

Unsafe child feces disposal and childhood wasting among under five children in Myanmar

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ABSTRACT

Background: Wasting is a major public health problem among under five children in developing countries, including Myanmar. The distribution of wasting and its associated factors are not well known in Myanmar.

Objectives: This study aimed to examine the wasting prevalence and identify the association between child feces disposal and wasting among under-five children in Myanmar.

Methods: A cross-sectional study was conducted on 1,207 under five children in Myanmar from September to December 2022. This study employed a multistage random sampling method with structured questionnaires and anthropometric measures. The World Health Organization's (WHO) definition and growth standards were used to determine the wasting. Multivariable logistic regression was performed to identify the association. An adjusted odds ratio with a 95% confidence interval and a p-value <0.05 was used to define statistical significance.

Results: The prevalence of childhood wasting among under five children in Myanmar was 11.10% (95% CI: 9.45 to 13.00). This study revealed that children from unsafe child feces disposing families were 94 % more likely to be wasted (AOR=1.94, 95% CI: 1.22 to 3.09; p-value 0.005). Other covariates to childhood wasting were water shortage (AOR=2.17, 95% CI: 1.13 to 4.16; p-value 0.02), less than four handwashing steps of mother (AOR=3.20, 95% CI: 1.93 to 5.32; p-value <0.001), located in hilly region (AOR=2.27, 95% CI: 1.53 to 3.37; p-value <0.001), boys (AOR=2.80, 95% CI: 1.86 to 4.23; p-value <0.001), birth interval less than 3 years (AOR=1.84, 95% CI: 1.10 to 3.11; p-value 0.02), and eating more than 4 times per day (AOR=3.19, 95% CI: 1.93 to 5.27; p-value <0.001).

Conclusion: This study showed a high prevalence of wasting among under five children in Myanmar. Improving the safe child feces disposal practices of mothers would be a critical intervention to reduce under five children's wasting.

Keywords: Children, Child feces disposal, Wasting

1. Introduction

As of 2022, 45 million under-five children were thin, and 13.7 million children were severely thinner than their average weight for height. Wasting and severely wasting prevalence stands at 6.8% and 2.1% of total under five children, respectively [1]. Malnutrition accounts for more than half of child deaths in under five children [2]. According to the UNICEF Child Malnutrition Report 2023, although childhood stunting has decreased steadily globally since 2000, wasting still persists at an alarming rate [1].

Wasted children often suffer from multiple nutritional deficiencies, not just limited to macronutrients like protein and calories but also micronutrients crucial for overall health and development. Moreover, severe acute malnutrition can lead to weakened immune systems, making children more susceptible to infections and illnesses, often resulting in death if left untreated [3].

The Joint Child Malnutrition Estimate (JME) 2020 report stated that 27.4 percent were short for their age and 8.2 were thinner than their expected height among under-five children in the Southeast Asia region. That report also identified that 6.7 percent of

Myanmar children are wasting [4]. As a consequence of the general crisis after the 2021 political turmoil in Myanmar, the nutritional status of the children can be worse than before.

In Myanmar, as in many developing nations, the safe disposal of child feces presents several challenges: Cultural practices and a lack of awareness contribute to inadequate disposal of child feces. Children are particularly vulnerable to the health risks associated with poor sanitation. Exposure to contaminated feces can lead to malnutrition, stunting, and various infections, impacting their overall health and well-being.

To address the research gaps, this study explored the wasting prevalence among under five children at the concurrent stage of Myanmar and identified the association between unsafe child feces disposal practices and childhood wasting among Myanmar's under five children.

2. Methods

2.1 Study Area

The study area was Myanmar. 16 townships from eight states and regions were selected to cover different geographical contexts in Myanmar, such as hilly, coastal, and plain areas.

2.2 Study Design

The study design for this study was a cross-sectional analytical study. The study population was 6 to 59-month-old children. The child's age in month was counted by subtracting the birth date from the time of data collection. A child between 5 and 59 months old, living in this area for more than 1 year, and whose parents gave their consent were included in this study. However, children with chronic diseases, congenital disorders, or physical or mental disabilities were excluded from this study.

