EdinBurg Peer-Reviewed Journals and Books Publishers
Journal of Medicine, Nursing and Public Health
Vol. 6||Issue 6||pp 12-31||June||2026
Email: info@edinburgjournals.org||ISSN: 3105-3394

Determinants of Nutritional Status Among Children Under Five Years of Age Admitted in Princess Marina Hospital, Botswana

Ditiro Acts Chere[1*], Sarah T. Bett[1], Regina Kamuhu[1], James Ndambuki[1]
[1]Food, Nutrition and Dietetics Department, School of Health Sciences, Kenyatta University
*Corresponding author email: chereditiro@gmail.com

Accepted: 23 April 2026 || Published: 01 June 2026

Abstract

The study sought to assess the determinants of nutritional status among children under 5 years of age admitted to Princess Marina Hospital in Botswana. The study specifically sought to determine the dietary practices of 0-59-month-old children admitted to PMH, assess their nutritional status, and identify predictors of that status. This study assessed the nutritional status and associated factors among children aged 0-59 months admitted to Princess Marina Hospital (PMH). A cross-sectional, hospital-based approach was employed, integrating quantitative data from structured questionnaires and anthropometric measurements with qualitative insights from caregiver interviews. Statistical analyses included descriptive summaries, chi-square tests, and logistic regression to identify predictors of malnutrition. The study examined the dietary practices of children aged 0-59 months admitted to PMH. Feeding behaviors were the strongest predictors of nutritional outcomes. Early initiation of breastfeeding, maintaining a minimum meal frequency, and achieving a minimum acceptable diet were protective factors against both stunting and underweight. These results emphasize the importance of promoting optimal infant and young child feeding practices to support healthy growth and development. The evaluation showed a considerable burden of stunting, wasting, and underweight among children admitted to PMH. More than two out of five children were stunted, underweight prevalence surpassed 60% in certain age categories, and wasting was mainly observed among younger children and those with low birthweight. Weight-for-Age Z scores (WAZ) proved to be the most comprehensive indicator, as they reflect both short-term and long-term influences on child growth. Strengthen caregiver education on infant and young child feeding through targeted training and community workshops. Promote exclusive breastfeeding and dietary diversity to improve nutritional outcomes.

Keywords: *Child nutrition, malnutrition, stunting, wasting, underweight, socio-demographic factors, Princess Marina Hospital, Botswana*

How to Cite: Chere, D. A., Bett, S. T., Kamuhu, R., & Ndambuki, J. (2026). Determinants of Nutritional Status Among Children Under Five Years of Age Admitted in Princess Marina Hospital, Botswana. *Journal of Medicine, Nursing and Public Health, 6*(6), 12-31.

1. Introduction

Malnutrition is caused by a variety of complex factors that operate at multiple levels. Inadequate maternal and childcare practices, restricted access to healthcare services, and bad living conditions are among the underlying dangers, whereas poor nutritional intake and disease are immediate causes. At a broader level, poverty, low literacy, and unequal resource distribution play a role, with cultural norms and household dynamics further influencing child nutrition outcomes (WHO, 2024; Arpadi & Ruel, 2023).

The effects of malnutrition are profound and long-lasting. Children affected often face weakened immunity, increased vulnerability to infections, impaired growth, and reduced physical and cognitive capacity. Chronic malnutrition perpetuates poverty by limiting educational achievement and future productivity, while also placing heavy economic demands on healthcare systems and national development (WHO, 2024; Bhutta et al., 2022).

Although risk factors such as poverty, infections, and limited access to healthcare are well documented, there remains a limited understanding of local socioeconomic and cultural contributors to protein-energy malnutrition (PEM). Research in Botswana and other sub-Saharan African countries emphasizes the importance of examining family structures, caregiving practices, and community environments alongside biomedical determinants (Satapathy et al., 2021). In regions with high HIV prevalence, traditional drivers such as poor diet, parental deprivation, illness, and poverty remain the dominant causes of stunting, even when HIV increases vulnerability (Saloojee et al., 2017).

Closing this knowledge gap is essential to nursing practice, as nurses are frontline caregivers who play a central role in assessing, intervening in, and preventing malnutrition. Identifying socio-cultural and economic factors specific to Botswana can inform culturally appropriate, context-sensitive strategies, ultimately improve child health outcomes, and reduce malnutrition-related complications (Philips, 2023; Arpadi & Ruel, 2023).

1.1 Problem Statement

Child malnutrition, particularly among those under five years of age, continues to be a serious public health issue in Botswana. National statistics indicate that approximately 10.5% of children are affected, with stunting rates surpassing 30% in certain districts (Statistics Botswana, 2020). On the global stage, UNICEF's *State of the World's Children 2023: For Every Child, Nutrition* report underscores that malnutrition remains a major driver of childhood illness and death, posing a significant barrier to achieving the Sustainable Development Goals (SDGs).

At Princess Marina Hospital (PMH), the country's main referral facility, the pediatric ward regularly manages cases of moderate-to-severe malnutrition. Hospital records show that between January and December 2023, the ward admitted 2,404 children, with malnutrition accounting for a notable share of admissions among children under 5. These cases are often complicated by conditions such as diarrhea, pneumonia, and anemia, which prolong hospital stays and increase the risk of fatal outcomes.

The persistence of malnutrition is closely linked to socio-economic realities. Caregiver unemployment, single parenthood, and limited educational attainment negatively affect feeding practices, dietary diversity, and timely access to healthcare. These challenges contribute to poor nutritional outcomes and delayed treatment. Despite the scale of the problem, there is limited hospital-based evidence on the underlying determinants of malnutrition. While admission figures highlight the burden, they do not explain the root causes. Without context-specific data, interventions risk being generic, misdirected, and less effective.

1.2 Broad Objective

To assess the determinants of nutritional status among children under five years of age admitted to Princess Marina Hospital, Botswana.

1.2.1 Specific objectives

i. To determine the dietary practices of 0-59-month-old children admitted to PMH.

ii. To determine the nutritional status of 0-59 months old children admitted at PMH.

iii. To determine the predictors of nutritional status among children aged 0-59 months admitted at PMH.

