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Evaluating Physical Indices for Determining Acute Malnutrition in Children: Evidence From Abuali Sina Balkhi Regional Hospital, 2023

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Abstract. *Childhood malnutrition remains a major public health challenge in developing countries. This study aimed to assess the prevalence of acute malnutrition and its associated factors among children aged over six months to five years who visited Abu Ali Sina Balkhi Regional Hospital in 2023. This descriptive-analytical study collected and analyzed data on weight, height, mid-upper arm circumference (MUAC), age, sex, and age group of the children. Inferential analysis using the Chi-square test indicated no statistically significant association between a child's sex and the prevalence of malnutrition ($p = 0.582$). However, logistic regression analysis revealed that reductions in weight and height significantly increased the risk of malnutrition ($p < 0.001$), while chronological age and age grouping had no significant effect. Descriptive statistics further showed that although mean weight, height, and MUAC increased with age, they remained below global growth standards. The findings of this study highlight the importance of early identification of anthropometric indicators for timely diagnosis and intervention in malnutrition cases. Strengthening primary healthcare systems, improving family education, and implementing community-based nutritional therapy programs are key recommended strategies to reduce the prevalence of childhood malnutrition.*

Keywords: *Acute malnutrition, child physical growth, mid-upper arm circumference, logistic regression, anthropometric indicators*

1. Introduction

The immune system consists of an intricate and highly coordinated network of cells, tissues, and organs that collectively defend the body from harmful microorganisms such as viruses, bacteria, fungi, and other pathogens. It is commonly divided into two major branches: the innate immune system and the adaptive immune system. The innate immune system provides rapid, non-specific protection through mechanisms such as physical barriers (e.g., the skin) and immune cells that respond quickly to a broad range of invaders. In contrast, the adaptive immune system offers a more specialized response and has the unique capacity to "remember" pathogens it has previously encountered, allowing for a more efficient and targeted reaction during future exposures (Delves & Roitt, 2000). The immune system is central to maintaining overall health. In terms of food-related immunity, one of its critical functions is to differentiate between harmless dietary components and potentially dangerous substances. The gut-associated lymphoid tissue plays a key role in this process by detecting and responding to materials that enter the body through the digestive tract (Mörbe et al., 2021).

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A major distinction between the immune systems of children and adults lies in their developmental stages. Children encounter numerous new pathogens as they grow, interact socially, and explore their surroundings. These exposures help shape and diversify their immune responses, enabling the development of a broad range of immune cells (Valiathan et al., 2016). Children often mount strong immune reactions—commonly seen through fever and rapid increases in specific immune cell populations—yet their still-developing immune system can make them more vulnerable to certain infections (Carsetti et al., 2020).

Nutrition is one of the most critical determinants of immune strength. Proper intake of vital nutrients—including vitamins such as C, D, and E, and minerals such as zinc and selenium—supports the normal functioning of immune processes. When these nutrients are lacking, the immune response can be compromised, increasing the risk of infections (Gombart et al., 2020). Many dietary elements, particularly antioxidants and anti-inflammatory compounds found in plant-based foods, contribute positively to immune regulation. Additionally, probiotics present in fermented foods like yogurt help sustain a healthy gut microbiota, further supporting immune health (Maldonado Galdeano et al., 2019). Because the immune system depends on a delicate interplay of many components and is heavily influenced by diet, maintaining a well-balanced, nutrient-rich diet is essential for optimal immune protection and overall health (Xiaogang et al., 2022). This review aims to explore how nutritional deficiencies impact the immune system, how these deficiencies relate to childhood infections, and to identify emerging nutritional strategies that may enhance children's health.

Malnutrition develops when the body does not obtain the nutrients it needs, ultimately impairing growth and normal physiological functions. Contributing factors include insufficient dietary intake, poor nutrient absorption, economic challenges, and various illnesses. Malnutrition weakens immune defenses by disrupting multiple biological pathways. Poverty, food insecurity, unhealthy eating behaviors, medical conditions, and limited nutrition education are among the major risk factors (Salois et al., 2012). The World Health Organization highlights that malnutrition is one of the leading contributors to childhood illness and death worldwide, representing a major cause of disease burden, disability, and mortality, particularly in infants during their first year of life (WHO/UNICEF, 2021). Research by Wobanthe et al. (2017) indicates that lack of colostrum feeding (AOR: 1.76; 95% CI: 1.01–1.06) and insufficient complementary feeding linked to poor nutritional knowledge (AOR: 2.82; 95% CI: 1.33–5.99) significantly contribute to malnutrition.

