

Factor Associated with Nutritional Status Among Children Aged 6 – 59 Months in Colol Public Health Center: A Cross-Sectional Study

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ABSTRACT

Objective: Malnutrition is one of the main factors influencing growth and development in children. Undernourishment still became a significant public health issue, including in Indonesia. This study aims to assess the prevalence and risk factors of nutritional status among children aged 6-59 months in Colol Public Health Center, East Manggarai Regency, and Indonesia.

Material and Methods: A cross-sectional observational community-based study was conducted in the working area of Colol Public Health Center in August 2023. This study included 138 parents and children aged 6 to 59 months who visited Posyandu, chosen by a simple random cluster sampling technique. The data were collected using a structured questionnaire, secondary data from the Maternal and Child Health (MCH) book, and anthropometrical measurements. Three anthropometric indicators (underweight, stunted, and wasted) were assessed according to the 2006 WHO Child Growth Standards and analyzed by SPSS 25.0. Bivariate and multivariate analyses were used to identify risk factors associated with children's nutritional status. The statistical significance was stated at p-value <0.05 with 95% confidence intervals.

Results: The prevalence of underweight, stunted, and wasted among children aged 6-59 months was 18.8%, 22.4%, and 6.5%, respectively. The multivariable logistic regression model showed that low birth weight increased the risk of underweight (AOR = 13.73 (95% CI: 2.40-78.63)), stunted (AOR = 30.55 (95% CI: 3.16-295.09)), and wasted (AOR = 12.16, 95% (CI: 2.02-73.37)) among children aged 6-59 months. Children with mothers aged <20 or > 35 years old increased odds for underweight (AOR 2.99 (95% CI: 1.13-7.94)). Meanwhile, children aged 24-59 years old were more likely stunted (AOR 4.89 (95% CI: 1.89-12.64)).

Conclusion: Undernutrition still becomes a public health problem among children aged under 5 years old in the working area of Colol Public Health Center, East Manggarai Regency. Low birth weight, age of the mother <20 or > 35 years old, and age of the children 24-59 years are significantly associated with nutritional status. The primary health center should cooperate with stakeholders across sectors, especially promoting programs to prevent low birth weight.

KEYWORDS: children, nutritional status, risk factor

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INTRODUCTION

Malnutrition can affect all populations, especially young children who are at a greater risk of malnutrition. Poor nutritional status in children early in life, from 0 to 5 years of age can hinder brain development and linear growth, which can have short and long-term effects on health, education, and socioeconomic status.^{1,2} The World Health Organization

(WHO) estimates that 45 million children under the age of five are likely to be wasted and 149 million stunted globally in 2022. Undernutrition is one of the contributing factors in over half of fatalities in children under the age of five.³ According to the Basic Health Research (Riskesdas) 2018, the prevalence of Indonesian children under five who are stunted and severely stunted decreased from 37.2% in 2013

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to 30.8% in 2018. The prevalence of wasted and severely wasted in children under five years old decreased from 12.1% in 2013 to 10.2% in 2018. Meanwhile, the prevalence of underweight and severely underweight increased from 17.7% in 2013 to 19.6% in 2018.⁴ A lot of effort is needed to achieve the goal of sustainable development goals (SDG) in 2030, which is to eliminate all forms of malnutrition in children.

It is commonly known that stunted, wasted, and underweight children have poor nutritional status.⁵ Stunting reflects chronic undernutrition resulted due to a bad diet over a long period of time. Chronic undernutrition leads to stunting, which in turn can lead to slow mental development, substandard academic performance, and reduced intellectual capacity.⁶ Acute undernutrition resulted from low food intake manifests as wasting. Consequently, wasting reduces the ability of the immune system to fight off infections, which increases susceptibility to infections. Acute weight loss, stunting, or both conditions can be combined to form underweight, which is a composite of wasting and stunting.^{3,7} The percentage of children whose height-for-age Z-score (HAZ) is less than two standard deviations (SD) is used to determine the prevalence of stunted. The percentage of children whose weight-for-age Z-score (WAZ) is less than -2 SD and whose weight-for-height Z-score (WHZ) is less than -2 SD, respectively, is another way to assess underweight and wasting.⁷