2. Literature Review

2.1 Dietary Practices and Nutritional Status

Dietary practices during infancy and early childhood are fundamental in shaping nutritional status and long-term health outcomes. Exclusive breastfeeding, timely introduction of complementary foods, and adherence to recommended feeding indicators, such as minimum meal frequency and dietary diversity, are essential for optimal growth and development. Evidence indicates that gaps in these practices contribute significantly to malnutrition among children under five, particularly in low- and middle-income countries (UNICEF, WHO, & World Bank, 2023).

Exclusive breastfeeding for the first six months supplies infants with vital nutrients and immune protection. Infants breastfed exclusively for the recommended duration show lower infection risk and improved growth compared with those introduced to other foods earlier (Arpadi & Ruel, 2023). Introducing solid foods before six months has been linked to diarrhea and malnutrition, while delaying introduction beyond six months may lead to nutrient deficiencies and growth faltering. Appropriate complementary feeding ensures a smooth transition from breastmilk to family foods without compromising nutritional status (UNICEF, WHO, & World Bank, 2023).

Early initiation of breastfeeding and provision of colostrum deliver critical antibodies and nutrients that protect infants against infections. Studies show that infants who receive colostrum have stronger immunity and reduced risk of early childhood illnesses (Arpadi & Ruel, 2023). Breastfeeding initiation itself remains a key global indicator of maternal and child health practices (UNICEF, WHO, & World Bank, 2023).

The World Health Organization and UNICEF recommend that children aged 6–23 months receive meals at least two to three times daily, with frequency increasing as they grow. Meeting this minimum meal frequency (MMF) is associated with reduced risks of undernutrition and improved energy intake (Arpadi & Ruel, 2023). The minimum acceptable diet (MAD), which combines meal frequency and dietary diversity, is strongly linked to adequate nutrient intake. Children who meet MAD are less likely to be stunted or wasted, whereas failure to meet this standard is associated with poor growth outcomes (UNICEF, WHO, & World Bank, 2023). Dietary diversity, defined by the number of food groups consumed, is a strong predictor of micronutrient adequacy. Diverse diets reduce risks of stunting and underweight, while monotonous diets dominated by staples often fail to meet nutrient requirements (Arpadi & Ruel, 2023).

Taken together, exclusive breastfeeding, timely complementary feeding, colostrum provision, breastfeeding initiation, and adherence to MMF and MAD standards form the foundation of optimal dietary intake for young children. Failure to meet these practices increases the risk of malnutrition, illness, and impaired development. Addressing gaps in infant and young child feeding practices is therefore essential for improving nutritional status and achieving global child health targets.

2.2 Child Health and Nutritional Status

Child health indicators, including birth outcomes, illness episodes, and preventive interventions, are closely tied to nutritional status. Low birthweight, recurrent infections, and gaps in immunization or supplementation programs increase vulnerability to stunting, wasting, and underweight. Preventive measures such as vitamin A supplementation and deworming are essential for breaking the cycle between poor health and malnutrition (UNICEF, WHO, & World Bank, 2023).

Birthweight is a key determinant of early growth and survival. Infants born with low birthweight face higher risks of stunting and wasting due to limited nutrient reserves and greater susceptibility to infections. Ensuring adequate maternal nutrition and antenatal care is therefore critical for improving child nutritional outcomes (Arpadi & Ruel, 2023). Frequent illnesses such as diarrhea and respiratory infections impair nutrient absorption and increase metabolic demands, leading to growth faltering. Children experiencing recurrent illness are more likely to suffer from undernutrition, creating a vicious cycle between poor health and inadequate nutrition (UNICEF, WHO, & World Bank, 2023).

Immunization reduces the burden of infectious diseases that contribute to malnutrition. Evidence shows that fully immunized children achieve better growth outcomes, underscoring the importance of vaccination coverage in child health strategies (Arpadi & Ruel, 2023). Vitamin A supplementation has been shown to lower child mortality and strengthen immune function, particularly in populations where deficiency is common. Compliance with supplementation programs is therefore vital for protecting children against infections and supporting growth (UNICEF, WHO, & World Bank, 2023). Deworming programs targeting soil-transmitted helminths also improve nutritional status by reducing parasite-related nutrient losses and enhancing growth. Children who receive regular deworming are less likely to experience anemia and growth faltering (Arpadi & Ruel, 2023).

Taken together, these health factors emphasize the importance of integrating nutrition interventions with broader child health strategies. Addressing low birthweight, preventing illness, and ensuring access to immunization, vitamin A supplementation, and deworming programs are essential for improving child survival and nutritional well-being. Strengthening preventive health services alongside nutrition programs offers the most sustainable pathway to reducing child malnutrition.

2.3 Health Services and Nutritional Status

Health service utilization is a critical determinant of child nutritional outcomes, as timely access to preventive and curative care reduces morbidity and supports growth. Quality health services ensure appropriate diagnosis, treatment, and preventive interventions, while barriers such as distance or poor service quality increase risks of stunting and wasting. Understanding how access to health services interacts with child nutrition is essential for designing integrated interventions (UNICEF, WHO, & World Bank, 2023).

Children from households with better access to quality health services are less likely to suffer from stunting and wasting compared to those with limited or poor-quality care. Availability of skilled personnel, essential medicines, and functional facilities directly influences nutritional outcomes (Arpadi & Ruel, 2023).

Birthplace is an important factor in child nutrition. Children delivered in health facilities are more likely to benefit from skilled attendance, early initiation of breastfeeding, and postnatal counseling, thereby improving nutritional outcomes. Conversely, home deliveries often limit access to immediate health interventions and increase risks of poor feeding practices and growth faltering (UNICEF, WHO, & World Bank, 2023).

Immunization reduces the burden of infectious diseases that contribute to malnutrition. Fully immunized children are less likely to experience growth faltering, highlighting the importance of vaccination coverage in improving nutritional outcomes (Arpadi & Ruel, 2023).

Prompt management of common childhood diseases such as diarrhea, pneumonia, and malaria prevents nutrient loss and supports recovery. Children who receive timely treatment are less likely to experience prolonged illness episodes that compromise nutritional status (UNICEF, WHO, & World Bank, 2023).

Distance to health facilities influences service utilization. Long travel times and high transport costs often discourage caregivers from seeking care, leading to delayed treatment and missed preventive interventions. Children living farther from health facilities are at higher risk of undernutrition due to reduced access to essential services (Arpadi & Ruel, 2023).

