Factors Predicting Chronic Malnutrition Among Young Children in Myanmar

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Abstract

Chronic malnutrition (i.e., stunting) is one of the significant health problems among children under five years old in Myanmar**.** The government has been trying to accelerate the reduction of malnutrition by collaborating and coordinating with other government and non-government organizations. However, the prevalence of chronic malnutrition remains high. This study examines the factors that could predict chronic malnutrition among young children using the Myanmar Demographic and Health Survey 2015–2016. Data record forms were used to collect the required information from the original data source. Descriptive statistics, the chi-square test, and logistic regression analysis were applied to analyze the data analysis and to determine the predictive power of independent variables. It was found that breastfeeding, birth weight, and family wealth index were significant predictors of childhood stunting. This study recommends emphasizing low-birth-weight infants to prevent chronic malnutrition and promote breastfeeding for all infants and children in Myanmar. Furthermore, policymakers should try poverty reduction and establish healthcare services that are easily accessible to the public, especially to the poor. Based on the findings of this study, more efforts to set up readily available public health services providing care for pregnant women and promoting breastfeeding would be some better precautions against chronic malnutrition for every child, particularly from developing countries**.**

Keywords

Children; chronic malnutrition; Myanmar; stunting

Introduction

Chronic malnutrition (i.e., stunting) is one of the significant health problems among children under five years old, especially in low and middle-income countries. Stunting means low height-for-age, which results from chronic malnutrition or chronic deficiencies of essential nutrients, recurrent infection, and poor psychological stimulation (World Health Organization [WHO], 2015). A compiled estimation by UNICEF, WHO, and World Bank Group (2021) found that nearly one in five (149.2 million) children under five years old suffered from stunting globally. In contrast, over half of all children under five (79 million) were affected by stunting in Asia in 2020. In Myanmar, 26.7% of children under five years old were affected by stunting, which was high compared to other nearby countries (Global Nutrition Report, 2023). Within the Myanmar region, the prevalence of childhood stunting goes up to 32% in children who live in the countryside, compared to those in inner-city areas (20%) (Ministry of Health and Sports & ICF, 2017). Thus, the prevalence of chronic malnutrition (stunting) in Myanmar is high and has become one of the leading health-related problems among Myanmar children.

The impacts of chronic malnutrition can burden those children's well-being and prevent their proper growth and development in the future. Chronic malnutrition can lead to an increased risk of death because of communicable diseases (e.g., malaria, diarrhea) and obesity, and diabetes later in life (UNCDF, 2021). Other negative impacts of stunting include underdeveloped brains, diminished mental ability, and learning capacity, poor participation in school activities, and reduced earnings in the future (Sablah, 2019). Additionally, the consequences of chronic malnutrition can damage a country’s economy due to compromised adult labor production and increased costs for health care (Global Panel on Agriculture and Food Systems for Nutrition, 2016). The health and profitability of over one-third of all people in developing countries were reduced by chronic malnutrition, making it the world's leading source of death among children and poverty (Valid Nutrition, 2018). Thus, the consequences that derive from malnutrition are very detrimental to the well-being, growth, and development of children, and needed to address this problem.

In 2013, Myanmar joined the Scaling Up of Nutrition (SUN) movement for nutritional coverage. In 2014, the Myanmar government made concrete time-bound actions based on the Zero Hunger Challenge (ZHC) of the United Nations for the accelerated reduction of food insecurity and undernutrition of children (Republic of the Union of Myanmar, 2018). Moreover, the iodization of salt, the National Code on Marketing of Breast milk Substitutes, the Early Childhood Intervention program, community-based Infant and Young Child Feeding (IYCF), and the Integrated Management of Acute Malnutrition (IMAM) were established for nutritional management among children in Myanmar (Republic of the Union of Myanmar, 2018).

