

Research Article

Supplementary Biscuits for the Recovery of Malnourished Children in Indonesia

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ABSTRACT

The objective of this research was to study the nutritional status of children before receiving biscuits, the biscuit supplementation regularity, the adequacy of the biscuits received and consumed by the children according to recommendations, and the relationship between supplementary biscuits consumption and nutritional status. Using a cross-sectional study design, the study was conducted in 2017 involving 586 children in three regions (11 provinces) in Indonesia. A chi-square test was performed to see the relationship between supplementary biscuits consumption and nutritional status. The most common nutritional problems were stunting-wasting (34.1%), stunting (32.6%), and wasting (23.9%). The nutritional problems occurred most often in the eastern region (96.4%), followed by the central region (95.5%) and the western (87.1%). Within three months, 66–78% of respondents received supplementary biscuits regularly, but only 10–29% received the supplementary biscuits as recommended in the same period. Within the three months' period, from respondents that received the supplementary biscuits as recommended, the region in which children consumed the biscuits according to the recommendations the most was the eastern region (45.2%), followed by the western (23.3%) and central regions (5.3%). Children who consumed biscuits as recommended in the three months' period had a 2.9 times possibility of having a normal nutritional status (categorized based on the weight-for-age index) (p-value=0.049).

INTRODUCTION

Children under five years old are the most vulnerable group of children to suffer from undernutrition, given that they require high levels of nutrients for growth. Malnutrition has serious, lasting impacts on individuals, their families, and the society, and it may cost countries medically, socially, and economically (World Health Organization (WHO) 2021).

The largest portions of malnourished under-fives in Asia suffer from stunting (54%) and wasting (69%) (UNICEF/WHO/World Bank 2020). In Indonesia, the stunted status in 2013 and 2018 was high (37.2% and 30.8%, respectively), and so was the wasted status (12.1% and 10.2%, respectively) (Ministry of Health Republic of Indonesia (MoH RI) 2013;

2019). Stunting has negative impacts related to low cognitive abilities, leading to low completed education levels and potentially to low income and welfare levels in the future (Schneider 2017). Meanwhile, the negative impacts of wasting are low body immunity, susceptibility to diseases, developmental delays, and the risk of death (UNICEF/WHO/World Bank 2020), thereby necessitating feeding, medication, and care for individuals to stay alive.

One of the efforts to reduce nutritional problems and to increase nutritional adequacy is providing biscuit supplementation for the recovery of malnourished children under five years (6–59 months). In addition to nutritional adequacy, the quality of nutritional sources needs to be considered (Randani *et al.* 2022). Therefore, the supplementary biscuits should be made with

a special formula containing energy, protein, and fat and enriched with vitamins and minerals (MoH RI 2017).

Some literature provides information about the effect of giving supplementary biscuits in changing, or improving, the nutritional statuses of children. Dina's study showed that there was an improvement and difference in the Weight-for-Age Index (WAZ) after biscuit supplementation but no significant difference in the Weight-for-Height Index (WHZ) (Rini *et al.* 2017). Another work reported no significant difference in the nutritional statuses of children under five years old based on the WHZ after supplementary biscuits consumption ($p=0.585$) (Putri & Mahmudiono 2020).

The objective of this study was to determine nutritional problems in children prior to biscuit supplementation, the biscuit supplementation regularity, the adequacy of the biscuits received and consumed by the children according to recommendations, and the relationship between the adequacy of the three months' biscuit supplementation and nutritional status.

METHODS

Design, location, and time

This research is part of the research on “the evaluation of biscuit supplementation for the recovery of malnourished children and pregnant women with chronic energy deficiency”. This study is an analytical descriptive observational study with a cross-sectional study design. The research was conducted in 2017 across 11 provinces in three (3) regions: Western region (Banten, East Java, North Sumatra, and Riau); Central region (West Kalimantan and South Kalimantan), and Eastern region (East Nusa Tenggara, North Sulawesi, South Sulawesi, Maluku, and North Maluku).