In summary, health services play a decisive role in shaping child nutritional outcomes. Access to quality care, skilled delivery, immunization, timely treatment of illness, and proximity to health facilities all interact to determine risks of stunting, wasting, and underweight. Addressing child malnutrition, therefore, requires strengthening health systems to ensure equitable access to preventive and curative services and to nutrition-specific interventions.

2.4 Conceptual Framework

The conceptual Framework for this study is shown in Figure 1.

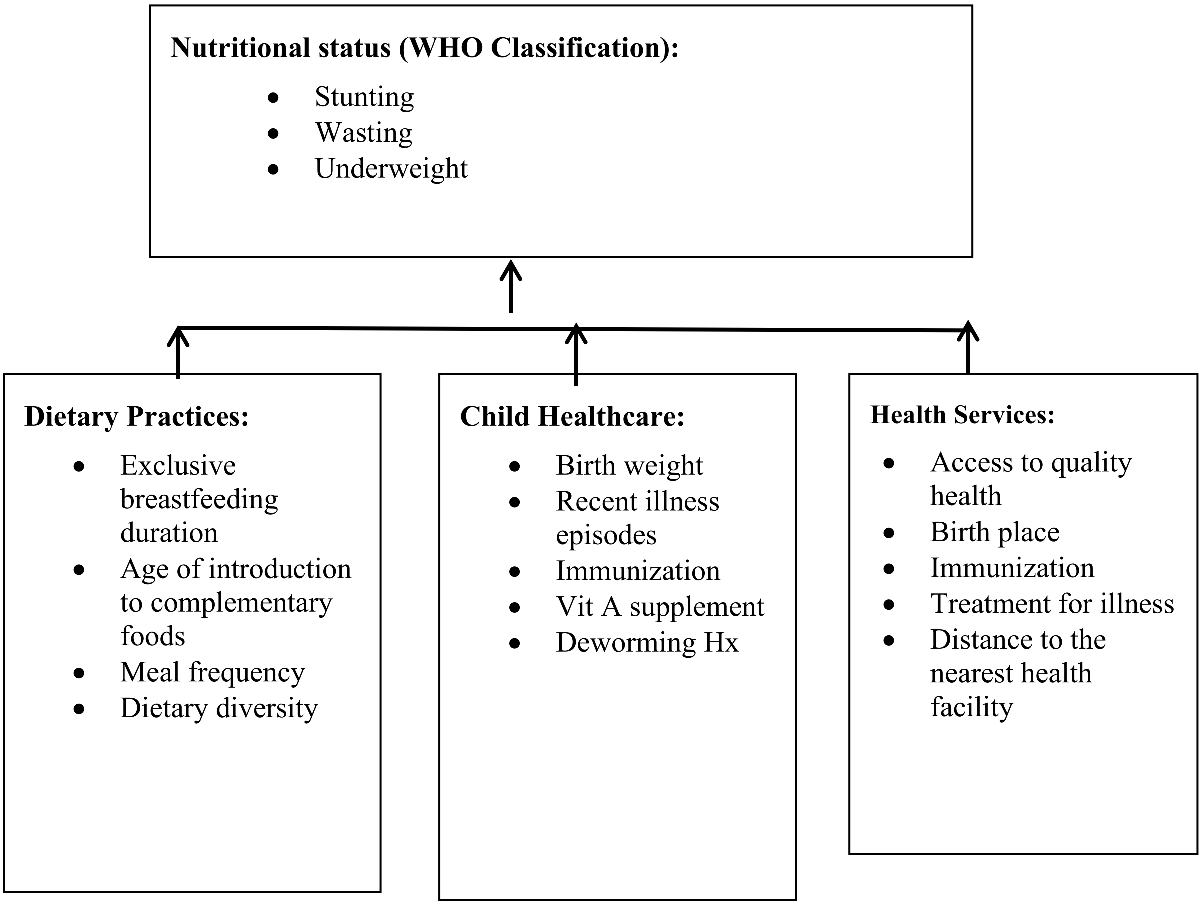

Figure 1: The UNICEF Conceptual Framework for Child Survival, Growth, and Development, adapted and modified (UNICEF, 2021)

3. Methodology

A hospital-based analytical cross-sectional design was employed to capture a snapshot of the nutritional status of children under five admitted to Princess Marina Hospital (PMH) and to examine its key determinants at a single point in time. The study population comprised children under five years of age admitted to Princess Marina Hospital with a clinical diagnosis of malnutrition. These admissions were specifically for the management and treatment of malnutrition, making this group appropriate for investigating the determinants influencing nutritional status. Selecting hospitalized children ensured that the study focused on cases with clinically confirmed malnutrition, thereby strengthening the validity of the findings (Statistics Botswana, 2018; UNICEF, 2023). Study participants were recruited using a sequential sampling strategy. During the study period, caregivers of children under five who were admitted to Princess Marina Hospital (PMH) and had a clinical diagnosis of malnutrition were eligible to participate. Consecutive sampling was considered appropriate in this hospital-based

EdinBurg Peer-Reviewed Journals and Books Publishers
Journal of Medicine, Nursing and Public Health
Vol. 6||Issue 6||pp 12-31||June||2026
Email: info@edinburgjournals.org||ISSN: 3105-3394

context because it enabled the systematic enrollment of all eligible cases until the required sample size was reached, thereby reducing the risk of selection bias (Etikan & Bala, 2017).

In total, 151 caregivers were enrolled, and anthropometric assessments were conducted on the admitted children to determine their nutritional status. The sample size was determined by the number of eligible admissions during the study period, ensuring adequate representation of malnutrition cases in the hospital setting (Statistics Botswana, 2018; UNICEF, 2023). Data collection combined a structured interviewer-administered questionnaire with standardized anthropometric assessments. Data analysis was conducted using SPSS version 28 (IBM Corp., 2023). The data were summarized using descriptive statistics, including means, standard deviations, and frequencies.

4. Results

4.1. Dietary Practices of 0–59 Months Old Children Admitted at PMH

4.1.1 Ever Breastfed (EvBF)

Out of 90 children assessed, 92.2% had ever been breastfed, while 7.8% had not. Among males, 94.2% had ever breastfed compared to 89.5% of females.