Although the Myanmar government tries to do a lot, it still has a problem with chronic childhood malnutrition, and it would be difficult for the country to reach the global target of decreasing to 40% the number of children under five years old who suffer from chronic malnutrition by 2025 (World Health Organization, 2014). In some states and regions across Myanmar, stunting is significantly higher, up to 41%, which means 4 out of 10 children will not reach their full potential in life (Ministry of Health and Sports & ICF, 2017). In the original Myanmar DHS (Myanmar Demographic and Health Survey), the prevalence of four types of malnutrition was described: 29% chronic malnutrition or stunting (short for their age), 7%

acute malnutrition or wasting (low weight for their height), 19% underweight (low weight for age) and only 1% overweight (more weight for height) (Ministry of Health and Sports & ICF, 2017). Across the total population, the prevalence of chronic malnutrition is much higher than other types of malnutrition. Previous studies using MDHS 2015–2016 focused on regional variation, mothers' factors related to BMI, weight, occupation, child's age and sex, and household factors related to toilet facilities and sources of drinking water (Blankenship et al., 2020; Khaing et al., 2019). Therefore, it is necessary to analyze the other factors that influence chronic malnutrition alongside efforts to reduce it because there might be a gap in knowledge for reducing chronic malnutrition in Myanmar.

Factors that could impact chronic malnutrition were studied in different countries. According to previous studies from other countries, factors influencing chronic malnutrition can be categorized into child-related, household-related, and economic factors. Based on literature reviews, child factors, including birth weight (Belbasis et al., 2016; Kadima, 2012; Tette et al., 2015) and breastfeeding (Sk et al., 2021; Tello et al., 2022) could impact chronic childhood malnutrition. In Myanmar, the prevalence of low birth weight is 12.3% (Global Nutrition Report, 2023), which is relatively high compared to the global target of 10.5% (UNICEF & WHO, 2019). Low birth weight children may have suffered from uterine growth failure, which results in higher risks of morbidity, mortality, and other forms of malnutrition (Tette et al., 2015).

A study in Thailand found that children with low birth weight (< 2,500 g) had a 3.4 times greater risk of being chronically malnourished compared with children born with an average weight (Okubo et al., 2020). In Myanmar, only 53% of children under five years old receive continuing breastfeeding, and 64% stop breastfeeding before two years of age (Ministry of Health and Sports & ICF, 2017). The children who received continuous breastfeeding up to their current age were 2.91 times less likely to suffer stunting than those who did not receive continuous breastfeeding up to their current age (Tello et al., 2022). One study in the Garhwal region of India depicted a situation in which the longer the duration of exclusive breastfeeding, the lower the prevalence of stunting ($p < .05$) (Rathaur et al., 2018).

In household-related factors, maternal age (ul Haq et al., 2022; Yirga et al., 2019), maternal education (Wali et al., 2020), antenatal care (ANC) visits (Talukder, 2017), and types of cooking fuel (Ranathunga et al., 2021) were significant factors for a child's nutrition status. According to general Myanmar cultural practice, young mothers have less power than husbands in making certain judgments and managing finances, which might affect budget allocation for the family. In 2020, 33 per 1,000 women between 15 and 19 gave birth (Statista, 2023). Teenage mothers were 7.56 times more likely than older mothers to have stunted children under the age of five because teenage mothers needed nutrients and energy to grow and compete for nutritional sources with their developing fetuses (Wemakor et al., 2018).

Maternal education is one factor that can influence the prevalence of chronic malnutrition, as mothers are generally the major caregivers of children. In Myanmar, 44% of teenage girls did not attend school (The Borgen Project, 2019), which might impact the nutritional status of their children. Educated mothers have higher health-seeking behaviors and a better understanding of preventive and treatment-related health services, which could reduce the morbidity and mortality of children and improve their overall health and nutrition (Wali et al., 2020). Likewise, ANC visits are needed for the health of mothers and their children because, during these visits, mothers receive vitamin supplementation, primary medical care, immunization, and health education concerning healthy behaviors, breastfeeding, and other childcare processes that could boost optimal fetus and child growth (UNICEF, 2022).

More than 30% of mothers in Myanmar had less than three, or even no, ANC visits during pregnancy (Ministry of Health and Sports & ICF, 2017). Unclean cooking fuel was another household factor that could lead to chronic malnutrition among children. Using biomass fuels produces enough carbon monoxide to cause carboxyhemoglobin levels to rise, and exposure to such smoke can result in anemia, low birth weight, a high risk of acute respiratory infection, and other childhood diseases that can, in turn, lead to chronic malnutrition (Mishra, & Retherford, 2007).