Undernourishment in children is influenced by environmental, social, demographic, cultural, and economic factors.^{8,9} The risk factors for nutritional status in children age under 5 years were age, sex, birth weight, premature birth, exclusive breastfeeding, history of diarrhea, place of birth, birth order, immunization status, maternal age, parental education level, and family income.¹⁰⁻¹³ In addition, environmental factors (house type, floor type, hygiene, water access, drinking water source, and access to health facilities) have been identified to be associated with stunting.¹⁴ Based on the Indonesian Nutritional Status Study (SSGI) in 2021, the prevalence of underweight in East Manggarai Regency was 26.2%, wasted 8.4%, and stunted 42.9%. East Manggarai was included in the five highest stunting prevalences in East Nusa Tenggara (ENT).¹⁵ Even though many programs have been launched to overcome undernutrition, the problem has not been resolved. It becomes important to identify the variables influencing children's nutritional status. Thus, the aim of this study was to determine the nutritional status and related factors among children ages 6-59 months in the Colol Public Health Center, East Manggarai Regency, Indonesia.

MATERIAL AND METHODS

Study Design and Population

This study was quantitative research with a cross-sectional approach, conducted in August 2023. The research population involved mothers and children aged 6–59 months who visited the Mother and Children Primary Care Center

(Posyandu), in six villages within the working area of the Colol Public Health Center in East Manggarai, East Nusa Tenggara, Indonesia. 138 pairs of mothers and children as samples were selected using a simple random cluster sampling technique by considering the inclusion and exclusion criteria. Mothers and children who suffered from diseases and refused to participate were excluded from the study. This study has passed the ethical review by the Ethics Commission from the University of Katolik Indonesia Santu Paulus Ruteng (Ref No 50/USP/R01/PE02/K/08/2023). Information regarding the purpose of the study was read to the participants, and verbal consent was received.

Data Collection

Both primary and secondary data are combined to gather the required information. Anthropometric measures and questionnaire interviews were used to gather primary data. Anthropometric measures were taken to obtain information about the child's weight, height or length of body. The questionnaire interview included the child's name, date of birth, gender, name of mother, address, mother's education, mother's occupation, exclusive breastfeeding, family size, family income, and member of the family smoking at home. Secondary data on the history of birth weight, maternal age at pregnancy, and gestational age were taken from mother and child (MCH) book.

Children's weight is measured using portable weighing scales and baby weight scales. Light clothing was worn for the measurement, and the weight was recorded to the closest 0.1 kg. A measuring board scaled by 0.1 cm was used to measure heights (standing for children ≥ 24 months) or lengths (laying for children under 24 months) in centimeters. This measurement was done by trained healthcare professionals. According to recommendations from the World Health Organization (WHO), three anthropometric indices were used to evaluate the children's nutritional status: weight for age, height for age, and weight for height. A child was classified as underweight, stunted, or wasted if their weight for age, height for age, and weight for height scores, respectively, were less than -2 SD below the median reference population's according to the WHO 2006 growth chart.

The mother's age at pregnancy, maternal education, maternal employment status, the age and gender of the children, history of premature birth, low birth weight, exclusive breastfeeding, number of household members, family income, and family members who smoke in the household were the independent variables, while nutritional status of the children aged 6-59 months was a dependent variable. Based on the Ministry of Health in Indonesia (2016), mothers who become pregnant at the ages of less than 20 or > 35 years old are at risk of complications. Maternal education was classified as either low (less than 9 years) or high (more than 9 years). The mother's occupation is differentiated whether she is working or not. The gestational

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age is preterm if the child was born less than 37 weeks gestational age and normal if the child was born at gestational age more than 37 weeks. Low birth weight children was the weight when the child was born less than 2.500 g, while a normal birth weight of >2.500 g. Children who get exclusive breastfeeding were those who only had breastmilk for 6 months. The number of family members is based on BKKBN 1998: large families if in one house there are >4 individuals and small families if there are ≤ 4 persons. The category of family income was based on District/City Minimum Wage (DCMW) or UMK of East Manggarai Regency according to the 2023 East Nusa Tenggara Governor Decree, which is Rp. 2,123,994. If the family income was less than the DCMW or UMK, it was categorized as low income. Smoking in the family was determined from the questionnaire question of whether any member living in the same household smoked.