An ethical approval was obtained from the Ethics Committee of the Indonesian Health Research and Development Agency through a letter numbered LB.02.01/2/KE.112/2017 set in Jakarta on March 31, 2017.

Sampling

Provinces were selected based on the highest prevalence of wasting in children in each region, and districts were selected based on the highest prevalence of wasting in children in the selected provinces. In each district, two locations

with the highest wasting prevalence rates were selected. The inclusion criterion was children living in the selected study sites who received biscuit supplementation in 2016, whereas the exclusion criterion was children receiving biscuit supplementation after July 2017 or children having no anthropometric (weight and height) data.

All sampling units (586 children) were analyzed for nutritional problems before the biscuit supplementation, biscuit supplementation regularity (1–3 months), and the amount of biscuit supplement received in three months according to recommendations. On sampling units who received biscuit supplement in the recommended amount in three months (110 children) an analysis was conducted regarding how they consumed the biscuits. All sampling units (586 children) were involved in the analysis of the relationship between the adequacy of the biscuits consumed in three months and nutritional status.

Data collection

The nutritional problems as illustrated by the nutritional statuses of children before receiving supplementary biscuits were assessed based on anthropometric (height and weight) measurements by nutritionists at local health centers (TPG) or cadres at integrated services posts (*Posyandu*).

Supplementary biscuits contain calories, protein, and fat. They are enriched with ten kinds of vitamins (A, D, E, K, B1, B2, B3, B6, B12, and folic acid) and seven kinds of minerals (iron, iodine, zinc, calcium, sodium, selenium, and phosphorus). Supplementary biscuits are usually given by nutritionists at local health centers (TPG) or cadres at integrated services posts (*Posyandu*).

Data on the regularity of biscuit supplementation and the amount of biscuit supplement received and consumed according to recommendations in three months were obtained from a structured questionnaire. Interviews were conducted based on the qualitative questionnaire to support the quantitative data collected.

Data analysis

The nutritional statuses of children were determined based on the Height-for-Age Index (HAZ) and Weight-for-Height Index (WHZ) according to a Regulation of the Minister of Health (Ministry of Health of Republic of Indonesia (MoH RI) 2020). A child would be classified as

stunted if the the Height-for-Age Index (HAZ) was less than -2 SD and wasted if the Weight-for-Height Index (WHZ) was less than -2 SD. The combined nutritional status (based on the HAZ and WHZ) determined whether the nutritional problems were chronic, acute, or a combination of both. The combined nutritional statuses used in this study were stunted, wasted, stunted-wasted, and not stunted-wasted (underweight, normal, and overweight).

The data on the amount of biscuit supplement received and consumed were processed by comparing them against adequacy recommendations. For daily consumption of supplementary biscuits, it was recommended for a child aged 6–11 months to take eight pieces and for a child aged 12–59 to take 12 pieces (MoH RI 2017).

A univariate analysis was carried out to obtain an overview of children who received supplementary biscuits. Additionally, a bivariate analysis with a chi-square test was carried out to see the association between the adequacy of biscuits consumed in three months and nutritional status (based on the HAZ, WAZ, and WHZ). In addition, an analysis of differences in nutritional problems and regularity of biscuit supplementation was carried out across regions using a difference test between proportions (chi-square test).

RESULTS AND DISCUSSION

Nutritional problems of children before biscuit supplementation

Nutritional problems are reflected in the nutritional status. The nutritional statuses

of children under five years prior to biscuit supplementation are presented in Figure 1.