2.3 Sample size and sampling

The study sample size was estimated using a multivariable logistic regression formula (Hsieh, Bloch, & Larsen, 1998) [5]. The total sample size of this study was 1207 children. In this study, the process of sample selection was performed in four steps. Firstly, eight states and regions were selected from a total of 14 states and regions to cover hilly, coastal, and plain geographical contexts. After that, two townships from each state and region were chosen by simple random sampling. Then, one ward from an urban area and two villages from a rural area were randomly selected. Finally, sample children were selected from the township health

profile by using a systematic random sampling technique. If the household had more than one child aged 6 to 59 months, a randomly selected child was included in this study.

2.4 Data Collection

The data collection period for this study was from September 1, 2022, to December 31, 2022. Face to face interview was conducted with a structured questionnaire. Questionnaires consisted of seven parts. 1) sociodemographic information; 2) child-related information; 3) parent-related information; 4) water, sanitation, and hygiene (WASH) information; 5) food safety information; 6) health literacy; and 7) disease-related information and biometric measurements. A stadiometer was used to measure the height, and a portable weighing scale was used to measure the weight.

2.5 Research Indicators

The dependent variable was childhood wasting. A child was considered wasted if the child's weight for height Z-score is <2 standard deviation (SD) than their expected weight for height. Body weight in kilograms and height in centimeters (cm) were taken to the nearest 0.1 decimal. Wasting was counted

as a dichotomous variable and coded as 1 = wasted child and 0 = non-wasted child.

The main interest variable was child feces disposal practice. According to the WHO/UNICEF Joint Monitoring Program definition on safe child feces disposal, children using toilets or latrines, putting or rinsing into toilets or latrines, and being buried were classified as safe child feces disposal. And disposing of child feces into drains, garbage, leaving it open, using a manual, and other ways of disposing of outside latrines are categorized as unsafe child feces disposal [6].

The independent variables for sociodemographic data included residential location (hilly, coastal, or plain), kitchen location (outside or inside the home), house floor type (concrete, wood, bamboo, or earth), and family size. Child-related data included age (categorized into 5 groups: 6–11 months, 12–23 months, 24–35 months, 36–47 months, and 48–59 months), gender (boy or girl), preterm labor (yes or no), low birth weight (yes or no), and birth interval. Child's parent variables included mother's age in years (categorized into 3 groups: less than 30 years old, 30 to 40 years old, and over 40 years old), weight in kilograms of parents

less than ASIA men (60.0 kg) and women (57.7 kg) average (yes or no), education status of parents completed a bachelor degree at least (yes or no), and contraceptive use before birth (yes or no).

JMP WASH services level for water, sanitation, and hygiene, water shortage (yes or no), proper solid waste disposal (yes or no), proper waste water disposal (yes or no), and hand washing steps were included in the WASH data. According to the JMP definition, water, sanitation, and hygiene services were classified. At least the basic drinking water service level was defined as using the drinking water from an improved water source within 30 minutes of the round trip. Safely managed sanitation was categorized for households with improved toilet facilities without sharing with others, and feces are disposed of safely in situ or removed to the treatment site. The basic hygiene level was classified according to the household's availability of handwashing facilities, soap, and water on their premises.

In food safety and diet pattern data, food safety scores (8 questions for clean, contain, cook, and chill), main food (rice or others), minimum diet diversity of at least four items (yes or no), eating frequency per day, and

food avoidance of some kind of food (yes or no) were included. Health literacy data was collected for sanitation, hygiene, and nutrition. Health literacy levels were categorized into four levels based on the obtained scores: inadequate health literacy for < 60 percent, problematic health literacy for 60 to 69 percent, adequate health literacy for 70 to 79 percent, and excellent health literacy for > 80 percent.

In childhood disease suffering data, diarrhea (yes or no), dysentery (yes or no), worm infection (yes or no), and any sickness Occurrence of three or more loose or liquid bowel movements over a 24-hour period during the preceding 2 weeks. Occurrence of diarrhea with blood or mucus and abdominal pain over a period of 24 hours during the preceding 2 weeks. Occurrence of abdominal pain with itchy anus and unexplained weight loss over 24 hours during the preceding 2 weeks.