Data analysis

The collected data was analyzed by SPSS version 25.0 IBM. Univariate analysis was conducted to determine the characteristics of respondents and the prevalence of children's nutritional status. The association between all independent variables and dependent variables (the children's nutritional status) was examined using bivariate analysis

(Chi-squared or Fisher's exact test). The risk of each component was ascertained by interpreting the odds ratio (OR) value with a significance level (p-value = 0.05) and 95% confidence interval. Multivariate logistic regression analysis was performed on variables from the bivariate analysis with a p-value <0.25 to identify the most influential independent variable on the dependent variable.

RESULTS

A total of 138 children aged 6-59 months were included in this study. The results of univariate analysis showed that 53.6% of subjects in this study were male and 46.4% were female. The majority of subjects in this study were children aged 6-23 months (56.5%), while children aged 24-59 months were 43.5%. Most children had a history of exclusive breastfeeding (84.1%), were full-term at birth (88.4%) and had normal birth weight (94.9%). The majority of mothers were aged 20-35 years at pregnancy (78.3%), 54.3% of mothers had low education levels, 63.8% of mothers were working, 97.8% of families had incomes below the regional minimum wage, 70.3% were with a number of family members >4 and 89.7% had at least one family member who smoked in the house (**Table 1**).

Table 1. Description of maternal, child, and household, characteristics of respondents (n=138)

Socio demographic characteristics	Frequency (n)	Percentage (%)
Age of the mother		
< 20 or > 35 years old	30	21.7
20 - 35 y.o	108	78.3
Maternal educations		
Low level of education	75	54.3
Higer level of education	63	45.7
Maternal occupation		
Working	50	63.8
Not working	88	36.2
Age of Children		
6-23 months	78	56.5
24-59 months	60	43.5
Gender		
Male	74	53.6
Female	64	46.4
Premature birth		
Yes	16	11.6
No	122	88.4
Low birth weight		
Yes	7	5.1
No	131	94.9
Exclusive breastfeeding		
Yes	116	84.1
No	22	15.9
Family members		
≤4	41	29.7
>4	97	70.3

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Familys income		
<UMR	135	97.8
≥UMR	3	2.2
Smoking in household		
Yes	123	89.1
No	15	10.9

Based on weight for age, the prevalence of normal weight, underweight, and severely underweight were 81.2%, 15.9%, and 2.9%, respectively. The prevalence of stunted and

severely stunted were 12.3%, and 10.1%, respectively. Meanwhile, based on weight for height, the prevalence of good nutrition was 93.5% and wasted was 6.5% (**Table 2**).

Table 2. The prevalence of nutritional status among children aged 6-59 months in Colol Public Health Center

Nutritional Status	Frequency (n)	Percentage (%)
Weight-for-age		
Normal	112	81.2
Severe underweight (< -3 SD)	4	2.9
Underweight (<-2 SD)	22	15.9
Overall Underweight	26	18.8
Height-for-age		
Normal	107	77.5
Severe stunted (< -3 SD)	14	10.1
Stunted (<-2 SD)	17	12.3
Overall stunted	31	22.4
Weight-for-height		
Normal	129	93.5
Wasted	9	6.5

The bivariate analysis showed that there was a significant relationship between the underweight with the mother's age and low birth weight. Children with mothers aged <20 years old or > 35 years old (OR = 2.87 (95% CI: 1.14-7.26)) and low birth weight (OR = 13.1 (95% CI: 2.38-72.04)) were associated with higher odds of being underweight (**Table 3**). Compared with children aged less than 24 months, children aged 24–59 months were more

likely to be stunted (OR = 4.44 (95% CI: 1.86-10.60). Children with a history of low birth weight also were more likely to be stunted (OR = 25.4 (95% CI (2.93-220.9)) (**Table 4**). Children who lived in households with > 4 family members have a higher likelihood of being wasted compared to those with ≤ 4 family members (OR = 5.37, 95% CI (1.27-22.65)). Low birth weight was associated with higher odds of wasted (OR = 15.62, 95% CI (2.84-86.08)) (**Table 5**).