A combination of two anthropometric indexes (HAZ and WHZ) provides a clearer picture of the nutritional problems that occurred in children before biscuit supplementation. Double nutritional problem of stunting and wasting had the highest prevalence rate (34.1%), followed by stunting-only (32.6%) and wasting-only (23.9%). Non-stunting-wasting was found in 9.4% of children, 2.4% of whom were underweight, 5.8% were normal, and 1.2% were overweight. Before receiving supplementary biscuits, most of the sample experienced undernutrition problems, either singly or in combination (93%). Another study reported a nearly identical finding to this finding (90.7%) (Sarimah & Hutagalung 2013).

Before received biscuit supplementation, 68% of children suffered from wasting. Based on the technical guidelines to which this study referred, the main targets of the biscuit supplementation are children aged 6–59 months who are suffering from wasting (WHZ<-2 SD) and are neither hospitalized nor receiving outpatient care (MoH RI 2017). Other targets are children who are in a recovery period after receiving a malnutrition treatment at a TFC/hospital/community health center (*Puskesmas*), underweight, not gaining weight twice in a row (2T), and on the red growth line trajectory (supplementation for recovery program technical guidelines 2011). Supplementary biscuits are rich in nutritional content and thus unfit to be given to overweight children.

The nutritional problems in children who were selected to receive supplementary biscuits

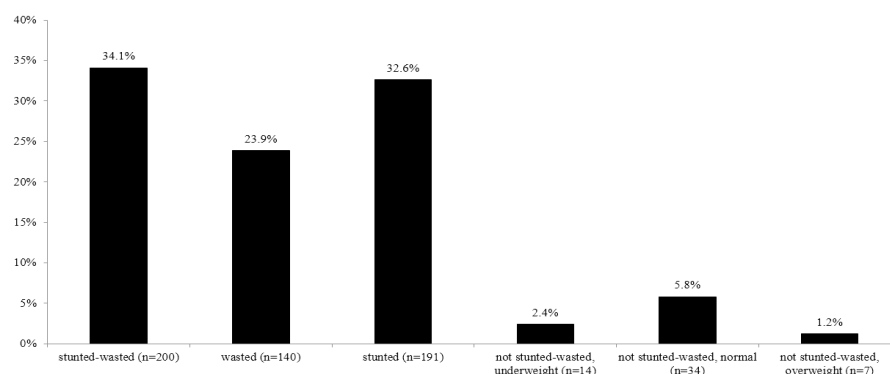


Figure 1. Type of malnutrition problem on children under five before receiving supplementary biscuits

(before biscuit supplementation) in each region are detailed in Table 1.

The overall nutritional problems (stunting-wasting, stunting, wasting, and underweight) were the highest in the eastern region (96.4%) and lower in the central region (95.5%) and western region (87.1%). The nutritional problems between regions showed statistically significant differences (p -value=0.000). There were different patterns of nutritional problems in each region. In the eastern region, the main problem was stunting-wasting (41.9%), followed by stunting (32.3%) and wasting (20.6%). The central

region had stunting as the most problematic (42.4%), followed by stunting-wasting (30.3%) and wasting (22.7%). In the western region, the problems in the order from the most common were stunting (30%), wasting (29%), and stunting-wasting (23.8%). This shows a disparity in patterns of nutritional problems between regions. The literature states that nutritional problems persist in high percentages in some provinces in the eastern region (Hastoety *et al.* 2018).

In terms of severity, stunting-wasting is considered the most severe because it has a higher risk of death. The percentage of stunted-

Table 1. Nutritional problems of children under five before receiving supplementary biscuits by region

