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The Effect of Complementary Feeding (MP-ASI) on Malnutrition Among Children Aged 6–24 Months

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ABSTRACT:

The incidence of undernutrition in children aged 6-24 months in the Service Area of Katobengke Community Health Center, Baubau City, has increased. This is concurrent with reliance solely on breastfeeding without complementary feeding (MP-ASI), necessitating research to determine the effect of MP-ASI provision on undernutrition status in children aged 6-24 months in that area. This study employed a quantitative method with a Pre-Experimental design, using a one-group pretest-posttest Design approach. The study involved all children identified as having an undernutrition status, totaling 27 children aged 6-24 months, using a Total Sampling Approach. Data analysis used the t-test to examine differences before and after the intervention and measured the effect using the N-Gain Score. The results of this study indicate that MP-ASI provision has an effect on the undernutrition status of children aged 6-24 months, with an N-Gain score of 0.1, categorized as low. There is an effect of MP-ASI provision on undernutrition status in children aged 6-24 months in the Working Area of Katobengke Community Health Center. It is recommended that parents, especially mothers with children aged 6-24 months, provide appropriate and correct MP-ASI according to the required nutritional content.

1. Introduction

Nutrition is a crucial factor that can significantly influence human growth and development, particularly during the early stages of life. During the first 1,000 days of Life, from pregnancy until the child is 2 years old, nutrition is crucial. Adequate nutrient intake supports rapid physical growth and brain development *(United Nations Children's Fund*, 2022).

The primary essential nutrition for infants initially is Exclusive Breast Milk (ASI) for the first 6 months. After the infant reaches 6 months of age, nutritional requirements increase along with the infant's growth and development. Meanwhile, the nutrient content in breast milk gradually

decreases, so the infant requires additional food as complementary feeding or MP-ASI (Savarino *et al*., 2021).

Proper implementation of MP-ASI will support optimal child development. As a guideline for MP-ASI provision, the World Health Organization (WHO) establishes four principles: timely, adequate, safe, and hygienic, as well as responsive complementary feeding. Therefore, the mother's role in the family is crucial in providing MP-ASI; appropriate maternal handling during MP-ASI provision can result in a healthy infant in terms of growth and development (Dedo, Sheptriani P.I., 2019).

The World Health Organization (WHO) recommends introducing complementary foods for infants between 6 and 24 months, while continuing to breastfeed for at least 2 years. According to the 4th and 5th Millennium Development Goals, this standard is recommended as it has been proven to reduce child mortality and improve maternal quality of life. This can reduce the risk of death in infants who are correctly breastfed and receive MP-ASI by 13% (Dedo, Sheptriani P.I., 2019).

Malnutrition remains an absolute global problem. It is estimated that up to 45% of deaths in children under 5 years of age are associated with malnutrition. In 2020, 149 million children under 5 worldwide suffered from stunting, 45 million were underweight, and 38.9 million were overweight. Proper nutrition is essential for avoiding nutritional problems in children (WHO, in Faustine & Gracella, 2022).

According to data from the 2018 Basic Health Research by the Indonesian Ministry of Health, there was an improvement in the nutritional status of toddlers in Indonesia. The national stunting incidence decreased from 37.2% (Riskesdas, 2013) to 30.8%. Similarly, the incidence of underweight decreased from 19.6% to 17.7%, and the incidence of wasting decreased from 12.1% to 10.2%. Although a decrease was observed, these results have not yet met the targets. The WHO aims to resolve nutritional problems if the incidence rate is less than 20%. In contrast, the government's program in the 2019 National Medium-Term Development Plan (RPJMN) aims to resolve severe and underweight malnutrition, with an incidence rate of 17%, and national stunting, at 14%.

According to Riskesdas 2018 for Southeast Sulawesi Province, the prevalence of underweight toddlers was 8.82%, stunting was 27.66%, and wasting was 5.34%. Generally, cases of severe malnutrition in Southeast Sulawesi Province have decreased over the last 5 years; if 250 cases were found in 2014, this number decreased to 204 cases in 2018. This general decrease in severe malnutrition cases is due to improved tracking and handling of severe malnutrition cases year by year, through enhanced capacity of personnel implementing Nutritional Status Monitoring (PSG), socialization, and support for the national nutrition awareness movement conducted annually both in health facilities (Community Health Centers, Polindes, and Posyandu) and educational institutions (Elementary/MI, Junior High, and Senior High Schools) (Southeast Sulawesi Provincial Health Office, 2019).

