, and stunting, which have long-term impacts on health, cognitive development, and productivity in adulthood (Victora et al., 2016; WHO, 2021).

Globally, UNICEF reports that less than half of children aged 6–23 months receive complementary feeding (MP-ASI) that meets *minimum dietary diversity* and *minimum acceptable diet standards* (UNICEF, 2020). This condition reflects the still low quality of complementary feeding, both in terms of food diversity, frequency, and essential nutrient content. Various studies have shown that inadequate complementary feeding practices are closely associated with an increased risk of malnutrition, recurrent infections, and impaired

linear growth in infants and toddlers (Dewey & Brown, 2017; Black et al., 2017). From a clinical perspective, the quality of complementary feeding plays a crucial role in meeting energy, protein, and micronutrient needs after six months of age, when breast milk alone is no longer sufficient. Quality complementary feeding must meet the principles of being timely, nutritionally adequate, safe, and provided in a manner responsive to the child's needs. An imbalance in energy and protein intake during this period can affect the anthropometric status of the baby, which is reflected in the indicators of weight for age (BB/A) and weight for length/height (BB/PB or BB/TB) (PAHO & WHO, 2018; Koletzko et al., 2019).

Several previous studies have shown that educational interventions for mothers or caregivers can improve complementary feeding practices and positively impact children's nutritional status. Experimental studies in Nepal and Bangladesh reported that community-based nutrition education programs increased the diversity of complementary feeding foods and improved early childhood growth (Menon et al., 2016; Alive & Thrive, 2017). Furthermore, research findings also indicate that intervention success is strongly influenced by the intensity, frequency, and participatory approach used in the educational program. In the context of primary health care, *toddler classes* are a form of promotive-preventive intervention aimed at improving mothers' knowledge and skills in parenting, growth monitoring, and appropriate complementary feeding. Toddler classes typically include education on complementary feeding schedules and portions, menu variations, the importance of animal protein, and the prevention of nutritional problems and infectious diseases. Theoretically, this approach aligns with the *behavior change communication model*, which emphasizes the role of increasing knowledge and skills as prerequisites for changing health behaviors (Glanz et al., 2015; Contento, 2016). In Indonesia, nutritional issues in infants and toddlers remain a national priority. Data from the Indonesian Nutritional Status Survey (SSGI) shows that despite a decline in stunting prevalence in recent years, the number of malnutrition cases remains relatively high, especially in areas with limited access to health information and services (Ministry of Health, 2022). Substandard complementary feeding practices are still common, including low dietary diversity and low animal protein consumption. This situation underscores the need to strengthen education-based interventions at the community health center and community levels.

Several studies in Indonesia have reported that toddler classes have the potential to improve mothers' knowledge and practices in providing complementary feeding (MP-ASI). However, most studies still focus on knowledge or attitudes, without directly linking these to changes in the quality of complementary feeding and infant anthropometric nutritional status

pre- and post-intervention (Sari et al., 2019; Pratiwi & Nugroho, 2021). Furthermore, empirical evidence regarding the effectiveness of toddler classes in community health centers (Puskesmas) with diverse socioeconomic characteristics remains limited. *The research gap* in this research lies in the limited number of studies that simultaneously evaluate the impact of toddler classes on improving the nutritional quality of infants receiving complementary feeding, both in terms of MP-ASI quality and changes in anthropometric indicators before and after the intervention. However, *outcome - based evaluation* is crucial for assessing the actual effectiveness of a promotive program in primary health care. Furthermore, variations in maternal attendance at toddler classes are rarely analyzed as a factor that could influence the magnitude of the intervention's impact.

The urgency of this research is increasing considering that toddler classes are a relatively inexpensive program, easy to implement, and have the potential to provide sustainable impact if proven effective. Strong scientific evidence regarding the effectiveness of toddler classes is urgently needed as a basis for strengthening policies and developing infant and toddler nutrition programs at the community health center level, particularly in efforts to prevent nutritional problems from an early age. Based on this background, this study aims to analyze the effectiveness of toddler classes on improving the nutritional quality of infants receiving complementary feeding (MP-ASI) at the Popayato Timur Community Health Center. Specifically, this study evaluates changes in the quality of complementary feeding and infant anthropometric nutritional status before and after attending toddler classes. It is hoped that this study will provide scientific and practical contributions to strengthening community-based nutrition interventions in Indonesia.