Table 3. Risk factors associated with underweight among children aged 6-59 months in Colol Public Health Center

Socio demographic characteristics	Severe underweight + Underweight		Normal		Total		p-value	OR (95 % CI)
	n	%	n	%	n	%		
Age of the mother (years)								
< 20 or > 35 y.o	10	33.3	20	66.7	30	100	0.022	2.87 (1.14-7.26)
20 - 35 y.o	16	14.8	92	85.2	108	100		
Maternal education								
Low level of education	16	21.3	59	78.7	75	100	0.414	1.44 (0.60-3.44)
Higer level of education	10	15.9	53	84.1	63	100		
Age of Children								
6-23 months	11	14.1	67	85.9	78	100	0.105	2.03 (0.85-4.82)
24-59 months	15	25.0	45	75.0	60	100		
Gender								
Male	16	21.6	58	78.4	74	100	0.369	1.49 (0.62-3.56)
Female	10	15.6	54	84.4	64	100		
Premature								

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Yes	1	6.3	15	93.8	16	100	0.306	0.26 (0.03-2.05)
No	25	20.5	97	79.5	122	100		
Low birth weight								
Yes	5	71.4	2	28.6	7	100	0.003	13.1 (2.38-72.04)
No	21	16.0	110	84.0	131	100		
Exclusive breastfeeding								
Yes	22	19.0	94	81.0	116	100	1.000	1.05 (0.32-3.42)
No	4	18.2	18	81.8	22	100		
Family members								
≤4	11	26.8	30	73.2	41	100	0.119	2.00 (0.82-4.85)
>4	15	15.5	82	84.5	97	100		
Familys income								
<UMR	26	19.3	109	80.7	135	100	1	0.807 (0.74-8.77)
≥UMR	0	0.0	3	100	3	100		
Smoking in household								
Yes	23	18.7	100	81.3	123	100	1	0.92 (0.24-3.53)
No	3	20.0	12	80.0	15	100		

Table 4. Risk factors associated with stunted among children aged 6-59 months in Colol Public Health Center

Socio demographic characteristics	Severe stunted +		Normal		Total		p-value	OR (95 % CI)
	Stunted							
	n	%	n	%	n	%		
Age of the mother (years)								
< 20 or > 35 y.o	10	33.3	20	66.7	30	100	0.107	2.07 (0.84-5.08)
20 - 35 y.o	21	19.4	87	80.6	108	100		
Maternal educations								
Low level of education	16	21.3	59	78.7	75	100	0.728	0.87 (0.39-1.93)
Higer level of education	15	23.8	48	76.2	63	100		
Age of Children								
6-23 months	9	11.5	69	88.5	78	100	<0.001	4.44 (1.86-10.60)
24-59 months	22	36.7	38	63.3	60	100		
Gender								
Male	20	27.0	54	73.0	74	100	0.167	1.78 (0.78-4.08)
Female	11	17.2	53	82.8	64	100		
Premature								
Yes	2	12.5	14	87.5	16	100	0.524	0.46 (0.10-2.13)
No	29	23.8	93	76.2	122	100		
Low birth weight								
Yes	6	85.7	1	14.3	7	100	0.001	25.4 (2.93-220.9)
No	25	19.1	106	80.9	131	100		
Exclusive breastfeeding								
Yes	25	21.6	91	78.4	116	100	0.581	0.733 (0.26-2.07)
No	6	27.3	16	72.7	22	100		
Family members								
≤4	11	26.8	30	73.2	41	100	0.424	1.41 (0.60-3.30)
>4	20	20.6	77	79.4	97	100		
Familys income								
<UMR	31	23.0	104	77.0	135	100	1	0.77 (0.70-0.84)
≥UMR	0	0.0	3	100	3	100		