According to Utami, Haida Meytania et al. (2018), children under five years of age with poor nutritional status are influenced by direct and indirect factors. Direct factors influencing undernutrition in toddlers are food consumption and infectious diseases. Meanwhile, indirect factors influencing a toddler's nutritional status include parental knowledge, education, occupation, economic status, and parenting practices. For infants aged 6-12 months, MP-ASI is crucial for fulfilling nutritional needs; thus, after providing good nutrition during pregnancy and exclusive breastfeeding, mothers must also pay attention to the MP-ASI period. MP-ASI is the transition from exclusive breastfeeding to family foods. Aspects to consider during MP-ASI provision include frequency, texture, portion, and type of MP-ASI. Furthermore, MP-ASI must be appropriate in both quantity and quality, as it can impact nutritional status; at this age, physical growth and cognitive development are of critical importance.

Noor Prastia and Listyandini in Maharani Safira (2021) stated that providing non-diverse types of MP-ASI can increase the risk of malnutrition in children, which can lead to stunted growth and increased morbidity and mortality. Children with habits of consuming non-diverse foods have a three times higher risk of stunting. Therefore, UNICEF recommends that children aged 6 to 23 months consume at least four out of seven food groups to meet their nutritional needs, as well as to introduce a variety of tastes and textures.

Diverse foods include foods from various food groups, such as: (1) grains, roots, and tubers; (2) legumes and nuts; (3) dairy products; (4) flesh foods (meat, fish, poultry); (5) eggs; (6) vitamin-rich fruits and vegetables (UNICEF, 2020).

According to Dedo, Sheptriani P.I. (2019), inappropriate MP-ASI provision, both in terms of quantity and quality, will lead to growth problems and malnutrition. Therefore, to address nutritional problems, improvements in the quantity and quality of MP-ASI are necessary.

UNICEF in Maharani Safira (2021) explains the theory regarding principles of good feeding practices, including three aspects related to sustainable complementary feeding: the introduction of complementary foods, food types, feeding frequency, and appropriate nutrition. A very important principle of complementary feeding, especially for rehabilitating undernourished children, is providing food based on the concept of high energy density but in small portions (Indonesian Ministry of Health and WHO) to manage acute malnutrition (Weight/Height) and prevent chronic malnutrition (Height/Age); thus, MP-ASI biscuits are provided to wasted and severely wasted toddlers.

Katobengke Community Health Center is located in Baubau City, Southeast Sulawesi Province. Based on the obtained data, this health center has 12 Posyandu (Integrated Health Posts), 5 located in Katobengke Village and 7 in Lipu Village. The total number of toddlers is 754, with 392 (52%) being infants aged 6 to 24 months. In 2020, the number of toddlers experiencing undernutrition was 101; in 2021, it was 47; and in 2022, it was 27 children under two years old with an undernutrition status. Despite the Katobengke Community Health Center providing complementary feeding, and although independent provision has been carried out, children

under two years old with undernutrition status are still found. Observations of 10 children under two years old revealed that 3 (30%) required MP-ASI because their weight was not appropriate for their age.

Based on the above description, the researchers are interested in conducting an experimental study entitled "The Effect of Complementary Feeding (MP-ASI) on Undernutrition Status in Children Aged 6-24 Months in the Working Area of Katobengke Community Health Center, Baubau City, 2023."

The problem statement is: What is the nutritional status of children before and after MP-ASI provision, and does MP-ASI provision have an effect on improving children's nutritional status?

Based on the above problems, it is necessary to research to determine the Effect of Complementary Feeding (MP-ASI) on Undernutrition Status in Children Aged 6-24 Months in the Working Area of Katobengke Community Health Center, Baubau City, 2023. The specific objectives are: (a) To determine the nutritional status of children aged 6-24 months before MP-ASI provision, (b) To determine the nutritional status of children under two aged 6-24 months after MP-ASI provision, and (c) To determine the Effect of Complementary Feeding (MP-ASI) on Undernutrition Status in Children Aged 6-24 Months in the Working Area of Katobengke Community Health Center, Baubau City, 2023.