Region	Stunted-wasted	Wasted	Stunted	Not stunted-wasted		
				Underweight	Normal	Overweight
Western region (n=210)	23.8	29.0	30.0	4.3	11.0	1.9
North Sumatera (n=57)	22.8	40.4	29.8	0.0	5.3	1.8
Riau (n=61)	21.3	36.1	11.5	3.3	24.6	3.3
East Java (n=43)	7.0	18.6	55.8	7.0	11.6	0.0
Banten (n=49)	42.9	16.3	30.6	8.2	0.0	2.0
Central region (n=66)	30.3	22.7	42.4	0.0	4.5	0.0
West Kalimantan (n=28)	46.4	17.9	35.7	0.0	0.0	0.0
South Kalimantan (n=38)	18.4	26.3	47.4	0.0	7.9	0.0
Eastern region (n=310)	41.9	20.6	32.3	1.6	2.6	1.0
NTT (n=93)	63.4	8.6	24.7	2.2	1.1	0.0
North Sulawesi (n=25)	36.0	32.0	20.0	4.0	4.0	4.0
South Sulawesi (n=42)	26.2	47.6	23.8	2.4	0.0	0.0
Maluku (n=62)	25.8	24.2	45.2	0.0	4.8	0.0
North Maluku (n=88)	39.8	14.8	38.6	1.1	3.4	2.3

The different test of nutritional problems of children under five before receiving supplementary biscuits between regions using the chi-square test showed a p -value of 0.000

wasted children was high in all regions. The highest percentage of stunting-wasting was found in the eastern region (41.9%), followed by the central (30.3%) and western region (23.8%). The province with the highest prevalence of stunting-wasting was East Nusa Tenggara (63.4%), followed by West Kalimantan (46.4%) and Banten (42.9%).

Stunting is an indicator of chronic malnutrition, and wasting is an indicator of acute malnutrition (Barth *et al.* 2020). The high prevalence of stunting-wasting in children shows that children have been experiencing long-standing nutritional problems that begun in the past and still continues until now (when the anthropometric measurement was carried out). The literature states that double-malnourished under-fives are at greater risks of diseases (acute respiratory infection, diarrhea, and measles) than single-malnourished children. Therefore, double malnutrition, underweight, and wasting in children need immediate intervention with supplementary foods, medication, micro-nutrition, education, and family empowerment (Andini *et al.* 2020).

In contrast to stunting-wasting, the highest prevalence of wasting was encountered in the western region (29%), followed by the central region (22.7%) and the eastern (20.6%). The highest prevalence of stunting was found in the central region (42.4%), followed by the eastern region (32.3%) and the western (30%). The WHO (2021) describes wasting as acute malnutrition due to inadequate intake or infectious diseases (especially diarrhea) and stunting as reflecting growth retardation, the cumulative long-term effects of malnutrition, repeated infections, and poor environmental conditions. It is also stated in the literature that the indicators of WHZ and HAZ reflect past nutritional status due to the use of more stable height parameters (Handayani *et al.* 2012).

The nutritional problems of children under five years old are complex in terms of individual and household characteristics, mother's education, sanitation, drinking water sources, child morbidity, access to weighing, income, poverty, and affordability. While natural poverty reflects the limited quality of natural and human resources, which leads to low productivity, cultural poverty originates from living in a poor environment since birth. Income and prices affect food affordability and consumption behavior,

which in turn affects nutritional status. These problems are often found in eastern Indonesia (Fauziyah 2016; Ariesthi *et al.* 2015; Ariesthi 2019).

Provinces that are relatively close together (NTT and North Maluku) have almost the same nutritional problems (high prevalence of stunting-wasting). This is in line with the results of Elisanti's study which revealed that there is a tendency for the nutritional status of an area to be influenced by, and affect, the nutritional status of adjacent (intersecting) areas (Elisanti 2017). It is also consistent with the First Law of Geography according to Waldo Tobler that everything is related to everything else, but things that are near are more related than things that are far away (Elisanti 2017). Adjacent areas generally tend to have almost the same geographical conditions, so the problems also tend to be the same.

Biscuit supplementation regularity and amount of biscuit received and consumed

The following table illustrates how regularly the biscuit supplement was distributed by the local government to targeted malnourished children regardless of the amount of the biscuit supplement (Table 2).