2.6 Data Analysis

Primarily, the collected information was entered into a Microsoft Excel matrix. Then, these data were exported to STATA version 13.0. Frequency and percentage were calculated for categorical variable types, and mean, standard deviation, medium,

minimum, and maximum values were analyzed for continuous variable types. Bivariate logistic regression was run for each covariate and main interest variable to identify the magnitude of the association with childhood wasting. Variables with p values less than 0.25 were included in the multivariable logistic regression model. After running the final input variables with backward elimination multivariable logistic regression, an adjusted odd ratio (AOR) value of less than 0.05 and a 95% confidence interval were used to determine the significant association between unsafe child feces disposal practices and childhood wasting.

2.7 Ethical Clearance

This study was approved by Khon Kaen University Ethics Committee for human research with the reference number HE652157. Written consent was taken from parents of the children.

3. Results

According to the analysis of this study, 134 of 1207 under-5 children were found with wasting, which means 11.1% of total Myanmar children's weight for height Z-score is <2 standard deviation (SD) than other

average children of their age. Wasting prevalence was peak (12.8%) in 12 to 23-month-old children, followed by 48 to 59 months (12.7%), 6 to 11 months (11.3%), 36 to 47 months (9.8%), and 24 to 35 months

(8.73%), respectively. Comparing the wasting prevalence between boys and girls, boys were 2.5 times more wasted than girls (Table 1).

Table 1: Childhood wasting prevalence among under five children in Myanmar by age and gender (n=1,207)

Wasting status	Total	Yes		95% CI
		Number (n)	Percentage (%)	
Child's Gender				
Girl	567	36	6.35	4.61 to 8.68
Boy	640	98	15.31	12.72 to 18.32
Age				
6 to 11 months	222	25	11.26	7.71 to 16.15
12 to 23 months	257	33	12.84	9.27 to 17.53
24 to 35 months	229	20	8.73	5.70 to 13.17
36 to 47 months	255	25	9.80	6.70 to 14.12
48 to 59 months	244	31	12.70	9.07 to 17.52
Total	1,207	134	11.10	9.45 to 13.00

Children from three different geographical areas were included equally: 35.05% from coastal areas, 35.63% from hilly regions, and 30.32% from plain areas. The majority of children (84.59%) are exposed to indoor air pollution because their kitchens are located inside their homes. Most of the children's homes had washable floors, and their floors were made up of cement or wood.

Two-thirds of families with under five children had a small family size with less than five family members. The girl population was slightly higher than the boy population (53:47 girl-boy ratio). This study found that 3.35 percent of under-five children were born

before 37 weeks in labor. And 5.05% of children were born with less than 2.5 kg at birth. The majority of the studied under-five children population were firstborn children. In terms of birth interval, 11.10% of children were born before the age of three. Relating to mother's age, 43.58% of under-five children's mothers were under 30 years old, 46.31% were between 30 and 40 years old, and 10.11% were over 40 years old.

While the majority of under-five children's mothers' weight (71.83%) was under Asian women's average weight (<57.7 kg), only 37.20% of fathers weight was less than Asian men's average weight (<60.0 kg). In terms of

parent education level, 10.11% of mothers and 7.95% of fathers completed bachelor's degrees or higher education. In terms of contraceptive usage, 70.59 % used any type of contraceptive method for birth spacing.

For accessibility of drinking water services level, the majority of under-five children's households (68.44%) accessed at least basic drinking water services level, 59.57% were in safely managed sanitation services level, and 87.65% were accessing basic hygiene services level. 5.97% of total children's households faced water shortage problems in the summer. 18.31% of households were using toilets by sharing with others.

In terms of child feces disposal, 84.92% of total under-five children's households dispose of child feces safely, meaning that children use toilets or parents dispose of child feces into toilets. Only 15.08% of households dispose of child feces unsafely, meaning that they dispose of child feces into the drain, ditch, open field, or somewhere. While the majority of households with under five children (69.26%) disposed of garbage properly, proper waste water disposal was found only in 44.08% of households. For the systematic handwashing steps of mothers, only 64.87% of mothers washed their hands

with full steps of handwashing with soap and water.

More than 90% of under five children household had 17 to 25 food safety score. The main foods of 91.96% of children were rice and others, while 8.04% of children still eat breastmilk even after 6 months of age. In terms of eating frequency, 29.58% of under-five-year-old mothers fed their children more than four times per day. And this study found that 80.70% of children avoid some kinds of food purposefully.