The results of this study are expected to be useful as additional information for the development of health science related to efforts to improve the nutritional health status of infants and children. These results are also expected to provide beneficial information for parents, particularly mothers, regarding the importance of giving appropriate MP-ASI for children aged 6-24 months.

2. Methodology

This research is a quantitative study using a Pre-Experimental design with a one-group pretest-posttest method (Notoatmodjo, 2018). The study included all 27 children aged 6-24 months, with each participating in the study (total sampling).

The categorization of the obtained N-gain values can be seen in the following table:

The experimental research sample:

Experimental Research Sample:

$$n = N$$

n = Total Smpling, N = Total Population

Descriptive (univariate) analysis was conducted to summarize the characteristics of each research variable. The effect was assessed by comparing children's nutritional status scores before (pretest) and after (posttest) the provision of MP-ASI. The calculation was performed using the following formula:

$$\text{N Gain} = \frac{Posttest\ Score - Pretest\ Score}{\text{Ideal Score} - Pretest\ Score}$$

Description:
a. Posttest Score = final test score
b. Pretest Score = initial test score
c. Ideal Score = maximum (highest) score that can be obtained

The table below shows the N-gain value categories:

Table 1. Gain Score Categorization

N-Gain Value	Categorization
g > 0,7	High
0,3 ≤ g ≤ 0,7	Normal
g < 0,3	low

Source: SPSS Indonesia (Malzer dalam Syahfitri, 2008 : 33)

$$Measuring\ Contribution$$
$$(R) = (r)^2 \times 100\ \%$$

3. Result and Discussion

Table 1 shows that out of 27 respondents, the largest age group was 13-24 months, with 18 children (66.7%), and the smallest was 6-12 months, with 9 children (33.3%).

Table 2 shows that the majority of children aged 6-24 months were male, totaling 14 children (51.9%), while the minority were female, totaling 13 children (48.1%).

Table 3 shows that out of 27 respondents, 15 children (55.6%) received MP-ASI that met the requirements, 10 children (37.0%) received MP-ASI that met the criteria to a sufficient extent, and 2 children (7.4%) received MP-ASI that did not meet the criteria.

Table 4 shows that out of 27 respondents, 18 children (66.7%) had an Underweight nutritional status, and 9 children (33.3%) had a Severely Underweight status.

Table 5 shows that out of 27 respondents, those with a Normal Weight nutritional status comprised 7 children (25.9%), those with an Underweight status comprised 12 children (44.4%), and those with a Severely Underweight status comprised 8 children (29.6%).

Table 6 shows that the average Pre-Test score for the nutritional status of children aged 6-24 months before the intervention was 7.4; this increased to an average of 7.6 in the Post-Test. Furthermore, the ideal score was 10.3, while the N-Gain value indicated an effect of MP-ASI provision on the nutritional status of children under two, with a value of 0.06, rounded to 0.1, categorized as low. Complete calculations are presented in *Appendix 1*.

Table 1.

Respondent Distribution by Child's Age, Katobengke Community Health Center, Baubau City, 2023

Age	F (n)	Percentage (%)
6-12 months	9	33,3
13-24 months	18	66,7
Total (n)	27	100,0

Source: Primary Data, 2023

Table 2.

Gender Distribution of Respondents, Katobengke Community Health Center, 2023

Children Sex	F (n)	Percentage (%)
Male	14	51,9
Female	13	48,1

Total (n)	27	100,0

Source: Primary Data, 2023

Table 3.

Distribution of Respondents by MP-ASI Provision in the Katobengke Community Health Center Area, Baubau City, 2023

MP-ASI Provision	F (n)	Percentage (%)
Meet reqruitments	15	55.6
Sufficiently Meets Requirements	10	37.0
Does Not Meet Requirements	2	7.4
Total (n)	27	100.0

Source: Primary Data, 2023

Table 4.

Pre-Test Nutritional Status Distribution of Respondents, Katobengke Community Health Center, Baubau City, 2023

Nutritional Status	F (n)	Percentage (%)
Underweight	18	66,7
Severely Underweight	9	33,3
Total (n)	27	100,0

Source: Primary Data, 2023

Table 5.

Post-Test Nutritional Status Distribution of Respondents, Katobengke Community Health Center, Baubau City, 2023

Nutritional Status	F (n)	Percentage (%)

Normal weight	7	25,9
Underweight	12	44,4
Severely Underweight	8	29,6
Total (n)	27	100,0

Source: Primary Data, 2023

Table 6.