Childhood malnutrition is a global problem that extends beyond simple food scarcity and reflects deep-rooted socioeconomic and health-related inequalities (Khanam et al., 2019). Defined as inadequate intake of essential nutrients, malnutrition impairs both physical and cognitive development, leaving long-term consequences on a child's well-being. In many regions, persistent food insecurity, lack of access to nutritious diets, and limited healthcare services intensify the problem. Malnourished children are at greater risk of infections, often experience developmental delays, and face higher mortality rates. The effects of malnutrition ripple outward, hindering community progress, limiting economic productivity, and perpetuating poverty across generations (Schroeder et al., 2021). Combatting childhood malnutrition requires a comprehensive and integrated approach that includes improving dietary practices, ensuring clean water access, strengthening healthcare systems, and providing nutrition education. Global and local initiatives that focus on eliminating hunger and encouraging sustainable food systems are vital. By addressing both the nutritional needs of children and the underlying social causes of malnutrition, societies can break poverty cycles and build healthier, more resilient future generations.

The World Health Organization is currently formulating an updated guideline aimed at improving the prevention and management of malnutrition. This global framework, designed to reduce severe malnutrition among children under five, promotes a more comprehensive approach that emphasizes integrating nutrition care into existing health services and strengthening overall health systems (WHO, 2023). Central to this child-focused strategy is the emphasis on breastfeeding and nutrient-rich home-based diets. The plan outlines detailed protocols for therapeutic feeding options such as milk substitutes, rehydration solutions, hydrolyzed formulas, and ready-to-use therapeutic foods (RUTF) for treating young children suffering from malnutrition and nutritional edema (WHO, 2023).

While breastfeeding remains the most effective intervention for lowering infant morbidity and mortality, its effectiveness may be compromised in situations where mothers face malnutrition or infections. In such environments, breastfeeding alone may not meet the infant's nutritional needs unless maternal nutrition is simultaneously improved (Christian et al., 2021).

Another form of malnutrition, often overlooked, is overnutrition, which manifests as overweight and obesity in children. These conditions arise from excessive intake of calorie-dense foods—particularly sugars—along with insufficient physical activity, genetic predisposition, and certain medical disorders. Excess body weight contributes to chronic inflammation and disrupts immune responses. Elevated body mass index (BMI) and abdominal fat are associated with higher infection risk and may diminish vaccine effectiveness. Lifestyle behaviors, including inactivity and unhealthy eating habits, further heighten these risks (Salois et al., 2012). Childhood obesity has now become a global epidemic, driven largely by increased consumption of low-nutrient, high-calorie foods and reduced physical activity (Kim & Lim, 2019). Beyond physiological effects, obese children frequently experience psychosocial difficulties, including bullying, social stigma, low self-esteem, and a heightened likelihood of mental health concerns (Edmunds, 2008). The long-term health implications are substantial as these children face elevated risks of diabetes, heart disease, and musculoskeletal problems later in life. Obesity may also negatively influence learning by affecting cognitive development and concentration. Addressing this growing problem requires a comprehensive strategy involving families, schools, communities, and policymakers. Initiatives must focus on improving dietary practices, promoting physical activity, and creating supportive environments that foster healthy behaviors. Through early prevention and effective interventions, the long-term consequences of childhood obesity can be mitigated, thereby supporting healthier futures for children and breaking the cycle of this widespread health issue (Han et al., 2010).