By region, the children who received supplementary biscuits regularly every month during the three months' period were mostly in the western region (78.1%), followed by those in the eastern region (72.6%) and the central region (66.7%). The differences between regions were not statistically significant (p -value=0.334). It appeared that the children in the eastern region were regularly given supplementary biscuits in three months, even though the amount given each month was less than the recommended adequacy (provisions).

The amounts in which the children received the supplementary biscuits based on the recommendations in the three months' period are presented in Table 3.

Disparity between regions was observed in the distribution of biscuits according to the recommendations. In three months, the eastern region saw the smallest percentage of children who received supplementary biscuits according to the recommendations (10%), followed by the western region (26.6%) and the central region (28.8%). Children who received supplementary biscuits less than the recommendations in the three months were mostly found in the eastern region (90%).

Table 2. Percentage routinity/time duration of children received supplementary biscuits

Region	n	Routinity/time of receiving supplementary biscuits					
		One month		Two month		Three month	
		n	%	n	%	n	%
Western (Jawa, Sumatera)	210	23	11.0	23	11.0	164	78.1
Central (Kalimantan)	66	9	13.6	13	19.7	44	66.7
Eastern (Sulawesi, NTT, Maluku)	310	38	12.3	47	15.2	225	72.6
Total	586	70	11.9	83	14.2	433	73.9

The different test on the routinity or time duration of children received supplementary biscuits between regions using the chi-square test obtained a p-value of 0.334

Regular biscuit supplementation for children in the recommended amount was faced with various constraints, one of which was encountered in the distribution process to the targets. The qualitative interviews carried out revealed that the main constraint to distribution was geographical conditions (difficulty to reach the destination, great distance, damaged roads, weather, and uncertain ship schedules). Other constraining factors were inadequate supplementary biscuits available, the lack of manpower, and the absence of a special budget for

distribution (Hermina 2017). These constraints can be anticipated through planning in which problems are mapped based on information, data, and facts available to achieve the expected results (Komala & Irwan 2019).

The percentages of children consuming supplementary biscuits according to the recommendations in three months of the sample (110 children) are presented in the following Table 4.

This study found that of the children who received and consumed the supplementary

Table 3. Percentage of children under five received amount of supplementary biscuits according to the provisions in three months

Region	n	Children received PMT-P biscuits less than the provisions*		Children received PMT-P biscuits according to the provisions	
		n	%	n	%
Western (Jawa, Sumatera)	210	150	71.4	60	26.6
Central (Kalimantan)	66	47	71.2	19	28.8
Eastern (Sulawesi, NTT, Maluku)	310	279	90	31	10
Total	586	476	81.2	110	18.8

*Provisions: The number of biscuits given to children aged 6–11 months is as much as 240 pieces/month and for children aged 12–59 months as much as 360 pieces/month; PMT-P: *Pemberian Makanan Tambahan Pemulihan* (Supplementary Biscuits for Recovery Program)

Table 4. Percentage of children under five consumed amount of supplementary biscuits according to the provisions in three months

Region	n	Children consumed biscuits less than the provisions*		Children consumed biscuits according to the provisions	
		n	%	n	%
Western (Jawa, Sumatera)	60	46	76.7	14	23.3
Central (Kalimantan)	19	18	94.7	1	5.3
Eastern (Sulawesi, NTT, Maluku)	31	17	54.8	14	45.2
Total	110	81	73.6	29	26.4

*Provisions: The number of biscuits consumed for aged 6–11 months is as much as 240 pieces/month and for children aged 12–59 months is as much as 360 pieces/month

biscuits according to the recommendations in the three months' period (26.4%), mostly were from the eastern region (45.2%), followed by those who were from the western region (23.3%) and central region (5.3%). The eastern region showed the highest percentage of supplementary biscuits consumption probably due to less access to food than in other regions. The consumption of supplementary biscuits that did not comply with the recommendations was because the biscuits were provided in insufficient amounts or because the consumption did not follow the recommendations although the biscuits were received in adequate amounts. A study by the National Development Planning Agency (Bappenas) found that the management of supplementary biscuits for moderately acute malnutrition (wasting) was not conducted comprehensively, only high-energy, high-protein supplementary foods were provided, and counseling activities were not performed adequately to raise public awareness (Ministry of National Development Planning of the Republic of Indonesia (Bappenas) 2019). Therefore, in addition to distributing supplementary biscuits adequately, it is also necessary to provide counseling and assistance for the children's families to increase their awareness of the importance of children consuming supplementary biscuits in the amount recommended.