Impact of MP-ASI Provision on Nutritional Status of Children Aged 6-24 Months, Katobengke Community Health Center, Baubau City, 2023

Ideal Score	Pre-Test	Post-Test	N Gain	N Gain Category
10.3	7.4	7.6	0.1	Low

Source: Primary Data, 2023

DISCUSSION

Based on the study's results, using descriptive analysis of respondent characteristics (univariate), it is evident that the majority of respondents (18 children) were aged 13-24 months, while 9 children were aged 6-12 months. Regarding gender, there were 14 male respondents and 13 female respondents. Meanwhile, for MP-ASI provision, out of 27 respondents, 15 children received MP-ASI that met the requirements. Those receiving MP-ASI that sufficiently met the criteria numbered 10 children; this was caused by children being picky eaters or only consuming preferred foods, as well as the mother's role in providing less varied food, where mothers gave the same food every day. Those receiving MP-ASI that did not meet the requirements numbered 2 children, caused by the children being sick, which affected their appetite due to a bitter taste in the mouth, body weakness, and discomfort from the illness.

The frequency distribution results of respondents' nutritional status before the MP-ASI intervention (Pre-Test) showed that out of 27 respondents, 18 children had an underweight dietary status, and 9 children were severely malnourished. The cause was that the food consumed by the children was not diverse or did not meet requirements due to several influencing factors, namely, children who were picky eaters, allergies to certain foods, and the persistence of Food Taboos or prohibitions against consuming certain foods considered threats or punishments for consumers, so mothers did not provide them. Subsequently, an intervention providing MP-ASI that met the requirements was conducted, including carbohydrates such as rice, potatoes, sweet potatoes, and corn; animal protein sources like meat, fish, eggs, and milk; plant protein sources like legumes, tempeh, and tofu; and vitamins obtained from various vegetables and fruits. After the MP-ASI intervention (Post-test), the nutritional status showed

that 7 children had a normal weight, 12 children were underweight, and 8 children were severely malnourished.

Based on the results of bivariate variable descriptive analysis conducted over 21 days, the average Pre-test nutritional status score for children under two was 7.4, while the Post-test average was 7.6, indicating an increase in nutritional status of 0.2 kg = (200 gr / 21 days = 9.5 grams/day). To reach the ideal body weight, approximately ± 2,700 grams were needed; thus, the time required (2,700: 9.5) x 1 day = 284 days to achieve the average ideal body weight of children under two, which is 10.3 kg.

The N-Gain test results indicated an improvement in nutritional status after the provision of Complementary Feeding (MP-ASI), with an average value of 0.06, rounded to 0.1, categorized as low, and a contribution value (R) of $(r)^2 \times 100\%$. (0.1)^2^ x 100% = 1%, meaning that each instance of MP-ASI provision can increase body weight by 1% of the total body weight requirement. Therefore, Ho is rejected, and it is concluded that there is an Effect of Complementary Feeding (MP-ASI) on Undernutrition Status in Children Aged 6-24 Months in the Working Area of Katobengke Community Health Center, Baubau City, 2023.

In this study, the most consumed MP-ASI by children aged 6-24 months were proteins, carbohydrates, and vitamins. In the article *Generasi Bersih dan Sehat* (GenBest, 2021), it is explained that: (1) Protein. Protein is divided into two types: animal protein (e.g., chicken, fish, eggs, milk) and plant protein (e.g., peanuts, red beans, mung beans, tempeh, tofu). In MP-ASI, it functions to form new cells that support the child's growth and brain development process. According to the Indonesian Ministry of Health's Recommended Dietary Allowances (RDA), every child must meet their daily protein needs. (2) Carbohydrates. Carbohydrates in MP-ASI not only serve as an energy source but also aid in the digestion and processing of protein and fat by the child. Carbohydrates themselves play a crucial role in supporting the child's growth and development process. (3) Micronutrients (Vitamins and minerals). Vitamins and minerals are essential for optimizing child growth and development, including brain and nerve development, as well as strengthening the immune system. Vitamins and minerals can be obtained from various nutritious foods, such as vegetables and fruits.