Evidence also indicates that children who experience early malnutrition—including low birth weight, stunted growth, or abnormal weight gain—are more likely to develop obesity later in life (Adair et al., 2013). In response, the World Health Organization developed guidelines in 2017 to support the assessment and management of infants and children in primary healthcare settings, especially in low- and middle-income countries. Recommendations included avoiding the early introduction of complementary foods in moderately malnourished or stunted infants and providing nutritional counseling for caregivers of overweight children under five (WHO, 2017). The WHO is also advancing an additional framework within primary healthcare systems aimed at reducing childhood disability linked to obesity, including impairments in bodily functions, structural complications, and activity limitations (WHO, 2022). A comprehensive project plan supporting this initiative is expected to be finalized by the end of 2023.

Globally, malnutrition—whether undernutrition or overnutrition—remains one of the most critical public health challenges. It profoundly affects children's physical development, cognitive function, and immune system maturation. According to WHO/UNICEF (2021), malnutrition is a leading contributor to disease burden and mortality among children under five, especially in developing countries such as Afghanistan, where poverty, food shortages, and limited healthcare access exacerbate the problem. Undernutrition weakens the immune system, increasing susceptibility to illnesses such as pneumonia, tuberculosis, and measles (Kuti et al., 2021; Hübschen et al., 2022), while obesity contributes to chronic inflammation and heightened risk of metabolic and allergic disorders (Pugliese et al., 2022; Thürmann et al., 2023). These consequences extend into later life, influencing growth and development through mechanisms such as epigenetic alterations and disturbances in gut microbiota (Kupkova et al., 2023).

In Balkh province, particularly at Abu Ali Sina Balkhi Regional Hospital, data on the nutritional status of newborns and young children are scarce. Anthropometric indicators—including weight, height, and mid-upper arm circumference (MUAC)—are essential for assessing undernutrition, stunting, and wasting (WHO, 2023). Early evaluation of these indices in newborns is crucial for identifying nutritional deficiencies and developing targeted interventions. Considering that the first two years of life are fundamental for physical and cognitive growth (Bourke et al., 2016), research in resource-constrained areas such as Balkh is especially important. This study contributes to understanding local nutritional trends, informing region-specific policies for managing malnutrition and improving immune health. Given the strong association between malnutrition and infection risk, this research may help identify vulnerable populations and support interventions such as micronutrient supplementation (vitamin A, zinc) or RUTF programs (Briend et al., 2015; Saied et al., 2022). In light of rising childhood obesity worldwide and its effects on immunity (Wahyuni et al., 2021), assessing weight indicators may also reveal emerging overweight trends in the region. Overall, this study has both local and regional significance, providing data to guide targeted interventions and strengthen healthcare services, ultimately improving child survival and well-being.

Despite global awareness of childhood malnutrition, region-specific data for northern Afghanistan remain limited. National surveys offer a broad picture but overlook local differences in nutritional status and variations in infection risk among young children. To date, no study has systematically evaluated weight, height, and MUAC among infants at Abu Ali Sina Balkhi Regional Hospital. By generating the first dataset on early childhood nutrition in this underserved region, the present study fills a critical evidence gap and supports tailored public health strategies.

Malnutrition—whether due to nutrient deficiencies or excessive caloric intake—is intricately linked to compromised immune function in children. It weakens the body's defense mechanisms, particularly in young children whose immune systems are still developing (Delves & Roitt, 2000). Malnutrition also affects physical and cognitive development and disrupts immunity through pathways involving epigenetic modification and gut microbiota imbalances (Bourke et al., 2016). Undernutrition, marked by insufficient intake of essential vitamins, minerals, proteins, and fatty acids, significantly impairs both innate and adaptive immune responses (Gombart et al., 2020). WHO reports that malnutrition remains one of the primary causes of disease and mortality in young children worldwide, especially during infancy (WHO/UNICEF, 2021). Specific nutrient deficiencies contribute to severe illnesses; for example, zinc deficiency independently predicts pneumonia risk among children in Nigeria (Kuti et al., 2021), while vitamin A deficiency reduces key immune cell populations, increasing mortality from measles (Abd El-Shaheed et al., 2018; Hübschen et al., 2022).