4.1.2 Early Initiation of Breastfeeding (EIBF)

Among 90 children, 66.7% were put to the breast within the first hour, 25.6% within the first day (1-24 hours), 5.6% were never put to the breast, and 2.2% of caregivers were unsure. By gender, 73.1% of males and 57.9% of females were initiated within the first hour.

4.1.3 Colostrum Feeding

Of 88 children assessed, 92% received colostrum, while 8% did not. Among males, 94.2% received colostrum compared to 88.9% of females.

4.1.4 Exclusive Breastfeeding (EBF)

All 12 children assessed for exclusive breastfeeding (100%) were not exclusively breastfed. This included 5 males and 7 females.

4.1.5 Continued Breastfeeding (CBF)

Among 38 children aged 12–23 months, 17.9% were still breastfeeding, while 82.1% were not. By gender, 15.4% of males and 23.1% of females continued breastfeeding.

4.1.6 Introduction of Solid, Semi-Solid, or Soft Foods (ISSSF)

Of 16 children assessed, 50% had been introduced to solid, semi-solid, or soft foods, while 50% had not. Among males, 71.4% had been introduced compared to 33.3% of females.

4.1.7 Minimum Dietary Diversity (MDD)

Among 78 children, 98.7% met the minimum dietary diversity requirement, while 1.3% did not. By gender, 97.9% of males met MDD criteria, compared with 0% of females (100% did not meet them).

4.1.8 Minimum Meal Frequency (MMF)

Of 78 children, 20.5% met the minimum meal frequency requirement, while 79.5% did not. Among males, 21.3% met MMF, compared with 19.4% among females.

EdinBurg Peer-Reviewed Journals and Books Publishers
Journal of Medicine, Nursing and Public Health
Vol. 6||Issue 6||pp 12-31||June||2026
Email: info@edinburgjournals.org||ISSN: 3105-3394

4.1.9 Minimum Acceptable Diet (MAD)

Among 78 children, 19.2% met the minimum acceptable diet, while 80.8% did not. By gender, 21.3% of males met MAD compared to 16.1% of females.

4.1.10 Individual Dietary Diversity Score (IDDS)

All 61 children assessed (100%) had a high dietary diversity score (≥6 food groups). This included 34 males and 27 females.

Overall, the findings demonstrate strong breastfeeding initiation and colostrum feeding practices, but reveal major deficiencies in exclusive breastfeeding, continued breastfeeding, meal frequency, and acceptable diet, despite relatively high dietary diversity scores (Table 1).

Table 1: Dietary practices of 0-59 months old children admitted at PMH

Variable	N: overall; male; females	Category	Overall		Males		Females	
			Freq	%	Freq	%	Freq	%
EvBF	90; 52; 37	No	7	7.8	3	5.8	4	10.5
		Yes	83	92.2	49	94.2	34	89.5
EIBF	90; 52; 38	Immediately (within first hour)	60	66.7	38	73.1	22	57.9
		within first day (1-24 hours)	23	25.6	12	23.1	11	28.9
		never put to the breast	5	5.6	2	3.8	3	7.9
		DNK (not sure)	2	2.2	-	-	2	5.3
Colostrum feeding	88; 52; 36	No	7	8.0	3	5.8	4	11.1
		Yes	81	92.0	49	94.2	32	88.9
EBF	12; 5; 7	No	12	100	5	100	7	100
CBF	38; 26; 13	No	31	82.1	22	84.6	10	76.9
		Yes	7	17.9	4	15.4	3	23.1
Met ISSSF	16; 7; 9	No	8	50.0	2	28.6	6	66.7
		Yes	8	50.0	5	71.4	3	33.3
Met MDD	78; 47; 31	No	1	1.3	1	2.1	31	100.0
		Yes	77	98.7	46	97.9	-	-
Met MMF	78;4 7; 31	No	62	79.5	37	78.7	25	80.6
		Yes	16	20.5	10	21.3	6	19.4
Met MAD	78; 47; 31	No	63	80.8	37	78.7	26	83.9
		Yes	15	19.2	10	21.3	5	16.1
IDDS Cat.	61; 34; 27	High DDS (>= 6)	61	100	34	100.0	27	100.0

Note. ISSSF = Introduction of solid, semi-solid, or soft foods; MDD = Minimum dietary diversity; MMF = Minimum meal frequency; MAD = Minimum acceptable diet; IDDS = Individual dietary diversity score; EvBF = Ever breastfed; EIBF = Early initiation of breastfeeding; EBF = Exclusive breastfeeding; CBF = Continued breastfeeding.

EdinBurg Peer-Reviewed Journals and Books Publishers
Journal of Medicine, Nursing and Public Health
Vol. 6||Issue 6||pp 12-31||June||2026
Email: info@edinburgjournals.org||ISSN: 3105-3394

4.1.11 Mean dietary diversity scores of the study children

The minimum dietary diversity (MDD) was assessed among 78 children (47 males and 31 females). The overall mean MDD score was 6.87 (SD = 0.92), with a range of 4–8 food groups. Male children had a mean score of 6.79 (SD = 0.91), while females had a slightly higher mean of 7.00 (SD = 0.93). The individual dietary diversity score (IDDS) was measured among 61 children (34 males and 27 females). The overall mean IDDS was 7.82 (SD = 0.47), with a range of 6–8 food groups. Scores were nearly identical across gender, with males averaging 7.82 (SD = 0.45) and females 7.81 (SD = 0.48). Overall, the findings indicate that dietary diversity among the study children was relatively high, with both MDD and IDDS scores approaching the upper end of the possible range of food groups, and minimal differences observed between male and female children (Table 2).

Table 2: Mean dietary diversity of the study children

Indicator	N: overall; male; females	Mean+SD [Min – Max]		
		overall	Males	Female
MDD	78; 47; 31	6.87+0.92 [4 – 8]	6.79+ 0.907 [4 – 8]	7.00+ 0.931 [5 – 8]
IDDS	61; 34; 27	7.82+0.47 [6 – 8]	7.82+0.45 [6 – 8]	7.81+0.48 [6 – 8]

4.2 Nutritional Status of Study Children

4.2.1 Prevalence of acute malnutrition (Wasting)

The analysis reveals a high prevalence of acute malnutrition **a**mong study children. Nearly half of all children (46.7%) are classified as acutely malnourished (global acute malnutrition, or GAM), and severe acute malnutrition (SAM) affects 29.3% of children, indicating a serious public health concern. Boys show a slightly higher prevalence of GAM (49.4%) compared to girls (43.1%), though the 95% confidence intervals overlap, suggesting this difference may not be statistically significant. Moderate acute malnutrition (MAM) is more prevalent in boys (22.4%) than in girls (10.8%). The non-overlapping confidence intervals suggest this difference is likely significant. Severe acute malnutrition (SAM) is higher among girls (32.3%) than among boys (27.1%), but, again, overlapping confidence intervals indicate uncertainty about this difference (Table 3).