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Smoking in household								
Yes	28	22.8	95	77.2	123	100	1	1.18 (0.31-4.47)
No	3	20.0	12	80.0	15	100		

The multivariable logistic regression model showed that children with mothers at pregnancy aged <20 or >35 years old were associated with increased odds of being underweight (AOR = 2.99 (95% CI: 1.13-7.94)). Children with a history of low birth weight were more likely to be underweight (AOR = 13.73 (95% CI: 2.40-78.63)), stunted

(AOR = 30.55 (95% CI: 3.162-295.09)) and wasted (AOR = 12.16 (95% CI: 2.02-73.37)). An increased prevalence of stunting was correlated with increasing ages. There was a correlation between stunted and children aged 24-59 (AOR = 4.89 (95% CI: 1.89-12.64)) (Table 6).

Table 5. Risk factors associated with wasted among children aged 6-59 months in Colol Public Health Center

Socio demographic characteristics	Wasted		Normal		Total		p-value	OR (95 % CI)
	n	%	n	%	n	%		
Age of the mother (years)								
< 20 or > 35	2	6.7	28	93.3	30	100	0.97	1.03 (0.20-5.24)
20 - 35	7	6.5	101	93.5	108	100		
Maternal educations								
Low level of education	5	6.7	70	93.3	75	100	1	1.05 (0.27-4.10)
Higer level of education	4	6.3	59	93.7	63	100		
Age of Children								
6-23 months	6	7.7	72	92.3	78	100	0.731	0.63 (0.15-2.64)
24-59 months	3	5.0	57	95.0	60	100		
Gender								
Male	7	9.5	67	90.5	74	100	0.176	3.24 (0.65-16.19)
Female	2	3.1	129	96.9	64	100		
Premature								
Yes	0	0.0	16	100	16	100	0.598	1.08 (1.03-1.135)
No	9	7.4	113	92.6	122	100		
Low birth weight								
Yes	3	42.9	4	57.1	7	100	0.006	15.62(2.84-86.08)
No	6	4.6	125	95.4	131	100		
Exclusive breastfeeding								
Yes	8	6.9	108	93.1	116	100	1	1.56 (0.18-13.10)
No	1	4.5	21	95.5	22	100		
Family members								
≤4	6	14.6	35	85.4	41	100	0.020	5.37 (1.27-22.65)
>4	3	3.1	94	96.9	97	100		
Familys income								
<UMR	9	6.7	126	93.3	135	100	1	0.93 (0.89-0.976)
≥UMR	0	0.0	3	100	3	100		
Smoking in household								
Yes	9	7.3	114	92.7	123	100	0.597	0.93 (0.88-0.97)
No	0	0.0	15	100	15	100		

DISCUSSION

Undernutrition, especially during critical periods for brain development and linear growth, prevents children from reaching their full physical, health status, and potential productivity.⁷ In this study, the prevalence of underweight, stunted, and wasted were 18.8%, 22.4%, and 6.5%, respectively. Various studies have reported the determinants

of the nutritional status of children under 5 years old. Nutrition-sensitive factors that affect the nutritional status of the children are food insecurity and inadequate economic resources. Child, maternal, and environmental factors (limited or poor access to education, health services, infrastructure, and unhygienic environments) are other

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nutrition-sensitive factors that adversely affect the nutritional status of children under 5 years of age.¹⁶

Table 6. Multivariate logistic regression of risk factors that most affected underweight, stunted and wasted among children aged 6-59 months in Colol Public Health Center

Variables	Adjusted OR (95%CI)	p-value
Underweight		
Age of mother <20 y.o or >35 y.o	2.99 (1.13-7.94)	0.028
Low birth weight	13.73 (2.40-78.63)	0.003
Stunted		
Age of children 24-59 months	4.89 (1.89-12.64)	0.001
Low Birth weight	30.55 (3.16-295.09)	0.003
Wasted		
Low birth weight	12.16 (2.02-73.37)	0.006