Stunting, driven by chronic undernutrition, is strongly linked to immune dysfunction and higher mortality in children under five. Research in Bangladesh shows that stunted children exhibit epigenetic changes—including elevations in H3K27ac and HeK9me3—that may trigger early hyperinflammatory immune responses and reduce metabolic resilience (Kupkova et al., 2021; 2023). Children with HIV/AIDS also face a higher burden of malnutrition due to deficiencies in micronutrients such as folate, vitamin C, and iron, contributing to frequent infections including diarrhea and tuberculosis (Intiful et al., 2021). Childhood obesity, another form of malnutrition, is associated with persistent low-grade inflammation and immune dysfunction (Pugliese et al., 2022). Obese children have increased risk of respiratory, dermatological, and urinary tract infections, as well as weakened vaccine responses (Brennan et al., 2019). Evidence also connects childhood obesity with allergic diseases, metabolic syndrome, and atopic asthma (Loid et al., 2015; Thürmann et al., 2023). A study in Indonesia further links overweight status to allergic sensitization (Wahyuni et al., 2021). Maternal obesity during pregnancy may also predispose children to immunological changes and allergic disease (Zhang et al., 2023). Diets high in added sugars and low in nutrients promote inflammation, insulin resistance, and gut dysbiosis, all of which impact immunity (Ebadi & Azlan, 2023). German research further indicates that obese children with hypertension display activation of cytotoxic genes and pro-inflammatory markers, increasing long-term cardiovascular risk (Thürmann et al., 2023).

Nutritional interventions remain among the most effective strategies for addressing malnutrition. Protein-based supplements—such as yogurt or leaf concentrates—have shown improvements in weight, hemoglobin levels, and immune cell ratios in undernourished children (Dewan et al., 2007). WHO-endorsed RUTF programs have also demonstrated high success in promoting weight gain in severely malnourished children (Briend et al., 2015). In Afghanistan, however, the healthcare system faces significant challenges—including shortages of trained staff, inadequate diagnostic resources, and unstable supply chains—which hinder effective nutritional assessment and treatment (Bartlett et al., 2018). Hospital-based research offers an advantage in such settings, as controlled environments allow for accurate anthropometric monitoring. Studies from similar contexts, such as tertiary hospitals in India, show that routine nutritional measurements are feasible for assessing progress and evaluating interventions (Kumar et al., 2016). Comparing local findings with WHO growth standards can also reveal population-specific deviations linked to maternal and neonatal care deficiencies (de Onis et al., 2007). For instance, a study in Bangladesh found that newborns with MUAC below WHO thresholds were at greater risk of neonatal complications, reinforcing the importance of localized anthropometric evaluation (Hossain et al., 2019).

2. Methods

This research was carried out to assess key nutritional indicators—body weight, age, height, and mid-upper arm circumference (MUAC)—among newborn and young infants admitted to Balkhi Abu Ali Sina Regional Hospital in Balkh province. These indicators are essential for evaluating the nutritional condition of children and determining the prevalence of undernutrition, including stunting, wasting, and severe acute malnutrition, as well as identifying cases of overweight. Considering the serious consequences of malnutrition on children's immunity and overall health, particularly in low-resource areas such as Balkh province, this study aims to provide evidence-based insights to support the development of targeted nutritional programs. The dataset used in this research was obtained from the pediatric ward's admission records for children diagnosed with severe acute malnutrition during the year 1402 (2023).

For analytical purposes, the children in this study were grouped into four age categories based on their age in months, allowing for clearer comparison of growth-related indicators such as height, weight, and MUAC. The age categories are as follows:

- **Group 1:** 6–12 months
- **Group 2:** 13–24 months
- **Group 3:** 25–36 months
- **Group 4:** 37–60 months

This classification aligns with major developmental phases in early childhood and supports more structured statistical analysis.

Type of Study

This study employed a cross-sectional design using a descriptive-analytical approach based on existing registry data. This method enables the assessment of nutritional status and gender-based differences at a single point in time and is appropriate for estimating malnutrition prevalence and identifying associated patterns.

Target Population

The target population includes all newborn and young infants—both male and female—who were admitted to the pediatric ward of Balkhi Abu Ali Sina Regional Hospital and were documented in the severe acute malnutrition registry during the year 1402 (2023).

Study Sample

The sample consists of 685 boys and girls whose clinical information was recorded in the hospital's severe acute malnutrition registry. A census sampling technique was used, meaning that all available cases within the specified year were included to ensure comprehensive data coverage.