Table 3: Prevalence of Acute Malnutrition (Wasting) based on weight-for-height z-scores (and/or oedema) and by sex

	All, N=151 n (%) [95% CI]	Boys, N=85 n (%) [95% CI]	Girls, N=65 n (%) [95% CI]
Prevalence of global malnutrition (<-2 z-score and/or oedema)	70 (46.7) [38.9 - 54.6]	42 (49.4) [39.0 - 59.8]	28 (43.1) [31.8 - 55.2]
Prevalence of moderate malnutrition (<-2 z-score and ≥ -3 z-score, no oedema)	26 (17.3) [12.1 - 24.2]	19 (22.4) [14.8 - 32.3]	7 (10.8) [5.3 - 20.6]
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	44 (29.3) [22.6 - 37.1]	23 (27.1) [18.8 - 37.3]	21 (32.3) [22.2 - 44.4]

NB: The prevalence of oedema is 0.0 %

4.2.2 Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema

Most Vulnerable Group (6-17 months): This age bracket exhibits the most severe crisis. The SAM rate is alarmingly high at 39.7%, and the GAM rate (SAM ± MAM) reaches 47.6%. This means nearly half of all infants and young toddlers in this group are acutely malnourished, with the majority of cases being severe. High-Risk Group (18-29 months): Malnutrition remains highly prevalent, with a GAM rate of 46.7%. While the SAM rate (26.7%) is lower than in the youngest group, it remains critically high. Apparent Decline (30-41 months): A notable improvement is seen in this preschool age group. The SAM rate drops sharply to 12.5%, and the GAM rate is 33.3%. This suggests a potential recovery or reduced vulnerability after the critical weaning and early feeding period. Concerning Resurgence (42-59 months): The data indicate a worsening of nutritional status in older preschool children. The combined groups (42-59 months) show high GAM rates (62.5% for 42-53 months and 60% for 54-59 months), driven largely by a high prevalence of Moderate Wasting. Caution is advised in interpreting the 54–59-month group due to the very small sample (N=5) (Table 4).

EdinBurg Peer-Reviewed Journals and Books Publishers
Journal of Medicine, Nursing and Public Health
Vol. 6||Issue 6||pp 12-31||June||2026
Email: info@edinburgjournals.org||ISSN: 3105-3394

Table 4: Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema

		Severe wasting		Moderate wasting		Normal		Oedema	
		(<-3 z-score)		(>= -3 and <-2 z-score)		(> = -2 z score)			
Age (mo)	**Total no.**	**freq.**	**%**	**Freq**	**%**	**freq**	**%**	**freq**	**%**
17-Jun	63	25	39.7	5	7.9	33	52.4	0	0
18-29	30	8	26.7	6	20	16	53.3	0	0
30-41	24	3	12.5	5	20.8	16	66.7	0	0
42-53	16	3	18.8	7	43.8	6	37.5	0	0
54-59	5	1	20	2	40	2	40	0	0
Total	138	40	29	25	18.1	73	52.9	0	0

4.2.3 Prevalence of Chronic Malnutrition (stunting)

The data reveal an extremely high and critical prevalence of chronic malnutrition (stunting) among the study population. Overall, 60.9% of children are stunted (height-for-age <-2 z-score). More than half (55.4%) are severely stunted, and the burden is similarly high for both sexes, though notable differences exist in the severity profile. Severe stunting affects 33.8% of all children, a rate that is itself critically high. Boys have a higher prevalence of severe stunting (38.4%) compared to girls (27.7%). While the confidence intervals slightly overlap, the 10.7-percentage-point difference suggests that boys are more likely to experience the most extreme form of growth failure. Girls have a higher prevalence of moderate stunting (32.3%) compared to boys (23.3%). The non-overlapping confidence intervals for moderate stunting indicate this difference is more robust (Table 5).

Table 5: Prevalence of stunting based on height-for-age z-scores and by sex

	All, N = 151 **n (%) [95% CI]**	Boys, N = 86 **n (%) [95% CI]**	Girls, N = 65 **n (%) [95% CI]**
Prevalence of stunting (<-2 z-score)	92 (60.9) [53.0 - 68.3]	53 (61.6) [51.1 - 71.2]	39 (60.0) [47.9 - 71.0]
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	41 (27.2) [20.7 - 34.7]	20 (23.3) [15.6 - 33.2]	21 (32.3) [22.2 - 44.4]
Prevalence of severe stunting (<-3 z-score)	51 (33.8) [26.7 - 41.6]	33 (38.4) [28.8 - 48.9]	18 (27.7) [18.3 - 39.6]

4.2.4 Prevalence of stunting by age based on height-for-age z-scores

The prevalence of stunting by age group is shown in Table 6. Among children aged 6–17 months, 34.4% were severely stunted, 25.0% moderately stunted, and 40.6% within the normal range. In the 18–29-month age group, 16.7% were severely stunted, 26.7% moderately stunted, and 56.7% normal. For children aged 30–41 months, 37.5% were severely stunted, 25.0% moderately stunted, and 37.5% normal. Among those aged 42–53 months, 56.3% were severely stunted, 25.0% moderately stunted, and 18.8% normal. In the oldest age group (54–59 months), 40.0% were severely stunted, 40.0% moderately stunted, and 20.0% normal. Overall, 33.8% of children were severely stunted, 25.9% moderately stunted, and 40.3% were within the normal range.