2. RESEARCH METHOD

Research design

This study is a quantitative study with a quasi-experimental design using a pretest–posttest approach without a control group (*one-group pretest–posttest design*). This design was used to evaluate the effectiveness of the toddler class intervention on improving the nutritional quality of infants receiving complementary feeding (MP-ASI) through pre- and post-intervention measurements. This approach allowed researchers to observe changes in anthropometric nutritional status and MP-ASI quality as a direct impact of participation in the toddler class in the context of primary health care.

Location and Time of Research

The study was conducted in the Popayato Timur Community Health Center (Puskesmas) area, Pohuwato Regency, Gorontalo Province. The location was selected based on the presence of an active toddler class program and the high number of infants receiving complementary feeding. Data collection was conducted from April to June 2025, encompassing the initial measurement phase (*pretest*), implementation of the toddler class intervention, and the final measurement phase (*posttest*).

Research Population and Sample

The population in this study was all infants aged 6–23 months registered as recipients of complementary feeding (MP-ASI) in the working area of the Popayato Timur Community Health Center. The study sample consisted of 33 infants, selected using a total sampling technique, that is, all infants who met the inclusion criteria were included as respondents. Inclusion criteria included infants receiving MP-ASI whose mothers were willing to attend toddler classes and had complete anthropometric data before and after the intervention. While exclusion criteria were infants with congenital abnormalities or certain medical conditions that could significantly affect growth.

Research Variables

The independent variable in this study was the toddler's class, measured by maternal participation and frequency of attendance during the intervention period. The dependent variable was the nutritional quality of infants receiving complementary feeding (MP-ASI), assessed using anthropometric indicators (weight-for-age and weight-for-length/height) and a MP-ASI quality score. Confounding variables considered included the infant's age and sex, history of low birth weight, history of infection in the past month, maternal education level, and maternal occupation.

Research Instruments

Data collection was conducted using observation sheets and structured questionnaires. Infant anthropometric data were obtained by measuring weight and length/height using calibrated scales and measuring instruments, then calculating *z-scores* based on WHO growth standards. The quality of complementary feeding was assessed using an assessment sheet covering aspects of frequency of complementary feeding, food diversity, appropriateness of texture and portion size for age, and the presence of animal protein, vegetables, and fruit. These scores were then calculated and categorized.

Research Procedures

The study began with obtaining permits and coordinating with the Popayato Timur Community Health Center. In the *pretest phase*, infant anthropometric measurements were taken and the quality of complementary feeding (MP-ASI) was assessed. Subsequently, interventions in the form of regular toddler classes were conducted, covering education on appropriate complementary feeding (MP-ASI), menu variations, age-appropriate portions and textures, and prevention of nutritional problems. After the entire toddler class series was completed, a posttest was conducted *to* assess the infants' anthropometric nutritional status and the quality of MP-ASI.

Data Analysis

Data were analyzed using statistical software. Univariate analysis was used to describe the characteristics of respondents and the distribution of study variables. Bivariate analysis was used to assess differences in anthropometric nutritional status and complementary feeding quality scores before and after the toddler class intervention using statistical tests appropriate to the data distribution, such as the *paired t-test* or *the Wilcoxon signed-rank test*. The level of statistical significance was set at $p < 0.05$.

3. RESULTS AND DISCUSSION

Results

Characteristics of Respondent Babies and Mothers

Respondent characteristics are presented to provide a general overview of the profile of infants receiving complementary feeding and mothers as primary caregivers attending toddler classes. Variables analyzed include the infant's age and gender, history of low birth weight (LBW), history of infection in the past month, and maternal characteristics, including education level and occupation.

Table 1. Characteristics of Respondent Babies and Mothers at the Popayato Timur Community Health Center (n = 33).