The economic factor is also influential. The wealth index of families is one of the most crucial factors that can determine the occurrence of chronic malnutrition in children (Poda et al., 2017; Yisak & Ewunetei, 2020). A study conducted among 2,497 Pakistani children using a Multiple Indicator Cluster Survey (MICS) illustrated how children of the lowest wealth index families were 2.174 times more prone to stunting than those of the wealthiest families (Ahmad et al., 2020). Despite the predictors of chronic malnutrition being well-documented in other countries, limited studies have been found in Myanmar. Findings from different settings and countries will realize different outcomes, as the generalizability of these studies will be limited among Myanmar children. Thus, this present study used the Myanmar Demographic and Health Survey 2015–2016 to examine the predictability of birth weight, breastfeeding, maternal age, maternal education, ANC visits, type of cooking fuel, and wealth index on chronic malnutrition among children under five years old in Myanmar for the whole country generalizability as this study was latest national-level study.

Methodology

Study design and participants

The study analyzes secondary data from the Myanmar Demographic and Health Survey 2015–2016 with a predictive correlational study design. In the original data set, data from 4,815 mothers who had children under-five years were included. For this study, the required data were selected by setting inclusion criteria (Complete data of parents, child, and household characteristics) and exclusion criteria (Inconsistent data) from original data sources. Thus, the final study participants were 1,459 mothers of children under five.

Research instrument and variables

In this study, data record forms were used to collect the required information from the original data source of the Myanmar DHS 2015–2016. In the Myanmar DHS 2015–2016, there were three questionnaires: the Household Questionnaire comprised three sections for household characteristics and family members' information, Woman's Questionnaire included 12 sections for maternal-related information, and Man's Questionnaire included eight sections for husband-related information.

The data record form of the current secondary data analysis had four parts: Part I: Mother's Socio-demographic Characteristics, Part II: Husband's Socio-demographic Characteristics, Part III: Child's Demographic Characteristics, and Part IV: Household Characteristics.

Part I: Mother's Socio-Demographic Characteristics

This section included four items to assess the mother's information. These were: the age of mothers, education, place of residence (urban/rural), and the number of ANC visits.

Part II**:** Husband's Socio**-**Demographic Characteristics

In this section, two items were included. These were: the age of husband and the education level of the husband.

Part III**:** Child's Demographic Characteristics

This section included eight items to gather information about the child. These were sex, age, weight, height, birth weight, height/age percentile, number of birth orders, and breastfeeding.

Part IV**:** Household Characteristics

In this section, two items were included to assess the information about the household. These were: wealth index and type of cooking fuel.

In this study, the dependent variable, chronic malnutrition, reflected a condition that develops when children in Myanmar do not eat the correct balance of nutrients, resulting in a Z-score of less than minus two standard deviations from the median reference height-for-age. By using the information of "sex," "age in months," "height in centimeters," and "height/age percentile," the Z-score of the child was calculated. In the present study, results were recorded into "No chronic malnutrition (stunting)" if the child's Z-score was greater than or equal to minus two standard deviations from the reference median for height-for-age. If a child's Z-score was less than minus two standard deviations from the reference median for height-for-age, it was recorded as "Chronic malnutrition."

In relation to independent variables, the birth weight of the children was recorded as "Low birth weight" if the child's birth weight was less than 2,500 grams and "No low birth weight" if the child's birth weight was greater than or equal to 2,500 grams. For breastfeeding, it was coded as "continuous breastfeeding that children received from birth up to current age (months)" and "never or did not receive continuous breastfeeding from birth to current age (months)." For maternal age, it reflected the mother's age at the time of the survey, and this was categorized into two groups; "15 to 19-year-old mothers' group, and "20 years to older mothers' group". Regarding with maternal education assessed as "What is the highest grade you completed?" and it was classified into four levels of education; no education, primary school education, secondary school education and higher than secondary school education.

The ANC visits were the total number of antenatal care visits mothers took during pregnancy. This study classified ANC visits as "No or less than three times ANC visits" and "Four or above times ANC visits." The type of cooking fuel was the material or gas used for cooking in the household. In this study, it was classified as "Clean cooking fuel," which were electricity, LPG, natural gas, and biogas, and "Unclean cooking fuel," which were kerosene, coal, lignite, charcoal, wood, straw, shrubs, grass, agricultural crop, and animal dung respectively. Concerning with Wealth index was the property level of a family, including the belongings and the kinds of facilities that they possess. This study was also classified into five groups in the primary data set; poorest, poorer, middle, richer, and richest wealth index.