Table 6: Prevalence of stunting by age based on height-for-age z-scores

		Severe stunting (<-3 z-score)		Moderate stunting (>= -3 and <-2 z-score)		Normal (> = -2 z score)	
Age (mo)	**Total no.**	**Freq**	**%**	**Freq**	**%**	**Freq**	**%**
17-Jun	64	22	34.4	16	25	26	40.6
18-29	30	5	16.7	8	26.7	17	56.7
30-41	24	9	37.5	6	25	9	37.5
42-53	16	9	56.3	4	25	3	18.8
54-59	5	2	40	2	40	1	20
Total	139	47	33.8	36	25.9	56	40.3

4.2.5 Prevalence of Underweight (Low Weight-for-Age Z-scores)

This composite indicator, reflecting both acute and chronic malnutrition, shows that nearly two-thirds (64.7% [56.7 - 71.9]) of all children are underweight, with the majority of these cases being severe (40.0%). There is no significant difference in prevalence between boys (65.9% [55.3 - 75.1]) and girls (63.1% [50.9 - 73.8]) – fully overlapping confidence intervals (Table 4.12). This pattern holds for both moderate and severe underweight categories. Boys show a slightly higher rate of severe underweight (42.4% vs. 36.9%), but the confidence intervals overlap substantially (Table 7).

Table 7: Prevalence of underweight based on weight-for-age z-scores by sex

	All, N = 151 **n (%) [95% CI]**	**Boys, N** = 85 **n (%) [95% CI]**	**Girls,N** = 65 **n (%) [95% CI]**
Prevalence of underweight (<-2 z-score)	97 (64.7) [56.7 - 71.9]	56 (65.9) [55.3 - 75.1]	41 (63.1) [50.9 - 73.8]
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	37 (24.7) [18.5 - 32.1]	20 (23.5) [15.8 - 33.6]	17 (26.2) [7.0 - 38.0]
Prevalence of severe underweight (<-3 z-score)	60 (40.0) [32.5 - 48.0]	36 (42.4) [32.4 - 53.0]	24 (36.9) [26.2 - 49.1]

4.2.6 Prevalence of underweight by age, based on weight-for-age z-scores

Young Infants (6-17 months) face the high burden of severe underweight (49.2%) total/global underweight cases, of 63.5%. At 18-29 months, severe underweight cases sharply drop to 16.7%, though total underweight remains high at 56.7%, now driven more by moderate cases (40%). At 30-41 months, the situation appears most stable, with the highest proportion of children in the normal range (54.2%) and the lowest total underweight rate (45.8%). Children aged 42-53 months suffer the highest burden of malnutrition, with a severe underweight rate of 56.3% and a staggering total underweight prevalence of 93.8% - almost every child in this age group is underweight. The trend continues, with all children (100%) aged 54-59 months being underweight, indicating a persistent problem, although interpretation is severely limited by the tiny sample size (N=5) (Table 8).

Table 8: Prevalence of underweight by age, based on weight-for-age z-scores

		Severe underweight (<-3 z-score)		Moderate underweight (>= -3 and <-2 z-score)		Norma l (> = -2 z score)		Oedem a	
Age (mo)	Total no.	No.	%	No.	%	No.	%	No.	%
17-Jun	63	31	49.2	9	14.3	23	36.5	0	0
18-29	30	5	16.7	12	40	13	43.3	0	0
30-41	24	5	20.8	6	25	13	54.2	0	0
42-53	16	9	56.3	6	37.5	1	6.3	0	0
54-59	5	3	60	2	40	0	0	0	0
Total	138	53	38.4	35	25.4	50	36.2	0	0

EdinBurg Peer-Reviewed Journals and Books Publishers
Journal of Medicine, Nursing and Public Health
Vol. 6||Issue 6||pp 12-31||June||2026
Email: info@edinburgjournals.org||ISSN: 3105-3394

4.3 Summary of Nutritional Status of Study Children

The nutritional assessment of children admitted to Princess Marina Hospital revealed a high burden of malnutrition across all indicators.

4.3.1 Acute Malnutrition (Wasting)

Based on weight-for-height z-scores and/or the presence of edema, 46.7% of the study children were classified as globally wasted. Of these, 17.3% had moderate wasting (z-score between -2 and -3), and 29.3% had severe wasting (z-score below -3 and/or edema). Boys (49.4%) were slightly more affected than girls (43.1%). Age-specific analysis showed the highest prevalence of severe wasting among children aged 6–17 months (39.7%), while older age groups generally had lower prevalence.

4.3.2 Chronic Malnutrition (Stunting).

Height-for-age measurements indicated that 60.9% of children were stunted. Among these, 27.2% were moderately stunted and 33.8% severely stunted. Boys (61.6%) and girls (60.0%) were similarly affected. Severe stunting was most pronounced among children aged 42–53 months (56.3%), suggesting that growth faltering persists into the preschool years.

4.3.3 Underweight (Low Weight-for-Age).

Overall, 64.7% of children were underweight. Of these, 24.7% were moderately underweight and 40.0% severely underweight. Boys (65.9%) and girls (63.1%) were similarly affected. Age-specific analysis showed the highest prevalence of severe underweight among children aged 42–53 months (56.3%) and 54–59 months (60.0%), indicating cumulative effects of prolonged nutritional deficits.

4.4 Predictors of Nutritional Status among 0 – 59 months Children admitted at PMH

All variables that showed significant associations with the outcome indicators (nutritional status indicators) were included in binary logistic regression models to assess their impact on the outcome indicators while controlling for other factors.

4.4.1 Predictors of Acute Malnutrition (Wasting) among 0-59 months admitted at PMH

4.4.1.1 Dietary Practices Predictors of Acute Malnutrition

A logistic regression model was fitted to assess the effects of the introduction of solid and semisolid soft foods (ISSSF), minimum meal frequency (MMF), minimum acceptable diet (MAD), and continued breastfeeding (CBF) on wasting (WHZ). The variables MAD and CBF did not significantly contribute to the model ($p > .05$) (Table 4.19). However, ISSSF (Wald $\chi^2 = 11.545$, $p = .001$) and MMF (Wald $\chi^2 = 4.103$, $p = .043$) significantly predicted child wasting. Children who were not fed solid and semisolid soft foods had 7.7 times higher odds of being wasted compared to those who were fed ISSSF (OR = 7.701, 95% CI [2.373, 25.030]). Similarly, children who did not meet the minimum meal frequency had 5.5 times higher odds of wasting compared to those who met MMF (OR = 5.495, 95% CI [1.057, 28.575]). These findings highlight ISSSF and MMF as critical dietary practices influencing acute malnutrition in this population (Table 9).