Inadequate, problematic, adequate, and excellent sanitation health literacy levels of mothers were 17.98%, 21.79%, 53.11%, and 7.13%, respectively. The majority of under-five-year-old mothers (43.58%) had an adequate hygiene and health literacy level. Similarly, the nutrition and health literacy levels of the majority of mothers (71.78%) were adequate. In terms of disease occurrence in the last two weeks, 7.13 percent of under-five children had diarrhea, 4.23% suffered dysentery, and 3.98% got a worm infection. And 46.06% of total respondents reported taking health care services to relieve any kind of sickness within the last month (Table 2).

Table 2: Baseline characteristics of under five children of Myanmar (n=1,207)

Characteristics	Total (n=1,207)	
	Number (n)	Percentage (%)
Location		
Plain	366	30.32
Hilly	418	34.63
Coastal	423	35.05
Indoor air pollution		
No	186	15.41
Yes	1021	84.59
Washable floor (concrete or wood)		
Yes	1023	84.76
No	184	15.24
Family members		
Less than 5 family members	853	70.67
Equal or more than 5 family members	354	29.33
Child's gender		
Girl	567	46.98
Boy	640	53.02
Preterm labor (birth before 37 weeks)		
Yes	44	3.65
No	1163	96.35
Low birth weight (< 2.5 kg)		
Yes	61	5.05
No	1146	94.95
Birth interval		
Firstborn	588	48.72
< 3 years	134	11.10
> 3 years	485	40.18
Age of mother		
< 30 years	526	43.58
30-40 years	559	46.31
> 40 years	122	10.11
Mean (SD)	30.86	(± 6.03)
Median (Min:Max)	30	(15:51)
Mother's weight under ASIA average woman's weight (<57.7 kg)		
Yes	867	71.83
No	340	28.17
Father's weight in kg under ASIA average man's weight (<60.0 kg)		
Yes	449	37.20
No	758	62.80
Mother's education completed Bachelor degree at least		
Yes	122	10.11
No	1085	89.89
Father's education completed Bachelor degree at least		
Yes	96	7.95
No	1111	92.05
Contraceptive use before birth		
No	355	29.41
Yes	852	70.59
Drinking water services level		
At least basic water services level	826	68.44

Characteristics	Total (n=1,207)	
	Number (n)	Percentage (%)
Limited water services level	14	1.16
Unimproved water services level	134	11.10
Surface water services level	233	19.30
Sanitation services level		
Safely managed sanitation services level	719	59.57
Basic sanitation services level	80	6.63
Limited sanitation services level	221	18.31
Unimproved sanitation services level	100	8.29
Open defecation sanitation services level	87	7.20
Hygiene services level		
Basic hygiene services level	1058	87.65
Limited hygiene services level	49	4.06
No handwashing facility hygiene services level	100	8.29
Water scarcity at summer		
No	1135	94.03
Yes	72	5.97
Sharing use toilet with others		
No	986	81.69
Yes	221	18.31
Safe child feces disposal practice		
Yes	1025	84.92
No	182	15.08
Proper garbage disposal		
Yes	836	69.26
No	371	30.74
Proper domestic used water disposal		
Yes	532	44.08
No	675	55.92
Handwashing steps of Mother		
4-7 steps	783	64.87
Less than 4 steps	424	35.13
Food safety score		
< 17 scores	99	8.20
From 17 to 24 scores	1108	91.80
Food staple		
Rice or others	1,110	91.96
Breastmilk	97	8.04
Minimum dietary diversity		
Diet diversity at least 4	706	58.49
Diet diversity less than 4	501	41.51
Eating frequency		
Eating < 4 times per day	850	70.42
Eating ≥ 4 times per day	357	29.58
Avoiding some kinds of food		
No	974	80.70
Yes	233	19.30
Health literacy level for sanitation		
Inadequate	217	17.98
Problematic	263	21.79
Adequate	641	53.11
Excellent	86	7.12

Characteristics	Total (n=1,207)	
	Number (n)	Percentage (%)
Health literacy level for hygiene		
Inadequate	326	27.01
Problematic	283	23.45
Adequate	526	43.58
Excellent	72	5.96
Health literacy level for nutrition		
Inadequate	211	17.48
Problematic	298	24.69
Adequate	625	51.78
Excellent	73	6.05
Have diarrhea in past two week		
No	1121	92.87
Yes	86	7.13
Have dysentery in past two weeks		
No	1156	95.77
Yes	51	4.23
Have worm infection in past two weeks		
No	1159	96.02
Yes	48	3.98
Get health care services for any sickness within a month		
No	651	53.94
Yes	556	46.06

Association of unsafe child feces disposal practice and childhood: Multivariable analysis

After controlling for confounding factors with backward elimination, multivariable analysis revealed that child feces disposal, water shortage, hand washing steps of the mother, geolocation, gender of children, birth interval, and eating frequency were factors associated with wasting among children under the age of five in Myanmar.