Ethical consideration

The Myanmar Demographic and Health Survey (MDHS) 2015–2016 was implemented by the Ministry of Health and Sports and ICF (2017) and approved by the National Health Sciences Research Committee in Myanmar. For this study and data analysis, the researcher requested and received a permission letter from the DHS Program on July 18, 2021. The study was also approved by the Institutional Review Board, Faculty of Nursing, Mahidol University, Bangkok, Thailand (COA No. IRBNS2021/41.0111). In the present study, no information was included to identify interviewed families, and the electronic datasets were kept strictly for confidentiality. A summary of the findings was reported in the study.

Data analysis

Data were analyzed using the Statistical Package for the Social Science (SPSS), and the significance level was set at alpha 0.05. Descriptive statistics were used for the characteristics of the sample and the study variables. The chi-square test was used to analyze the correlation between independent and dependent variables, and logistic regression analysis was used to determine the predictive power of independent variables based on assumptions.

Findings

In this secondary data analysis, 1,459 mothers with children under five were selected as study participants. Table 1 shows the demographic characteristics of the study population (n = 1,459). Concerning the education level, only 6.2% of mothers did not attend school, and the rest had any education. In total, only 21.8% of mothers took too few ANC visits (no or less than three times), and 78.2% of mothers took enough ANC visits (four or more times) during pregnancy. Of the children, 7.7% were born with a birth weight of less than 2,500 grams, and 92.3% had a birth weight greater than or equal to 2,500 grams. Among all the children under five years old studied, 53.8% received continuous breastfeeding from birth to current age (months), and 46.2% were classed as 'never or did not receive continuous breastfeeding.' Concerning the nutritional status of the children, 84.2% of the children did not suffer from chronic malnutrition (stunting). However, 15.8% under five-year-old children suffered from chronic malnutrition (stunting) in this study. Besides this, concerning the wealth status of the families, 49.2% were 'richer' and 'richest' families, whereas 31% of families lived in 'poorer' and 'poorest' wealth status, and 19.8% had 'middle' wealth status.

Table 1: Descriptive Analysis of Participants' Characteristics (n = 1,459)

Participants Characteristics	*n*	%
Maternal education level		
No education	90	6.2
Primary school	550	37.7
Secondary school	611	41.8
Higher than Secondary school	208	14.3
Number of ANC visits		
Four or above times	1,141	78.2
Less than three times	286	19.6
No visit	32	2.2

Participants Characteristics	*n*	%
Birth Weight (Grams)		
Low birth weight (< 2,500)	112	7.7
No low birth weight (≥ 2,500)	1,347	92.3
Min = 727, Max = 5,000		
Breastfeeding		
Continuous breastfeeding from birth to current age (months)	785	53.8
Never or did not receive continuous breastfeeding	674	46.2
Chronic malnutrition (Stunting) status of children		
Stunting	230	15.8
Not stunting	1,229	84.2
Wealth index (household facilities and characteristics)		
Poorest	202	13.8
Poorer	251	17.2
Middle	288	19.8
Richer	362	24.8
Richest	356	24.4
Types of cooking fuel		
Clean cooking fuel	425	29.1
Unclean cooking fuel	1,034	70.9

As shown in Table 2, birth weight, breastfeeding, maternal education, ANC visits, and wealth index were significantly associated with chronic malnutrition ($p < .05$). In this assumption test of chi-squared analysis, all expected numbers of grouped variables were greater than five ranging from a minimum expected count of 10.72 to a maximum of 106.25. In this study, all independent variables could explain 6.3% of the dependent variable ($R^2 = 0.063$, $p = .000$) (Table 3).

Table 2: Relationship Between Birth Weight, Breastfeeding, Maternal Age, Maternal Education, ANC Visits, Type of Cooking Fuel, Wealth Index, and Chronic Malnutrition

Variables	Total	Chronic malnutrition (Stunting)				*p* value
		Yes		No		
		n	%	n	%	
Birth weight						.005**
Low birth weight (< 2,500)	112	28	25	84	75	
No low birth weight (≥ 2,500)	1,347	202	15	1,145	85	
Breastfeeding (for all under 5 years children)						.000***
Continuous breastfeeding from birth to current age (months)	785	95	12.1	690	87.9	
Never or did not receive continuous breastfeeding	674	135	20	539	80	
Maternal age (Years)						.102
15–19	35	9	25.7	26	74.3	
20 or older	1,424	221	15.5	1,203	84.5	
Maternal education						.039*
Higher than secondary school education	208	31	14.9	177	85.1	
Secondary school education	611	81	13.3	530	86.7	
Primary school education	550	97	17.6	453	82.4	
No education	90	21	23.3	69	76.7	