Table 9: Dietary predictors of wasting among 0-59 months children admitted at PMH

DV	IVs	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
WHZ	Feeding of SSSF (1)	2.042	.601	11.545	1	.001	7.707	2.373	25.030
	Minimum Meal Frequency (1)	1.704	.841	4.103	1	.043	5.495	1.057	28.575
	Minimum Acceptable diet (1)	1.602	.847	3.580	1	.058	4.962	.944	26.080
	Continued breastfeeding (1)	19.281	133×10^4	.000	1	.999	2.363×10^8	.000	.
	Constant	-2.173	.790	7.571	1	.006	.114		

4.4.1.2 Child Health Predictors of Acute Malnutrition

The logistic regression model for child health predictors was fitted using deworming compliance, diarrhea prevalence, and child birthweight. The model was statistically significant ($\chi^2(3) = 23.588$, $p < .0001$; Table 10) and correctly classified 65.3% of the cases. All three variables significantly predicted child wasting ($p < .05$). Children who did not comply with the deworming schedule had 3.35 times higher odds of being wasted compared to those who complied (OR = 3.352, 95% CI [1.403, 8.008]). Children with low birthweight had nearly nine times higher odds of being wasted compared to those born with normal weight (OR = 8.944, 95% CI [1.072, 74.615]). In addition, children who experienced diarrhea had 2.27 times higher odds of being wasted compared with those without diarrhea (calculated as $1/0.440 \approx 2.27$; OR = 0.440, 95% CI [0.220, 0.900]). These findings highlight deworming compliance, birth weight, and the prevalence of diarrhea as key predictors of acute malnutrition in this sample (Table 10).

Table 10: Child health predictors of wasting among 0-59 months children admitted at PMH

DV	IVs	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
WHZ	Birthweight (1)	2.191	1.082	4.098	1	.043	8.944	1.072	74.615
	Deworming Tx (1)	1.210	.444	7.411	1	.006	3.352	1.403	8.008
	Diarrhea (1)	-.820	.365	5.056	1	.025	.440	.215	.900
	Constant	-.833	.426	3.826	1	.050	.435		

EdinBurg Peer-Reviewed Journals and Books Publishers
Journal of Medicine, Nursing and Public Health
Vol. 6||Issue 6||pp 12-31||June||2026
Email: info@edinburgjournals.org||ISSN: 3105-3394

4.4.1.3 WASH Predictors of Acute Malnutrition

Among the WASH factors included in the logistic regression model, only living in overcrowded or unsanitary environments significantly predicted wasting among children aged 0–59 months. Children residing in such conditions had markedly higher odds of being wasted (OR = 0.159, 95% CI [0.072, 0.351]; $p < .001$). This translates to children in unsanitary or overcrowded households being approximately 6.3 times more likely to experience wasting compared to those living in cleaner, less crowded environments (Table 11).

Table 11: Effect of WASH factors on wasting among 0-59 months old children

DV	IVs	B	S.E.	Wald	df	Sig.	Exp(B)	95% CI. for EXP(B)	
								Lower	Upper
WAZ	Sources of drinking water (1)	20.282	2.00×10^4	.000	1	.999	6.432×10^8	.000	.
	Toilet facility (1)	.326	1.321	.061	1	.805	1.385	.104	18.425
	Handwashing (1)	-.359	.569	.397	1	.529	.699	.229	2.132
	Living condition (1)	-1.840	.404	20.688	1	.000	.159	.072	.351
	Constant	.693	1.225	.320	1	.571	2.000		

4.4.2 Predictors of Chronic Malnutrition (Stunting) among 0 – 59 months admitted at PMH

4.4.2.1 Dietary Predictors of Stunting

Three indicators of feeding practices, early initiation of breastfeeding (EIBF), minimum meal frequency (MMF), and minimum acceptable diet (MAD), were included in the regression model, and all were significantly associated with stunting among the study children. Children who were not initiated on breastfeeding within one hour of birth had 4.7 times greater odds of being stunted compared to those who were initiated within the first hour (OR = 4.714, 95% CI [1.207, 18.407]; $p = .026$). Children who did not meet the minimum meal frequency had 5-fold higher odds of stunting compared with those who attained MMF (OR = 5.078, 95% CI [1.395, 18.492]; $p = .014$). Similarly, children who did not achieve the minimum acceptable diet had 4 times greater odds of being stunted compared to their counterparts who attained MAD (Table 12).

EdinBurg Peer-Reviewed Journals and Books Publishers
Journal of Medicine, Nursing and Public Health
Vol. 6||Issue 6||pp 12-31||June||2026
Email: info@edinburgjournals.org||ISSN: 3105-3394

Table 12: Dietary practices predictors of stunting among 0-59 months children admitted at PMH

DV	IVs	B	S.E.	Wald	df	Sig.	Exp(B)	95% CI.for EXP(B)	
								Lower	Upper
HAZ	Qtn_15_EIBF_BINARY(1)	1.603	.692	5.362	1	.021	4.970	1.279	19.310
	Met Minimum Meal Frequency (MMF)(1)	1.625	.659	6.073	1	.014	5.078	1.395	18.492
	Met minimum acceptable diet (MAD)(1)	1.490	.664	5.029	1	.025	4.436	1.206	16.313

4.4.2.2 Child Health Predictors of Stunting

Two child health variables, diarrhea prevalence and acute respiratory infections (ARIs), that showed significant associations in the bivariate analysis were entered into the regression model. Of these, only the prevalence of diarrhea significantly predicted stunting. Children with no episodes of diarrhea had 0.47 times the odds of being stunted compared with those who experienced diarrhea (OR = 0.471, 95% CI [0.234, 0.964]; p = .039). This indicates that children with diarrheal morbidity had approximately 2.12 times higher odds of being stunted than those without diarrhea (Table 13). In contrast, ARIs did not significantly predict stunting (p = .168).