Data Collection Method

Data were collected secondarily from the pediatric ward's admission registry. The records provided information on:

- **Nutritional indicators:** weight (kg), age (months), height (cm), and MUAC (cm)
- **Gender:** male or female

The researcher extracted the data manually and entered them into standardized forms. To enhance accuracy, two independent reviewers cross-checked the extracted entries against the original records.

3. Results and Discussion

The study relies solely on hospital registry data, which lack essential socioeconomic and environmental variables such as household income, parental education, feeding practices, and sanitation conditions factors known to significantly influence childhood nutritional status. Their absence may limit the depth of interpretation and obscure important contextual drivers of malnutrition. Additionally, the hospital-based sampling frame captures children who are more likely to present with acute or severe health issues, potentially overestimating malnutrition prevalence compared with the general population. These constraints should be considered when applying the findings beyond this clinical setting.

Descriptive Data Analysis

In line with the assessment of the physical growth status of children with malnutrition, descriptive analysis was conducted as the initial step of statistical analysis. The objective of this analysis is to identify trends in the key physical growth indicators, including body weight, height, and mid-upper arm circumference (MUAC), across different age groups of children.

Descriptive analysis enables the provision of an overall view of data distribution and, through the calculation of values such as mean, standard deviation, minimum, and maximum, allows for the examination of growth levels or growth delays across different age groups. In this study, children were categorized into four age groups (6–12 months, 13–24 months, 25–36 months, and 37–60 months), and the aforementioned indices were evaluated to understand the current status while establishing a foundation for comparative and clinical analyses.

Descriptive indices of physical growth (weight, height, and mid-arm circumference) in children with malnutrition, categorized by age groups

Table 1. Descriptive Indices of Physical Growth Among Children With Malnutrition by Age Groups

Child Age Group (Months)	Weight (kg) Mean ± SD	Weight Min–Max	Height (cm) Mean ± SD	Height Min–Max	MUAC (cm) Mean ± SD	MUAC Min–Max
Group 1	5.00 ± 1.18	2.30–9.30	63.01 ± 5.26	49–89.7	10.54 ± 1.30	6.00–16.30
Group 2	6.34 ± 1.21	3.40–9.80	70.25 ± 4.61	57–87	11.21 ± 1.29	7.00–16.50
Group 3	6.64 ± 1.35	3.40–10.20	73.41 ± 6.59	62–91.5	10.39 ± 1.41	6.00–13.00
Group 4	7.52 ± 1.96	3.70–12.60	78.96 ± 9.09	56–97	11.08 ± 1.47	8.00–15.10
Total	5.71 ± 1.48	2.30–12.60	67.08 ± 7.13	49–97	10.79 ± 1.35	6.00–16.50

The physical growth indices, including weight (in kilograms), height (in centimeters), and mid-upper arm circumference (MUAC, in centimeters), of children with malnutrition are presented in the table based on different age groups. The mean weight of children varied from 5.00 ± 1.18 kilograms in the first age group (6 to 11 months) to 7.52 ± 1.96 kilograms in the fourth age group (24 to 59 months), indicating an increase in weight with age. The mean height also ranged from 63.01 ± 5.26 centimeters in the first age group to 78.96 ± 9.09 centimeters in the fourth age group, with this upward trend also correlating with age

The mid-upper arm circumference (MUAC), as a sensitive indicator for assessing acute malnutrition, showed an overall mean of 10.79 ± 1.35 centimeters, which is below the standard criterion for adequate nutrition across all age groups studied. This index varied between 10.39 ± 1.41 centimeters and 11.21 ± 1.29 centimeters across different age groups, indicating varying degrees of malnutrition severity among the children in these groups. The range of values (minimum to maximum) for weight (2.3 to 12.6 kilograms), height (49 to 97 centimeters), and MUAC (6 to 16.5 centimeters) reflects significant variability in the nutritional status of the study sample. These findings suggest the presence of a wide range of malnutrition severity among children under 5 years of age under examination.