Variables	Total	Chronic malnutrition (Stunting)				*p* value
		Yes		No		
		n	%	n	%	
Number of ANC visits						.039*
Four or above times	1,141	168	14.7	973	85.3	
No visit or less than three times	318	62	19.5	256	80.5	
Type of cooking fuel						.082
Clean cooking fuel	425	56	13.2	369	86.8	
Unclean cooking fuel	1,034	174	16.8	860	83.2	
Wealth index						.001**
Richest	356	37	10.4	319	89.6	
Richer	362	52	14.4	310	85.6	
Middle	288	49	17.0	239	83.0	
Poorer	251	45	17.9	206	82.1	
Poorest	202	47	23.3	155	76.7	

Of seven independent variables, only three variables (birth weight, breastfeeding, and wealth index) could significantly predict childhood stunting in this study. Children born with low birth weight had 1.87 times increased risk of stunting compared to that non-low birth weight (OR = 1.87, 95% CI [1.16, 3.00], p = .009). Among the under five years old children, the children who never or did not receive continuous breastfeeding up to the current age (months) had a 2.05 times higher chance of suffering chronic malnutrition than the children who received continuous breastfeeding (OR = 2.05, 95% CI [1.52, 2.76], p = .000). The risks of stunting were 1.71 times increased in richer (OR = 1.71, 95% CI [1.043, 2.83], p = .034), 2.21 times increased in the middle (OR = 2.21, 95% CI [1.27, 3.85], p = .005), 2.45 times increased in poorer (OR = 2.45, 95% CI [1.33, 4.50], p = .004) and 3.26 times increased in poorest (OR = 3.26, 95% CI [1.73, 6.16], p = .000) families compared to those of richest families.

Table 3: Logistic Regression Analysis of Birth Weight, Breastfeeding, Maternal Age, Maternal Education, ANC Visits, Type of Cooking Fuel, and Wealth Index on Chronic Malnutrition

Variables	Odds Ratio	95% CI Lower–Upper	*p* value
Birth weight (grams)			
No low birth weight (≥ 2,500)	(Reference)		
Low birth weight (< 2,500)	1.87	1.16–3.00	.009*
Breastfeeding			
Continuous breastfeeding from birth to current age (months)	(Reference)		.000***
Never or did not receive continuous breastfeeding	2.05	1.52–2.76	
Maternal age (Years)			
20 or older	(Reference)		
15–19	1.99	0.88–4.47	.094
Maternal education			
Higher than secondary school education	(Reference)		
Secondary school education	0.66	0.40–1.08	.104
Primary school education	0.78	0.46–1.31	.356
No education	0.91	0.45–1.84	.806

Variables	Odds Ratio	95% CI Lower–Upper	*p* value
Number of ANC visits			
Four or above times	(Reference)		
No visit or less than three times	1.14	0.81–1.60	.448
Type of cooking fuel			
Clean cooking fuel	(Reference)		
Unclean cooking fuel	0.87	0.57–1.31	.507
Wealth index			
Richest	(Reference)		
Richer	1.71	1.04–2.83	.034*
Middle	2.21	1.27–3.85	.005**
Poorer	2.45	1.33–4.50	.004**
Poorest	3.26	1.73–6.16	.000***

*Note: $R^2 = 0.063$, $p = .000$) Significant at ***$p < .001$, **$p < .01$, *$p < .05$*

Discussion

This study identified the factors that could impact the chronic malnutrition status of children under-five years in Myanmar. According to this present study, birth weight can impact chronic malnutrition significantly. Children born with low birth weight (< 2,500 grams) were at a 1.87 times higher risk of stunting than those with non-low birth weight. This consequence might be because children with low birth weight in Myanmar could face many undesirable health problems as they have fragile health and immune systems, leading to chronic malnutrition. Children born with low birth weight are highly vulnerable to communicable diseases, such as diarrhea and respiratory infections, and increased risks of consequences like anemia, fatigue, and loss of appetite compared to those normal children. This awareness, in turn, could alter the nutritional status of children with low birth weights (Khanal et al., 2014).