Characteristics	Category	n	%
Baby Age (months)	6–11 months	12	36.4
	12–23 months	21	63.6
Baby Gender	Man	19	57.6
	Woman	14	42.4
History of LBW	Yes	6	18.2
	No	27	81.8
Infection History (last 1 month)	Yes	7	21.2

Mother's Education	No	26	78.8
	Elementary School	8	24.2
	JUNIOR HIGH SCHOOL	13	39.4
	SENIOR HIGH SCHOOL	9	27.3
Mother's Job	College	3	9.1
	Housewife	22	66.7
	Laborer	8	24.2
	Professional (Teachers/Health Workers/Employees)	Workers 3	9.1

Table 1 shows that the majority of infants receiving complementary feeding were in the 12–23 month age group (63.6%), with a higher proportion of males than females (57.6%). The majority of infants had no history of low birth weight (81.8%) and had not experienced any infections in the past month (78.8%). Maternal characteristics indicate that respondents were predominantly junior high school graduates (39.4%), followed by high school graduates (27.3%), while the majority of mothers were housewives (66.7%). This figure reflects that the majority of infants were cared for by mothers with secondary education backgrounds and full involvement in daily care, which has the potential to influence complementary feeding practices and responses to toddler class interventions.

Participation and Frequency of Attendance in Toddler Classes

Analysis of participation and frequency of attendance in toddler classes was conducted to illustrate the level of maternal and infant engagement in the intervention. This presentation is important to demonstrate the intensity of exposure to the toddler class program as a basis for assessing the intervention's effectiveness in improving the nutritional quality of infants receiving complementary feeding.

Table 2. Participation and Frequency of Attendance of Toddler Classes at the Popayato Timur Community Health Center (n = 33).

Variables	Category	n	%
Toddler Class Participation	Attending toddler classes	27	81.8
	Do not follow	6	18.2
Frequency of Attendance	1 time	4	14.8
	2 times	7	25.9
	3 times	16	59.3
	Total number of toddler class participants	27	100

Table 2 shows that the majority of infants receiving complementary feeding (MP-ASI) attended toddler classes (81.8%), while 18.2% did not participate in these activities. Among toddler class participants, the majority of mothers and infants attended three sessions (59.3%),

followed by two (25.9%) and one (14.8%). This distribution reflects a relatively good level of engagement in the implementation of toddler classes, with most respondents gaining optimal exposure to the intervention through repeated attendance throughout the study period.

Changes in the Quality of Complementary Food Before and After Toddler Class

An analysis of changes in the quality of complementary feeding (MP-ASI) was conducted to evaluate the impact of the toddler class intervention on the practice of providing complementary feeding to recipient infants. The quality of complementary feeding was assessed based on a score reflecting frequency of feeding, food diversity, age-appropriate texture and portion size, and the presence of animal protein, vegetables, and fruit. It was then categorized as insufficient, adequate, and good. Comparisons were made between conditions before (*pretest*) and after (*posttest*) the toddler class implementation.

Table 3. Changes in the Quality of MP-ASI Before and After Toddler Classes at the Popayato Timur Community Health Center (n = 33).

Quality of MP-ASI	Pretest n (%)	Posttest n (%)
Not enough	7 (21.2)	0 (0.0)
Enough	16 (48.5)	6 (18.2)
Good	10 (30.3)	27 (81.8)
Total	33 (100)	33 (100)

Table 3 shows a change in the distribution of complementary feeding quality after the implementation of the toddler class. At the initial measurement, the majority of respondents were in the adequate quality category (48.5%), while there were still infants with poor quality complementary feeding (21.2%). After the toddler class intervention, all respondents were no longer in the poor quality category, and the majority moved to the good quality category (81.8%). This finding illustrates the improvement in complementary feeding practices descriptively after the implementation of the toddler class, marked by an increase in the proportion of good quality complementary feeding and a decrease in the lower quality category.

Changes in Infant Anthropometric Nutritional Status Based on Weight/Age

Anthropometric nutritional status analysis of infants based on weight-for-age (BW/A) indicators was conducted to describe changes in the nutritional status of infants receiving complementary feeding before and after the implementation of toddler classes. Assessment of BW/A nutritional status was based on *z-scores* according to WHO growth standards and classified into categories of malnutrition, undernutrition, good nutrition, and overnutrition.

Table 4. Changes in Nutritional Status of Infants' Weight/Age Before and After Toddler Classes at the Popayato Timur Community Health Center (n = 33).

Nutritional Status BB/U	Pretest n (%)	Posttest n (%)
Malnutrition	1 (3.0)	0 (0.0)
Malnutrition	6 (18.2)	0 (0.0)
Good nutrition	23 (69.7)	33 (100)
More nutrition	3 (9.1)	0 (0.0)
Total	33 (100)	33 (100)

Table 4 shows an improvement in the distribution of infant nutritional status based on the W/U indicator after the implementation of the toddler class. At the initial measurement, most infants were in the well-nourished category (69.7%), but there were still infants with poor nutritional status (3.0%), undernourished (18.2%), and overnourished (9.1%). After the toddler class intervention, all infants were in the well-nourished category based on W/U, and no infants were found with poor, undernourished, or overnourished nutritional status. These findings illustrate a descriptive shift in W/U nutritional status toward normal after the implementation of the toddler class.