This study analyzed the risk factors associated with being underweight, stunted, and wasted among children aged 6-59 years old in the area of work at Colol Public Health Center to identify what has to be improved for children to have good nutritional status and grow up in good health. History of low birth weight, maternal age at pregnancy, and children's age were found to be significantly associated with the nutritional status of children aged 6-59 months. In this study, the majority of mothers aged 20-35 years old when pregnant (78.3%), and only 21.7% of mothers were aged <20 or >35 years old. The results of the multivariate logistic regression showed there was a significant correlation between the age of the mother and underweight children ($p = 0.028$), AOR 2.99 (95% CI: 1.13-7.94). This may be because young mothers need adequate nutrition to grow into adulthood, and as young mothers, food shared in small portions between infants and mothers is inadequate. In addition, younger mothers may tend to have poor knowledge and practices on nutrition and less experience in childcare practices.¹⁷ Disconcordant with another study by Weya et al., which reported that in the Puncak District of Puncak Jaya Regency, there is no correlation between mother age and the nutritional health of children under five ($p = 0.463$).¹⁸

Low birth weight was a risk factor for underweight among children aged 6-59 months, $p = 0.003$ (AOR=13.73 (95% CI: 2.40-78.63)). This result is in line with earlier research showing that low birth weight infants have a higher chance of being underweight later in life due to insufficient fetal nutrition. According to Khan et al. (2019), underweight children had a strong correlation with small birth weight (AOR= 1.67, 95%CI 1.14-2.45).⁵ Despite various studies that have reported determinants for underweight in children aged less than 5 years, we found no association between maternal occupation, child age, gender, history of preterm birth, exclusive breastfeeding, number of family members, family income, and family history of smoking with being underweight. In contrast, previous studies have reported that stunted and underweight were associated with the type of maternity.^{13,19} Jain et al., reported there was an association

observed between the gender of the child and their nutritional status ($P = 0.0196$).¹³ A study by Mshida et al (2018) in Tanzania revealed that being a boy increased the risk of being underweight compared to girls.⁸ The differences in the results of this study may be caused by differences in subject characteristics and research methods. Therefore, to reduce the prevalence of undernourishment, a community approach is needed and solutions are based on the problems or risk factors faced by the local community.

The incidence of stunted in children aged 6-59 months was found to be substantially correlated with both low birth weight and child age in this study. As children become older, the chance of their becoming stunted increases. Stunted was 4.89 times more common in children aged 24-59 months compared to 6-23 months, $p = 0.001$ (AOR = 4.89 (95% CI: 1.89-12.64)). In line with the study by Menalu et al., reported that children between the ages of 24-59 months had a 3.2 times higher risk of stunting than children ages 0 - 6 months.¹¹ Another study has also reported that the incidence of stunting increases with age.¹⁴ Additionally, Khan et al. observed that the likelihood of stunting rises noticeably with age. Stunted children were more common in the 12-59-month age group than in the less than 12-month age group.⁵ At the age of 6 months, infants are still sufficient with breastfeeding, but as age increases, there is an increase in nutritional needs for growth and development, therefore requiring supplementary feeding. The increasing rate of stunting in children along with age emphasizes the need for appropriate and timely initiation of supplementary feeding to meet the increasing nutritional needs of children. A literature review study shows that stunting in African children worsens after the age of two, which is often related to the feeding of nutrient-deficient supplementary foods. Moreover, as children become older, they start interacting with their environment and consuming a wider range of foods that can contain antinutritional elements, contaminated food and water, all of which raise the possibility of them coming into contact with infectious agents.⁷

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A systematic review study showed that the child characteristic that consistently influenced stunting was low birth weight.²⁰ In this study, we found that low birth weight was a risk factor for being stunted (AOR = 30.55, 95% (CI: 3.16-295.09)). In another study, it was also reported that low birth weight (LBW) is associated with stunting.^{21,22} In addition, a history of low birth weight increased the risk of stunting more than 12 times higher than of normal birth weight, according to earlier studies.²³ Khan et al. (2019) reported child's small size at birth was associated with being stunted (AOR = 1.48, 95%CI 1.02- 2.16) in children.⁵ Compared to children with normal birth weight, children born with low birth weight (LBW) have both acute and chronic growth retardation during the intrauterine period, are more prone to infection, and have a decrease in appetite. Malnutrition in infants early in pregnancy can affect an unborn child's weight and length, resulting in a short, thin baby.^{21,23}