In this study, the minimum birth weight was just over 700 grams, which is extremely low. Therefore, those children could more easily catch communicable diseases (such as diarrhea), which could disturb their nutritional intake and status. Many studies in other countries aligned with the findings of this present study, which studies reported that low birth weight was a significant risk factor for childhood stunting in their respective countries (Abbas et al., 2021; Kusumawati et al., 2018; Ntenda, 2019). All these studies explained that children born with low birth weight had increased birth complications and higher risks of morbidity and mortality, affecting nutrient intake and status.

Breastfeeding was a significant predictor of chronic childhood malnutrition or stunting. Children continuously breastfed up to their current age (months) were 2.05 times less likely to suffer chronic malnutrition than those in the 'never or did not receive continuous breastfeeding children' group. Of a sample of 1,459 children under five years, over half (53.8%) were continuously breastfed from birth until their current age (months). This result was similar to the previous studies in that breastfeeding was a preventive factor for reducing childhood stunting (Dabar et al., 2020; Rathaur et al., 2018; Sari et al., 2021). In a mother's breast milk, colostrum, essential nutrients, and vitamins are already included for optimal growth and development of children. Additionally, breast milk promotes the production of antibodies needed to fight against childhood infections (e.g., diarrhea, respiratory infection) that could otherwise lead to morbidity and mortality in children (Astuti et al., 2020). Thus,

breastfeeding could hamper the prevalence of chronic malnutrition among young children by ensuring the growth of children and maintaining their well-being of those children.

Regarding the wealth level of the family, a low level of wealth status was a significant risk factor for childhood stunting in young children in Myanmar. The risk of stunting gradually increased following the level of poorness of the family. The results of binary logistic regression analysis were 1.71 times increased in richer (OR = 1.71, 95% CI [1.043, 2.83], p = .034), 2.21 times increased in the middle (OR = 2.21, 95% CI [1.27, 3.85], p = .005), 2.45 times increased in poorer (OR = 2.45, 95% CI [1.33, 4.50], p = .004) and 3.26 times increased in poorest (OR = 3.26, 95% CI [1.73, 6.16], p = .000) families compared to those of richest families. The possible explanations for why poor wealth status could predict the stunting status of children in this study were that around half of the participants lived under middle wealth status, and a low level of wealth status had limitations in their ability to spend money on adequate and quality foods and specialized health services. In contrast, wealthy families could spend money on these things. Myanmar is one of the world's developing countries; therefore, the government could not supply everything freely, such as improved healthcare services and nutritious foods and drinks.

A consistent finding of Ahmad et al. (2020) explained that the risks of chronic childhood malnutrition (stunting) were higher in low-wealth quintile families than in high-wealth families due to less ability to afford improved sanitation, health care, and quality foods. Reinhardt and Fanzo (2014), who used the UNICEF causes of malnutrition framework to find causes of chronic malnutrition, described how the wealth index was a fundamental cause of childhood malnutrition, as the wealth index of a family determined the basic infrastructure of a household such as water, sanitation, electricity, and shelter.

Other factors: maternal age, maternal education, ANC visits, and type of cooking fuel, did not have a significant impact on chronic malnutrition. The age of mothers did not predict chronic malnutrition significantly; this might be mean age of mothers was 30.90 years which means that they had enough maturity in terms of both mental and physical aspects. Decreased hospitalization, fewer accidental injuries, and more childhood immunization frequently occurred among young children in adult parents compared to young parents (Sutcliffe et al., 2012), which could contribute to the nutritional status of children. One study in Myanmar found that adult mothers had significant health-seeking behavior related to childbearing and childrearing practices (Toe et al., 2021). Besides, mothers involved in the current study had enough maturity as they were in adulthood. Therefore, they could have enough confidence and more intention for their children's feeding and well-being. Some studies align with the present study because the age of mothers did not significantly impact childhood stunting (Kadima, 2012; Santosa et al., 2022). These studies explained that the age of mothers alone could not directly influence the nutritional status of children. However, when combined with other socioeconomic factors and child factors, it could affect the stunting status of children.

In terms of maternal education, the literacy level of mothers could not predict the stunting status of children in this study. Maternal education could not indicate chronic malnutrition in this study because only 6.2% of mothers had no education. In comparison, over 55% of mothers had secondary and higher levels of education. In Myanmar, media used for patient education features easily understandable languages for all mothers and patients so that they can understand and apply health information for children's health even if they have a low level of education. Similarly, the Ministry of Health and Sports planned to provide home care visits and group discussion services about prenatal care, delivery care, postnatal care, the

importance of breastfeeding, and child-caring practices for all adolescents, mothers, and fathers (Republic of the Union of Myanmar, 2014).