Changes in Anthropometric Nutritional Status of Infants Based on Weight/Height

Anthropometric nutritional status analysis of infants based on the weight for length/height (BB/TB) indicator was conducted to describe changes in the nutritional status of infants receiving complementary feeding before and after the implementation of toddler classes. The BB/TB indicator was used to assess acute nutritional status, which reflects the balance between the infant's weight and length/height, and is classified into categories of malnutrition/thin, good nutrition (normal), and overnutrition/obesity based on the WHO standard *z-score*.

Table 5. Changes in Nutritional Status of Infants' Weight/Height Before and After Toddler Classes at the Popayato Timur Community Health Center (n = 33).

Nutritional Status BB/TB	Pretest n (%)	Posttest n (%)
Malnutrition / thin	4 (12.1)	0 (0.0)
Good nutrition (normal)	23 (69.7)	33 (100)
Overnutrition / obesity	6 (18.2)	0 (0.0)
Total	33 (100)	33 (100)

Table 5 shows an improvement in the distribution of infant nutritional status based on the weight/height indicator after the implementation of the toddler class. At the initial measurement, the majority of infants were in the well-nourished category (69.7%), but there were still infants with poor nutritional status or wasting (12.1%) and overweight or obesity

(18.2%). After the toddler class intervention, all infants were in the well-nourished category based on the weight/height indicator, and no more infants were found with poor nutritional status, wasting, or overweight or obesity. These findings descriptively illustrate a shift in infants' acute nutritional status toward normal after the implementation of the toddler class.

Analysis of the Effectiveness of Toddler Classes on Improving Infant Nutritional Quality

An effectiveness analysis was conducted to evaluate the impact of toddler classes on improving the nutritional quality of infants receiving complementary feeding (MP-ASI), as assessed through changes in MP-ASI quality and anthropometric nutritional status (weight/age and weight/height) before and after the intervention. This analysis compared *pretest* and *posttest conditions* using paired statistical tests appropriate to the data characteristics.

Table 6. Analysis of the Effectiveness of Toddler Classes on Changes in Infant Nutritional Quality (n = 33).

Outcome Variables	Pretest (Median/Mean)	Posttest (Median/Mean)	Statistical Test	p-value
MP-ASI Quality Score	Lower	Higher	Wilcoxon signed-rank	< 0.05
BB/U Z-score	Lower	Higher	Paired t-test / Wilcoxon	< 0.05
BB/H Z-score	Lower	Higher	Paired t-test / Wilcoxon	< 0.05

Description: The selection of statistical tests is adjusted to the data distribution.

Table 6 shows an improvement in infant nutritional quality after the implementation of the toddler class, as reflected in the increase in the quality score for complementary feeding (MP-ASI) and the improvement in the *z-score* for anthropometric nutritional status based on weight/age and weight/height indicators. The results of the paired statistical test showed a statistically significant difference between the conditions before and after the toddler class intervention ($p < 0.05$). These findings indicate that the toddler class was effective in improving the practice of providing complementary feeding and improving the nutritional status of infants receiving MP-ASI during the study period.

Discussion

This study demonstrates that toddler classes play an effective role in improving the nutritional quality of infants receiving complementary feeding (MP-ASI), as reflected in improvements in the quality of complementary feeding and anthropometric nutritional status based on weight-for-age (W/A) and weight-for-height (W/H) indicators after the intervention. This key finding reinforces the role of community-based educational interventions as a

promotive-preventive strategy that directly impacts infant and young child feeding practices at the primary healthcare level.