Inferential Statistics Section

In this section, an inferential analysis of the collected data regarding the malnutrition status of children aged 6 months to 5 years is conducted. The primary objective of this analysis is to examine the statistical relationships between demographic and clinical variables (including gender, age, weight, height, and MUAC) and malnutrition status to determine whether these factors are significantly associated with the occurrence of malnutrition. To generalize the results from the sample to the target population, appropriate statistical tests such as the Chi-Square test for categorical variables and logistic regression for multivariate analyses will be employed. Additionally, if needed, tests such as the t-test or ANOVA will be used to compare means. Subsequently, the relationship between the child's gender and malnutrition status will be examined first, followed by an analysis of the other independent variables.

Chi-Square Test (Chi-Square Test of Independence)

One of the most critical research questions in the present study is to investigate whether a child's gender is related to their malnutrition status. Since both variables under examination (gender and malnutrition) are categorical (qualitative) in nature, the Chi-Square test was employed to assess the presence or absence of a significant relationship between them. This test is capable of determining whether the distribution of malnutrition differs significantly between girls and boys or if this difference is merely due to random fluctuations in the data.

Table 2. Chi-Square Test of Association

Test	Value	df	Asymptotic Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.303	1	0.582	—	—
Continuity Correction[a]	0.167	1	0.682	—	—
Likelihood Ratio	0.302	1	0.583	—	—
Fisher's Exact Test	—	—	—	0.672	0.340
Linear-by-Linear Association	0.302	1	0.582	—	—
N of Valid Cases	685	—	—	—	—

a. Computed only for a 2×2 table.

b. 0 cells (0.0%) have expected count less than 5; minimum expected count = 25.05.

In this analysis, the relationship between a child's gender and malnutrition status was examined using the Chi-Square test. The results indicated that the difference in malnutrition rates between girls and boys is not statistically significant ($\chi^2 = 0.303$, df = 1, $p = 0.582$). Based on these findings, it can be concluded that, in this sample, the child's gender is not a determining factor in the occurrence of malnutrition, and the observed difference may be attributed to random fluctuations.

Binary Logistic Regression

Binary logistic regression is one of the widely used and effective statistical models for analyzing data where the dependent variable is dichotomous (binary). This model enables the simultaneous examination of the impact of multiple continuous and categorical independent variables on the probability of a specific event, such as malnutrition in children. Particularly in nutritional and child health studies, logistic regression is recognized as a powerful tool for identifying and evaluating risk and protective factors. By employing the logistic function, this model estimates the odds ratio of event occurrence based on changes in independent variables and can enhance the understanding of complex relationships between individual characteristics and nutritional status.

In this study, given the significance of weight, height, age, and age group in determining the nutritional status of children under five years, a binary logistic regression model was implemented to predict the likelihood of malnutrition and assess the role of each of these variables. This analysis contributes to a deeper understanding of factors associated with malnutrition and enhances the development of nutritional intervention policies.

Table 3. Logistic Regression Analysis of Predictors of Malnutrition Status

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Weight of child (kg)	-1.669	0.193	74.549	1	0.000	0.188
Groupings of Child Age (Months)	—	—	2.304	3	0.512	—
• Group Age (1)	0.247	2.248	0.012	1	0.912	1.281
• Group Age (2)	0.502	1.888	0.071	1	0.790	1.652
• Group Age (3)	1.774	1.714	1.071	1	0.301	5.894
Height of child (cm)	0.201	0.046	19.281	1	0.000	1.223
Age of child (months)	0.040	0.065	0.377	1	0.539	1.041
Constant	-1.637	3.393	0.233	1	0.630	0.195

Note: Variables entered in Step 1: Weight (kg), Groupings of Child Age (months), Height (cm), Child Age (months).

Analysis of Logistic Regression Results

To identify the determinants of malnutrition among children under five, a binary logistic regression model was employed using weight, height, age, and age group as predictor variables. The analysis showed that body weight was a highly significant factor ($p < 0.001$), demonstrating a protective effect against malnutrition. The negative regression coefficient ($\beta = -1.669$) and the corresponding odds ratio (OR = 0.188, with no confidence interval reported) indicate that each additional kilogram of weight is associated with roughly an 81.2% reduction in the odds of malnutrition. This result reinforces the role of body weight as a sensitive and reliable marker for nutritional status, consistent with widely documented findings in pediatric nutrition research.