Various risk factors for stunting in children less than 5 years old have been reported. Stunting was also reported to be associated with the following determinants such as child gender^{24,25}, preterm birth, not exclusively breastfed for the first 6 months²⁵, maternal age, low maternal education^{26,27} and low family socioeconomic status.^{9,17,25–28} In this study, we found no correlation between maternal age, maternal education, gender, history of prematurity, exclusive breastfeeding, number of family members, family income, and smoking in the household with being stunted. Lestari et al. (2018) also reported no association between gender, maternal education ($p = 0.292$), or socioeconomic status ($p = 0.371$) with stunting.²³ This study is in line with the research of Andriyanu et al. (2019), which found that gender did not affect the prevalence of stunting in children.²⁷ The importance of maternal education and family income may vary in community. The difference may be due to differences in study design as well as characteristics of the research subjects and the standards of socioeconomic status of different region which our study took place in a rural area where most of the subjects earned less than the minimum wage.

In this study, we found a significant association between low birth weight and wasted among children aged 6-59 months ($p = 0.006$), AOR=12.16 (95% CI: 2.02-73.37). Abbas et al. (2021) have reported that LBW significantly and negatively affects the health outcomes that could affect children under five in Pakistan. Compared to children of normal birth weight, low birth weight children had a significantly higher likelihood of both stunting and wasting (OR = 2.0, CI = 1.7-2.3), mild wasting (OR = 1.5, CI = 1.3-1.6), and severe wasting (OR = 1.6, CI = 1.3-2.0).²⁹ LBW infants are more likely to remain underweight in childhood, therefore preventive measures to reduce low birth weight infants are necessary to reduce the prevalence of malnutrition.

The sex and age of the child may be important factors affecting the nutritional status of the child. However,

the relationship between sex, age, and nutritional status varies between studies.³⁰ Other characteristics such as maternal age, maternal education, gender, history of prematurity, exclusive breastfeeding, family income, and smoking in the household, were not significantly associated with being wasted in this study. In line with the previous study, there was no significant correlation found between the nutritional status of children under five years old and maternal education ($p = 0.616$), family income ($p = 0.511$), or exclusive breastfeeding ($p = 0.847$).³¹ Fekadu et al. (2015) reported maternal education was not statistically associated with any of the anthropometric indices (underweight, stunted, and wasted).³² Another study reported that maternal education plays an important role in a child's nutritional status.²⁸ The variation in the results indicated that moms with higher levels of education do not necessarily possess greater knowledge than mothers with lower levels of education because nowadays, information technology is developing fast and information is very easy to access. Meanwhile, Public Health Center or Puskesmas play a part in enhancing nutrition-related health education and increasing knowledge of mothers.

This study has several limitations. Firstly, the cross-sectional design of the study may have weak causal inference between the independent factors and the outcome. Furthermore, there may be bias in remembering and reporting regarding certain components of family income. Other risk factors such as dietary diversity, nutritional intake, and children's past illnesses were not studied in this research. In addition, this study did not directly examine the nutritional aspirations of the children to infer the association with undernutrition. Further studies should include other variables, larger sample sizes, and larger population coverage.

CONCLUSION

The nutritional status of children aged under five years remains a concern in the community. The prevalence of underweight, stunted, and wasted children aged 9-59 months in Colol Public Health Center was 18.8%, 22.4%, and 6.5% respectively. Low birth weight, maternal age, and age of children are significantly associated with nutritional status. Mothers aged at pregnancies less than 20 years or more than 35 years old and low birth weight were significantly associated with underweight. Children aged 24-59 years and low birth weight were more likely to be stunted. Meanwhile, low birth weight is also associated with being wasted. The primary health center should cooperate with stakeholders across sectors, especially promoting programs to prevent incidents of low birth weight. Targeted nutrition interventions based on community are necessary to reduce the impact of malnutrition. To prevent low birth weight, antenatal care (ANC) programs should be well initiated and implemented at all levels for all pregnant women.

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