In terms of WASH practices, children from families with poor child excrement disposal were nearly twice as likely as other children to be wasting (AOR=1.94, 95%CI=1.22 to

3.09, p-value = 0.005). Children who lived in water-stressed areas, on the other hand, have a higher risk of wasting than those who lived in non-water-stressed areas (AOR = 2.17, 95% CI = 1.13 to 4.16, p-value = 0.02). Moreover, children whose mother washed her hand less than 4 of the handwashing steps were more likely to waste than the children whose mother used 4–7 steps for handwashing practices (AOR = 3.20, 95% CI = 1.93–5.32, p-value <0.001). Children from hilly areas were more likely to waste about 2.3 times more (AOR = 2.27, 95% CI = 1.53 to 3.37, p-value <0.001) than children from plain and coastal areas. In terms of the gender component linked with wasting, boys were

2.8 times more likely than girls to be wasted (AOR=2.80, 95%CI=1.86 to 4.23, p-value <0.001). Moreover, children with a birth interval of more than 3 years were more likely to be wasted than other children's birth intervals of less than 3 years (AOR = 1.84,

95% CI = 1.10 to 3.11, p-value <0.001). Furthermore, children who ate more than four times per day were twice as likely as children who ate less (AOR = 3.19, 95% CI = 1.93 to 5.27, p value <0.001) to squander (Table 3).

Table 3: Factors associated with wasting among under five children (n=1,207)

Variable	Total (No.)	Wasting (%)	Crude OR	Adjusted OR	95% CI	P-value
Safe Child feces disposal						
Yes	1025	10.15	1	1		
No	182	16.48	1.75	1.94	1.22 to 3.09	0.005
Water shortage						
No, water shortage	1135	10.57	1	1		
Yes, at least once	72	19.44	2.04	2.17	1.13 to 4.16	0.02
Handwashing steps of Mother						
4-7 steps	783	9.58	1	1		
Less than 4 steps	424	13.92	1.52	3.20	1.93 to 5.32	<0.001
Geolocation						
Plain and coastal	789	9.00	1	1		
Hilly	418	15.07	1.79	2.27	1.53 to 3.37	<0.001
Child's Gender						
Girl	567	6.35	1	1		
Boy	640	15.31	2.67	2.80	1.86 to 4.23	<0.001
Birth interval						
First child and more than 3 years	1073	10.34	1	1		
Less than 3 years	134	17.16	1.80	1.84	1.10 to 3.11	0.02
Eating times						
Less than 4 times	850	9.53	1	1		
4 times and more	357	14.85	1.65	3.19	1.93 to 5.27	<0.001

4. Discussion

Wasting in children refers to a disorder in which children are abnormally thin for their height. It is the most obvious and potentially fatal form of malnutrition. Severe wasting reduces children's immune systems, leaving them vulnerable to sickness, developmental

delays, and mortality. Wasting increases the risk of imminent death as well as the chance of long-term detrimental implications for development.

This study discovered that improper child feces disposal, experiencing water scarcity, unsystematic handwashing practices of the

mother, residing in hilly regions, male gender type, birth interval less than 3 years, and eating more than 4 times were all connected with childhood wasting in Myanmar.

In terms of water, sanitation, and hygiene (WASH) practices, this study investigated whether improper child feces disposal, such as rinsing feces into drains, throwing feces into garbage, leaving feces in open, and using as manure, was a risk factor for childhood wasting. Children from poor child feces disposal families were about twice as likely as other children to waste. Bauza's study on 34 nations using DHS survey data from 2005 to 2014 discovered that kid feces disposal was connected with lower levels of underweight and wasting [7]. This study's findings supported previous studies on the association between children's excrement disposal practices and childhood waste.