One study in Ghana revealed the same finding as the present secondary data analysis, that maternal education could not predict chronic malnutrition at a significant level (Tette et al., 2015). The study explained that only 6.5 % of the mothers they studied were uneducated, while the other mothers had basic or post-basic education; thus, they could have basic knowledge about the health and nutrition of children. A contrary result occurred in a Pakistan study; however, the opposite results might be because over half of the mothers studied were illiterate (Ahmad et al., 2020).

In this secondary data analysis, ANC visit was not a significant predictor of chronic malnutrition in children. This finding might be because only 2.2% of mothers had no prenatal visits, while the other 97.8% went to a health clinic for antenatal care. During even just one ANC visit, mothers could receive immunization and further directions on how to take care of their pregnancy, as well as certain micronutrients such as folic acid and other vitamin supplementation. Moreover, some studies showed that ANC visits did not have any desirable effects on the child's overall health status for conditions such as asthma, obesity, and height beyond the neonatal period. However, it positively impacts maternal health-related behaviors, such as reducing mothers' smoking habits (Evans & Lien, 2005; Noonan et al., 2013). Many previous studies were similar to this study as they described that ANC visits did not significantly impact childhood stunting (Cetthakrikul et al., 2018; Rizal & van Doorslaer, 2019; Simbolon et al., 2021).

Finally, the type of cooking was also not a significant predictor of childhood stunting. This result might be that unclean cooking fuel was mainly utilized in rural areas; however, in those areas, the houses are generally far from each other and not as crowded as in urban areas where gases from stoves can flow freely. Besides this, many open spaces occur in rural areas, with green forests that release pure oxygen that could assist in ventilation. Trees are a practical natural resource for reducing air pollution and improving the surrounding air quality (Traverso, 2020). A congruent finding occurred in one study conducted in India. The researcher described how stunting came from the interaction of complex environmental factors, socioeconomic factors, and other cultural factors (Lee et al., 2021). However, in contrast, one study using the Indian National Family Health Survey (1998–1999) found that using unclean fuel could significantly predict the stunting status of Indian children (Mishra & Retherford, 2007).

The reason why the results of the Indian study were different from the current secondary data analysis might be because over half of the households surveyed did not have a separate kitchen and lived in crowded spaces. The present study's findings partially supported the study hypothesis, as only three out of seven variables predicted chronic malnutrition among young children in Myanmar. However, this study used data from the Myanmar Demographic Health Survey (2015–2016). Due to the design of secondary data analysis and data limitations, some factors are not considered, such as the knowledge, attitude, and food practice of mothers that are vital for promoting children's nutrition and preventing chronic malnutrition. Therefore, the study could not reflect the current situation, and further studies are needed.

Conclusion and recommendations

This study found that birth weight, breastfeeding, and wealth index of the family were significant predictors of chronic childhood malnutrition. Among the studied variables, birth weight was one of Myanmar's most significant predictors of chronic childhood malnutrition. Children with low birth weight had a higher risk of stunting than those with regular birth weight. Thus, nurses need to identify the birth weight of the child, as well as nurses should establish a unique intervention program for children with low birth weight and an education program (e.g., breastfeeding, complementary feeding, etc.) for mothers of children with low birth weight. Likewise, nurses should encourage and help lactating mothers to provide exclusive breastfeeding until six months of age and continue breastfeeding by adding nutritionally adequate and safe complementary foods for children up to 2 years of age and beyond. Nurses should also emphasize the health of children from low-income families by explaining seasonal food sources which are cheaper and more nutritious for children. Moreover, children of low socioeconomic status families should be directed to places where free services and supplies such as vitamin supplementation are available.

For the parents, it would be recommended to give breastfeeding or feed breast milk as long as possible and seek health information from public health services. In addition, if the mothers have children with low birth weight, they should strictly follow the suggestion of the healthcare staff and provide care to those children for chronic malnutrition prevention. Moreover, the study's findings can be shared in continuous nursing education to improve knowledge regarding chronic malnutrition and its predictors among under-five-year-old children in Myanmar. Besides this, further studies on childhood stunting and mothers' preventive behaviors should be conducted. Similarly, quasi-experimental research should be done on preventing chronic malnutrition and promoting nutritional status for young children in Myanmar.

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