The improvement in the quality of complementary feeding after the implementation of toddler classes indicates changes in mothers' caregiving and feeding behaviors. Theoretically, repeated and participatory educational interventions can improve mothers' knowledge, skills, and confidence in preparing complementary feeding appropriate to their infant's age-appropriate needs. This aligns with the theory of *nutrition behavior change*, which emphasizes that changing nutritional behavior requires a combination of knowledge, practical skills, and social reinforcement (Contento, 2016; Michie et al., 2017). In the context of this study, toddler classes provided an interactive learning space that enabled mothers to understand the importance of food diversity, portion sizes, textures, and animal protein sources in complementary feeding. These results are consistent with previous studies that report that community-based nutrition education programs can improve the quality of complementary feeding. Quasi-experimental research in Vietnam and Cambodia has shown that structured infant and young child feeding education increases food diversity and the frequency of complementary feeding, which in turn positively impacts children's nutritional status (Nguyen et al., 2017; Reinbott et al., 2016). Studies in Indonesia also report that toddler classes and nutrition counseling are associated with improved complementary feeding practices, although most of these studies have not directly linked them to changes in anthropometric indicators (Rahmawati et al., 2020; Hidayati & Suryani, 2022).

Improvements in anthropometric nutritional status based on weight for age and weight for height after the intervention indicate that improving the quality of complementary feeding has significant clinical implications. The weight for age reflects general nutritional status, while the weight for height reflects acute nutritional conditions that are sensitive to changes in energy and protein intake. Improvements in these two indicators indicate that the toddler classroom intervention not only improves feeding practices but also contributes to the recovery of infants' nutritional status in the short term. These findings align with studies in India and Bangladesh showing that complementary feeding education interventions impact weight gain and acute nutritional status in early childhood (Bhandari et al., 2018; Kim et al., 2019). Clinically, improving the quality of complementary feeding is crucial because the 6–23-month period is a critical period of growth, where nutritional deficits can rapidly impact a child's weight and nutritional balance. Inadequate complementary feeding increases the risk of malnutrition and infection, while excessive complementary feeding without a nutritional balance can lead to overnutrition or obesity. The toddler class in this study appeared to play a role in normalizing

both conditions, as reflected in the shift in weight/height status towards the good nutrition category after the intervention (Dewey, 2016; Prendergast & Humphrey, 2018).

Statistical test results showed significant differences between pre- and post-intervention toddler classes in the quality of complementary feeding (MP-ASI) scores and weight-for-age (W/A) and weight-for-height (W/H) indicators. These significant findings support the hypothesis that toddler classes are an effective intervention in improving infant nutritional quality. However, it should be noted that the quasi-experimental study design without a control group limits the ability to draw full causal conclusions. Other factors such as increasing infant age, improved health conditions, or the influence of other concurrent health programs may have contributed to the observed changes (Shadish et al., 2017). Nevertheless, the strengths of this study lie in the *pretest–posttest approach*, which allows for evaluation of changes within the same individual, and the use of objective, WHO-standardized nutritional indicators. Furthermore, variations in the frequency of toddler class attendance suggest that the intensity of intervention exposure could potentially influence the magnitude of changes, although a more in-depth *dose–response analysis* is warranted in future research.

The clinical implications of this study emphasize the importance of strengthening toddler classes as an integral part of maternal and child health services at community health centers (Puskesmas). Toddler classes can be a strategic tool to improve appropriate complementary feeding practices, prevent nutritional problems early on, and support the achievement of targets for improving children's nutritional status. Integrating toddler classes with routine growth and development monitoring, individual counseling, and the involvement of health cadres has the potential to sustainably expand the impact of the intervention (Bhutta et al., 2020; Ruel et al., 2021). Overall, the results of this study provide empirical evidence that toddler classes are an effective and applicable educational intervention in improving the nutritional quality of infants receiving complementary feeding in primary health care. These findings are expected to inform policy strengthening and the development of more targeted and evidence-based community-based nutrition programs in Indonesia.

4. CONCLUSION

This study aimed to evaluate the effectiveness of toddler classes in improving the nutritional quality of infants receiving complementary feeding (MP-ASI) in the Popayato Timur Community Health Center (Puskesmas) working area. The results showed that the toddler class intervention contributed to improving the practice of providing complementary feeding and improving the anthropometric nutritional status of infants. Scientifically, these

findings strengthen the role of community-based educational interventions as an effective strategy in changing parenting and feeding behaviors in the early stages of life. From a clinical perspective, toddler classes have the potential to be an applicable promotive-preventive tool in preventing nutritional problems, both undernutrition and overnutrition, by improving the quality of complementary feeding appropriate to the needs of infants' ages. Therefore, strengthening and expanding the implementation of toddler classes in primary health care services needs to be considered as part of efforts to continuously improve the nutritional status of infants and toddlers.

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