Table 13: Child Health Predictors of Stunting among 0-59 months children admitted at PMH

DV	IVs	B	S.E.	Wald	df	Sig.	Exp(B)	95% CI.for EXP(B)	
								Lower	Upper
HAZ	Diarrhea(1)	-.752	.365	4.248	1	.039	.471	.231	.964
	ARIs(1)	.516	.374	1.899	1	.168	1.674	.804	3.486
	Constant	.574	.299	3.684	1	.055	1.775		

a. Variable(s) entered on step 1: Diarrhea, Respiratory infection.

4.4.3 Predictors of Underweight among 0 – 59 months Children

4.4.3.1 Dietary Predictors of Underweight

All three dietary practice variables assessed in the logistic regression model significantly predicted underweight status (p < .001). Children aged 6–8 months who were not fed solid and semisolid soft foods had 22.7 times higher odds of being underweight compared to those who were fed (OR = 22.678, 95% CI [2.535, 202.855]). Children who did not meet the minimum meal frequency had nearly 17-fold higher odds of being underweight compared with those who attained MMF (OR = 16.955, 95% CI [2.854, 100.710]). Likewise, children who did not meet the minimum acceptable diet had about 15 times greater odds of being underweight than their counterparts who met MAD (OR = 14.912, 95% CI [2.478, 89.719]) (Table 14).

Table 14: Dietary predictors of underweight among 0-59 months children admitted at PMH

DV	IVs	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I .for EXP(B)	
								Lower	Upper
WAZ	ISSSF (1)	3.121	1.118	7.796	1	.005	22.678	2.535	202.855
	Minimum Meal Frequency (1)	2.831	.909	9.696	1	.002	16.955	2.854	100.710
	Minimum Acceptable diet (1)	2.702	.916	8.710	1	.003	14.912	2.478	89.719
	Constant	-2.343	.858	7.460	1	.006	.096		

4.4.3.2 Child Health Predictors of Underweight

Of the child health variables assessed in the regression model, only the prevalence of diarrhea significantly predicted WAZ (Wald χ^2 = 9.860, p = .002). Children who did not experience diarrhea had 0.305 times the odds of being underweight compared to those who had episodes of diarrhea (OR = 0.305, 95% CI [0.145, 0.640]). This translates to children with diarrheal morbidity having approximately 3.28 times higher odds of being underweight than those without diarrhea (Table 15).

Table 15: Child health predictors of underweight among 0-59 months children admitted at PMH

DV	IVs	B	S.E.	Wald	df	Sig.	Exp(B)	95% CI. for EXP(B)	
								Lower	Upper
WAZ	Birthweight_ (1)	20.158	12261.035	.000	1	.999	567974656.728	.000	.
	Deworming Tx (1)	.780	.425	3.361	1	.067	2.182	.948	5.023
	Diarrhea (1)	-1.187	.378	9.860	1	**.002**	.305	.145	.640
	Distance to the nearest HF (1)	.860	.627	1.881	1	.170	2.363	.691	8.076
	Constant	.385	.398	.940	1	.332	1.470		

5. Conclusion

The study examined the dietary practices of children aged 0–59 months admitted to PMH. Feeding behaviors were the strongest predictors of nutritional outcomes. Early initiation of breastfeeding, maintaining a minimum meal frequency, and achieving a minimum acceptable diet were protective factors against both stunting and underweight. These results emphasize the importance of promoting optimal infant and young child feeding practices to support healthy growth and development.

The evaluation showed a considerable burden of stunting, wasting, and underweight among children admitted to PMH. More than two out of five children were stunted, underweight prevalence surpassed 60% in certain age categories, and wasting was mainly observed among younger children and those with low birthweight. Weight-for-Age Z scores (WAZ) proved to be the most comprehensive indicator, as they reflect both short-term and long-term influences on child growth.

Key factors influencing nutritional status included dietary adequacy, child morbidity, caregiver socio-demographic attributes, and the hygiene environment. Taken together, these determinants illustrate the multifactorial nature of malnutrition and emphasize the need for integrated interventions that simultaneously address nutrition, health, and socio-economic conditions.

6. Recommendations

- Strengthen caregiver education on infant and young child feeding through targeted training and community workshops.
- Promote exclusive breastfeeding and dietary diversity to improve nutritional outcomes.
- Establish and strengthen hospital-based nutrition programs at PMH.
- Integrate nutrition screening into routine child health services to ensure early detection and support.
- Strengthen social support systems for caregivers, particularly those from low-income households.
- Scale up community-based nutrition and livelihood programs to improve household food security and resilience.

References

Arpadi M., & Ruel, M. T. (2023). Dietary diversity is associated with child nutritional status: Evidence from 11 demographic and health surveys. *The Journal of Nutrition, 134*(10), 2579–2585.

Bhutta, Z. A. (2022). Optimizing prevention and community-based management of severe malnutrition in children. *PLOS Medicine, 19*(3), e1003924. https://doi.org/10.1371/journal.pmed.100392

Etikan, I., & Bala, K. (2017). Sampling and sampling methods. *Biometrics & Biostatistics International Journal, 5*(6), 00149. https://doi.org/10.15406/bbij.2017.05.00149

Philips, J. A. S., D. (2023). Effects of a supplementary feeding program on the nutritional status of children in Daynile District Hospital, Mogadishu, Somalia. *Journal of Nutrition and Dietetics*, 4(1). https://doi.org/10.57039/jnd_04_01_08

Saloojee, H., De Maayer, T., Garenne, M. L., & Kahn, K. (2017). What's new? Investigating risk factors for severe childhood malnutrition in a high HIV prevalence South African setting. *Scandinavian Journal of Public Health, 35*(69_suppl), 96–106. https://doi.org/10.1080/14034950701356435

Satapathy, D. M., Pradhan, K. C., Sahu, T., & Behera, T. R. (2021). *Effect of feeding practices on nutritional status of infant and young children residing in urban slums of Berhampur: A decision tree approach*. *Indian Journal of Public Health, 65*(2), 123–128.

UNICEF (2020). *UNICEF conceptual framework*. https://www.unicef.org/documents/conceptual-framework-nutrition

UNICEF (2021a). *The State of the World's Children 2021*. UNICEF.

UNICEF (2021b). *The state of the world's children 2021: On my mind—Promoting, protecting and caring for children's mental health*. UNICEF.

UNICEF (2023a). *Botswana situation report: Child health and nutrition*. UNICEF.

UNICEF (2023b). *The state of the world's children: Nutrition*. UNICEF Publications.