The relationship between biscuits intake and nutritional status

Significant results ($p < 0.005$) were found on the relationship between supplementary biscuits

consumption and nutritional status according to the Weight-for-Age Index (WAZ). Children who consumed supplementary biscuits less than the recommendations were at 2.9 times the risk of being underweight (Table 5). In other words, sufficient consumption of supplementary biscuits by children according to the recommendations in three months would increase the possibility of having a normal nutritional status by 2.9 times.

Consuming supplementary biscuits according to the recommendations is expected to help alleviate nutritional problems in children under five years old. Another study supports this finding with evidence that supplementary biscuits have a role in improving nutritional status by increasing the body weights of undernourished children (Herianto 2017). Children who consumed supplementary biscuits had increased body weights by 18.16% (Adibin 2018). Consumption of supplementary biscuits by toddlers for 90 days improved the nutritional statuses of the toddlers based on the WAZ and WHZ (Mahmudah & Ulvie 2018).

The relationship between biscuits consumption and nutritional status according to the HAZ and WHZ was not statistically significant ($p \geq 0.005$). This could be because the HAZ and WHZ reflect past nutritional status with more stable height parameters (Handayani *et al.* 2012) and describe nutritional status in the long term, while this study only analyzed the relationship after consumption of supplementary biscuits for only three months.

Table 5. The relationship between biscuits consumed and the nutritional status of children after three months

Amount of biscuits consumed	n	Nutritional status		OR (95% CI)	<i>p</i>
Category WHZ					
		Wasted (%)	Normal (%)		
< Provisions (=0)	142	38.7	61.3	1.138 (0.362–3.573)	1.000
≥ According to the provisions (=1)	14	35.7	64.3		
Category WAZ					
		Underweight (%)	Normal (%)		
< Provisions (=0)	142	74.6	25.4	2.944 (0.987–8.968)	0.049*
≥ According to the provisions (=1)	14	50.0	50.0		
Category HAZ					
		Stunted (%)	Normal (%)		
< Provisions (=0)	142	66.2	33.8	1.088 (0.345–3.426)	0.885
≥ According to the provisions (=1)	14	64.3	35.7		

WHZ: Weight for Height Index; WAZ: Weight for Age Index; HAZ: Height for Age Index; OR: Odds Ratio
 ≥ According to the provisions as score 1 in all variable that tested (category WHZ, WAZ, and HAZ)

CONCLUSION

Before receiving supplementary biscuits, children were mostly of the stunted-wasted nutritional status (34.1%), and the rest were of the stunted (32.6%), wasted (23.9%), and not stunted-wasted (9.4%) statuses. The greatest prevalence of undernutrition problems was found in the eastern region (96.4%), followed by the central (95.5%) and western (87.1%) regions.

The percentage of children who received biscuits every month in three months across all regions was in the range 66–78%, but only 10–29% received the supplementary biscuits according to the recommendations in the three months' period. Of the children who received biscuits as recommended within the three months, the highest percentage of children who consumed the biscuits according to the recommendations was found in the eastern region (45.2%), followed by the western (23.3%) and central regions (5.3%).

Children who consumed supplementary biscuits in the recommended amount for three

months had 2.9 times the possibility of having a normal nutritional status (based on the WAZ, statistically significant with $p=0.049$).

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DECLARATION OF CONFLICT OF INTERESTS

The authors have no conflict of interest in preparing the manuscript.

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