Water is the most important source of cleanliness and nutrition for children. This study discovered that water stress was a predictor of wasting among children under the age of five in Myanmar. Children living in water-stressed areas were twice as likely to waste as children living in water-rich areas. A previous Ethiopian study similarly demonstrated the usefulness of better water

reducing childhood malnutrition [8]. A number of studies [9] have demonstrated the link between water quality and child malnutrition. However, this study emphasized the necessity of water quantity for year-round access to water.

Handwashing with water and soap is the best and simplest technique to prevent illness and infection. This study discovered that children whose moms handwashed less than four steps were more likely to waste than children whose mothers handwashed four to seven steps. The role of handwashing in malnutrition was also discovered in a Nepal study [10], which found that hand washing with soap and water in the family might enhance weight for height score by 0.13. This study investigated the impact of mothers' systematic hand washing on childhood wasting.

Residential location of children was a significant factor in childhood wasting. This study found that hilly region dwellers were two times more likely to be wasting than plain and coastal area resident children in Myanmar. This study finding fulfilled the previous study of Timor Leste [11], showing that rural urban differences and provincial differences were the determinants of

childhood wasting. In Ghana, the Darteh study [12] discovered that regional variation was a major associated factor for childhood wasting. If the area differed, the behavior, culture, environment, and lifestyle would also alter, resulting in a distinct wasting prevalence.

Furthermore, this study discovered that boys were 2.8 times more likely than girls to waste. A similar link was discovered in research conducted in Bangladesh and Timor Leste [11, 13]. These studies found that girls were less likely than boys to waste. Furthermore, the study discovered that having children within a three-year interval was a risk factor for childhood wasting. According to a study conducted in Ghana [14], children with birth intervals of less than one year were four times more likely to be wasting than first children. In terms of the eating time and wasting link, this study discovered that eating four or more times per day was a risk factor for kid wasting. One Chinese study [15] investigated the relationship between eating habits and children's waste. Furthermore, the Mexican study [16] revealed the eating pattern and undernutrition in children. There had been no previous research on the relationship between eating times and childhood waste.

This was the first study to identify the childhood wasting prevalence of under-five children in Myanmar after the 2016 Demographic Health Survey report. And this study examined the association between unsafe child feces disposal practices and the childhood wasting of Myanmar children. Thus, the results of this study were the reference findings for further studies on childhood malnutrition. And the evidence-based recommendations of this study will be helpful for the planning of a childhood nutrition development program. Moreover, this study highlighted the need to promote safe childhood disposal among under five children's families. That finding will be strong advocacy for policymakers for promoting safe child feces promotion practices in child nutritional development programs.

5. Conclusion

The wasting prevalence among under-five children in Myanmar from this study was higher than the JME estimate for Myanmar and also higher than the Southeast Asia average. Unsafe child feces disposal practices of mothers were significantly associated with childhood wasting among under-five children in Myanmar. Other

WASH factors water scarcity and a mother's hand washing with less than seven steps were also associated with childhood wasting. Moreover, living in hilly regions, male gender, a less than 3-year birth interval, and a lower feeding frequency were all significant predictors of childhood wasting. Promoting safe child feces disposal practices, promoting accessible water supply at home year-round, promoting seven-step hand washing practices, paying attention to the nutritional program in hilly areas, promoting birth spacing, and providing health education for child feeding frequency could be helpful to reduce childhood wasting among under-five children in Myanmar.

Based on the study's findings, the following evidence-based recommendations were made to mitigate the wasting prevalence among under-five children: i) To promote the safe child feces disposal practice among mothers; ii) To promote the accessibility of drinking

water at home for twenty-four seven; iii) To provide the health education sessions for mothers to promote systematic hand washing practices; iv) To emphasize the nutrition promotion program in hilly areas than others; v) To provide health education to mothers for feeding frequency to under five children; vi) To educate mothers for birth spacing; and vii) To conduct operational research or experimental studies to be the strong evidence for the association of child feces disposal practice and childhood wasting.

Acknowledgement

We would like to express our sincere thanks to all participants, mothers and children, for their participation and providing information on this study. And the authors are pleased to acknowledge all local administrators, village leaders, and basic health staff for their support in the data collection for this study.

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