Appropriate and good Complementary Feeding (MP-ASI) is food that contains macronutrients and micronutrients capable of meeting the infant's nutritional needs. MP-ASI provision can be viewed from various aspects, one of which is the type of MP-ASI. MP-ASI given to infants must be rich in nutritional content, such as carbohydrates, protein, fat, as well as vitamins and minerals. The purpose of providing MP-ASI to infants is not merely to satisfy their hunger, but also to meet their nutritional needs for growth and development. Inappropriate MP-ASI provision can also cause disturbances in child development and growth (Nurhidayat, Muh., 2021). This aligns with Lawrence Green's theory, which states that if the ingredients for MP-ASI are available in adequate quantities, then providing MP-ASI to children can also be beneficial (Laily, Nur, 2021).

Lawrence Green's behavioral theory posits that a person's behavior is significantly influenced by predisposing factors (such as age, education, knowledge, occupation, and income), enabling factors (including health facilities and infrastructure), and reinforcing factors (support from health workers and family). Support from others or family significantly influences parental behavior, especially that of mothers, in implementing appropriate MP-ASI provisions for their children. The more optimal the support given, the better the child's nutritional status.

Based on the results obtained from the research conducted on children aged 6-24 months, it was found that there is an Effect of Complementary Feeding (MP-ASI) on Undernutrition Status in Children Aged 6-24 Months in the Working Area of Katobengke Community Health Center, Baubau City, 2023, with a low category. Thus, alternative solutions for improving the nutritional status of children aged 6-24 months include: for mothers with children, it is advisable to increase the consumption of foods containing protein, carbohydrates, and vitamins as required by the government. Health workers play a crucial role in motivating and providing additional information and understanding to the community about the importance of MP-ASI provision to reduce the incidence of undernutrition in children. These findings are consistent with Nur Fitriana, *et. al*., (2023), who used the N-Gain Score test and showed that there was an effect of *zoom* media and pocketbooks on the knowledge and attitudes of female students about balanced nutrition and body image at Attanwir Islamic Boarding School over one month, with the effectiveness of attitudes in the *zoom* group being 10% (less effective category) and in the pocketbook group 5% (less effective category).

Based on the research results of I Putu Sudayasa, *et. al.* (2019), MP-ASI with fish type given for 1 month showed that insufficient fish consumption quantity influenced undernutrition status (*OR=2.789, CI: 1.322-5.886*), and inadequate fish consumption frequency also influenced undernutrition status (*OR=2.545, CI: 1.147-5.651*) in toddlers. Thus, it can be concluded that there is an effect of the quantity and frequency of fish consumption on the nutritional status of toddlers in the working area of Wangi-Wangi Community Health Center, Wangi-Wangi District.

These research results align with those of Pujiati Setyaningsih et al. (2018), who investigated the effects of MP-ASI types of carbohydrates and egg protein. The study found an impact of carbohydrate provision (p-value = 0.0025) and egg protein provision (p-value = 0.0055). The results align with those of Tri Budi Rahayu et al. (2018), who found that providing moringa leaves for 7 days had a significant effect. (2-tailed) value of 0.000 < 0.05, so it can be concluded that there is an effect of moringa leaf provision on the nutritional status of toddlers based on Body Mass Index for Age (BMI/A).

4. Conclusion

Based on the research results and discussion above, it can be concluded that the Nutritional Status of children under two (aged 6-24 months) before MP-ASI provision, measured by weight-for-age, found an average value of 7.4 kg, with an interval of 5.8 kg - 9.3 kg. Then, the Nutritional Status of children under two (aged 6-24 months) after MP-ASI provision, measured by weight-

for-age, showed an average value of 7.6 kg, with an interval of 6.0 kg to 9.8 kg. This means there was an average weight gain increase of 0.2 kg during MP-ASI provision, indicating an effect of MP-ASI provision on undernutrition status in children under two (aged 6-24 months) in the Working Area of Katobengke Community Health Center, Baubau City, 2023, with a low category.

Based on the conclusion above, it is suggested that Parents, especially mothers with children aged 6-24 months, ensure the provision of appropriate and correct MP-ASI to their children according to the required nutritional content. Health workers are advised to use this as additional information to provide the community with a deeper understanding of the importance of MP-ASI provision for children in reducing the incidence of Undernutrition. For future researchers conducting similar studies, it is recommended to include other indicators that have not yet been explored and to investigate the Nutritional Status of children aged 6-24 months or under two years more thoroughly.

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