In contrast, height displayed a statistically significant positive association with malnutrition risk, with $\beta = 0.201$ and OR = 1.223 ($p < 0.001$). Although this initially appears contradictory, it may reflect situations in which children are taller but do not possess proportional body mass, resulting in a lower body mass index or height–weight mismatch.

This pattern suggests that height, when interpreted independently of weight or BMI, may reveal underlying nutritional imbalances. These findings highlight the need for more nuanced analyses that explore potential moderators, mediators, or interaction effects in future studies.

The variables age ($p = 0.539$) and age group ($p = 0.512$) did not show statistically significant relationships with malnutrition. This implies that age, in isolation, is not a strong predictor of nutritional status when anthropometric measurements are already included in the model. The non-significance of the categorized age groups could also stem from shared nutritional characteristics across categories or uneven sample distribution among groups.

Overall, the regression outcomes underscore the importance of weight and height as central indicators in identifying children at heightened risk of malnutrition, demonstrating that age-related variables alone are insufficient predictors. To strengthen predictive accuracy in future models, the inclusion of composite indices—such as body mass index (BMI)—along with socioeconomic, environmental, and feeding-related factors is recommended.

Discussion and Interpretation

The primary objective of this study was to investigate the prevalence and associated factors of malnutrition among children aged over six months and under five years admitted to Balkhi Abu Ali Sina Regional Hospital. Based on the findings obtained, the results indicate that certain physical growth indices, such as weight and height, exhibited a significant relationship with malnutrition status, whereas age, age group, and gender did not show a statistically significant association with malnutrition.

Relationship between Gender and Malnutrition

The chi-square test conducted to examine the relationship between a child's gender and acute malnutrition based on MUAC showed that this association is not statistically significant ($p = 0.582$). This finding suggests that in the studied population, there is no significant difference between girls and boys in terms of the prevalence of malnutrition. This result is consistent with some similar studies, which indicate that gender alone is not a determining factor in children's nutritional status.

Investigation of Predictors of Malnutrition

The binomial logistic regression model revealed that among the variables included in the model, the child's weight ($p < 0.001$) and height ($p < 0.001$) were significantly associated with malnutrition. In other words, as weight and height increase, the likelihood of malnutrition decreases significantly. The beta coefficient for weight was $B = -1.669$, and for height, it was $B = 0.201$, indicating a strong influence of these two indices on the likelihood of malnutrition.

In contrast, the variables of the child's age ($p = 0.539$) and age groups ($p = 0.512$) did not have a statistically significant effect in the model. This may be due to the overlap of age-related indices with weight and height or the uneven distribution of children across different age groups.

Descriptive Analysis of Physical Growth Indicators

Descriptive statistics showed that the mean weight, height, and MUAC increase with age, but these indicators remain at lower levels compared to global standards. For instance, the mean mid-upper arm circumference (MUAC) across the sample was 10.79 cm, indicating a high prevalence of acute malnutrition in the studied population,

Comparison with Previous Studies

The findings of this study are consistent with some research in developing countries, which have identified malnutrition as being more closely associated with the child's physical factors (such as weight and height) and have considered the role of gender to be less significant. However, there are also studies that have identified gender and age as influential factors. These differences may stem from variations in environmental, economic, cultural, and social conditions across different communities.

Conclusions

The findings of this study reveal a notably high prevalence of acute malnutrition among children aged 6 to 59 months who were admitted to Abu Ali Sina Balkhi Regional Hospital. Although no statistically significant differences were observed between boys and girls, the analysis demonstrated that anthropometric indicators—particularly weight and height—play a critical role in predicting malnutrition status. Reductions in these measurements were identified as the strongest predictors of acute malnutrition, indicating that lower weight and height markedly increase the risk of nutritional deficits. In contrast, chronological age and age-group classification did not show a significant influence on malnutrition occurrence, suggesting that age alone is not a reliable determinant of nutritional risk. These findings underscore the necessity of routine monitoring of children's growth indicators within primary healthcare systems to enable early detection and timely intervention for malnutrition.

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Conflicts of Interest

The authors declare no conflict of interest.

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