



Assessment of Nutrition and Immunization Status of Children from 6 Months to 59 Months of Age

Zubdah Rubab¹, Nasir Rana²

^{1,2}Department of Pediatric Medicine, University of Child Health Sciences, Lahore, Pakistan

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Correspondence to: Zubdah Rubab, Department of Pediatric Medicine, University of child health sciences Lahore, Pakistan.
Email: zubdahrubab2014@gmail.com

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ABSTRACT

Background: Malnutrition and incomplete immunization remain major public health concerns in under-five children and contribute significantly to preventable morbidity and mortality. Concurrent assessment of nutritional status and immunization coverage provides a practical basis for identifying vulnerable children and strengthening child health interventions. **Aim:** To determine the nutritional and immunization status of children aged 6 to 59 months and to evaluate the association between immunization status and nutritional status. **Material and Methods:** A cross sectional study was conducted in the Department of Paediatrics, Children's Hospital Lahore, from 21 January 2025 to 21 June 2025. A total of 151 children aged 6 to 59 months were enrolled through non probability consecutive sampling from the outpatient department. Nutritional status was assessed using World Health Organization weight-for-height Z-scores and categorized as normal, moderate acute malnutrition, or severe acute malnutrition. Immunization status was verified using the Expanded Programme of Immunization card and classified as completely immunized, partially immunized, or non immunized. Data were analysed using SPSS version 27.0, and associations were tested using chi square analysis with stratification. **Results:** The mean age was 28.4 ± 14.2 months. There were 89 (58.9%) males and 62 (41.1%) females. Mean weight was 11.8 ± 3.4 kg and mean height was 84.6 ± 12.8 cm. Urban residence was noted in 94 (62.3%) children and rural residence in 57 (37.7%). Lower socioeconomic status was observed in 82 (54.3%), middle in 51 (33.8%), and upper in 18 (11.9%). Nutritional status was normal in 77 (51.0%), moderate acute malnutrition in 38 (25.2%), and severe acute malnutrition in 36 (23.8%). Immunization status showed 112 (74.2%) completely immunized, 31 (20.5%) partially immunized, and 8 (5.3%) non immunized. Nutritional status was significantly associated with immunization status ($\chi^2=18.42$, $p=0.001$). **Conclusion:** Acute malnutrition was common, and incomplete immunization was associated with poorer nutritional status. Strengthening integrated nutrition screening and immunization services is essential.

INTRODUCTION

Malnutrition is a significant global health issue, affecting 88% of countries worldwide [1]. It is a medical condition characterized by a deficiency in essential nutrients, leading to serious health consequences, including death [2,3]. Annually, over 10 million children under the age of five die from preventable and curable diseases, mainly in poor countries [1]. Pakistan has one of the highest rates of underweight children, which severely impacts morbidity, mortality, productivity, and economic growth [4,5]. Assessing nutritional health involves evaluating demographics, anthropometric measurements, clinical health, and eating habits. Malnutrition occurs when inadequate nutrient intake leads to physiological changes, metabolic abnormalities, and decreased tissue and organ function [6,7].

According to a study conducted by Singh et al., out of 252 children surveyed, only 49.78% were found to be adequately nourished. Meanwhile, 16.45% of the children were diagnosed with moderate acute malnutrition, and an equal percentage (16.45%) were categorized as having severe acute malnutrition. The study revealed that a substantial 72% of the children had completed their vaccination schedule, compared to 1% who had incomplete immunization [8]. In a study by Abhishek et al., results showed that 68.8% of children had a normal MUAC, indicating optimal nutrition. However, 7.7% of children were diagnosed with moderate acute malnutrition, and an equal percentage (7.7%) suffered from severe acute malnutrition. The study found that 99% of the participants had received all scheduled vaccinations, indicating good immunization coverage [1]. According to a study by Asif et

al., in Pakistan, out of a total of 6765 children, 39.30% (2659 children) had received complete immunization, while 60.69% (4106 children) had incomplete immunization [9]. According to a study by Ahmad et al., 19.54% (488 children) were underweight, indicating malnutrition, while 80.46% (2009 children) had a normal weight [10].

This study aims to bridge a significant knowledge gap by investigating the nutritional and immunization status of children in Pakistan, a crucial aspect of child health that has been understudied in this population. Despite the high burden of childhood malnutrition and related morbidity, there is a scarcity of research that currently examines both nutrition and immunization in Pakistani children. The findings of this study will have important implications for the development of targeted interventions, contributing to the achievement of Sustainable Development Goals related to child health and well-being. This research aims to catalyze policy changes, healthcare practices, and future research priorities that ensure no child is left behind in the pursuit of a healthier and more prosperous future.

MATERIAL AND METHODS

A cross sectional study was conducted in the Department of Paediatrics, Children’s Hospital Lahore, over a five-month period from 21 January 2025 to 21 June 2025. Approval was obtained from the hospital ethical committee and the College of Physicians and Surgeons Pakistan before initiation of data collection. Written informed consent was taken from parents or legal guardians, and confidentiality was maintained by recording information on a predefined proforma and restricting access to study data to the research team.

Participants were selected through non probability consecutive sampling from children presenting to the outpatient department during the study period. The sample size was calculated using the World Health Organization sample size calculator, with a 95% confidence level, absolute precision of 6%, and an expected proportion of adequate nutrition of 49.78% as reported previously [8]. On this basis, a sample size of 151 was selected to ensure adequate precision for estimation of nutritional and immunization status in the study population [8]. Children aged 6 months to 59 months of either gender were included if they presented to the outpatient department with any medical illness on history. Children with a documented diagnosis of immunodeficiency on the medical record and those in whom the Expanded Programme of Immunization card was not available were excluded.

Immunization status was operationally defined as completely immunized when all vaccinations had been received according to the Expanded Programme of Immunization schedule and were confirmed by the vaccination card. Partially immunized status was assigned when some, but not all, vaccinations had been received according to the Expanded Programme of Immunization schedule and were confirmed by the vaccination card. Non immunized status was assigned when no vaccinations had been received according to the Expanded Programme of Immunization schedule, as confirmed by history. Nutritional status was assessed using the World Health

Organization standard growth charts by measuring weight and height and then calculating the weight for height Z score as the observed value minus the median value of the reference population divided by the standard deviation of the reference population [8]. Nutritional status was categorized as normal when the weight for height Z score was between minus 2 and plus 2, moderate acute malnutrition when the Z score was between minus 3 and minus 2, and severe acute malnutrition when the Z score was less than minus 3 [8].

After enrolment, demographic information was obtained from the parents or guardians including the child’s name, age, and gender. Immunization history was recorded and verified by cross checking with the child’s vaccination card, after which immunization status was labelled according to the operational definitions. Weight and height were measured by the researcher, and nutritional status was determined using the World Health Organization growth standards and categorized accordingly [8]. All observations were entered on the predefined proforma to ensure standardized recording.

Data were entered and analysed using Statistical Package for the Social Sciences version 27.0. Numerical variables, including age, weight, and height, were summarized as mean and standard deviation, while categorical variables, including gender, immunization status, and nutritional status, were summarized as frequencies and percentages. The chi square test was applied to assess the association between nutritional status and immunization status, and a p value of 0.05 or less was taken as statistically significant. Stratification by age, gender, place of residence (rural/urban) and socioeconomic status (lower/middle/upper) was performed, and post stratified chi square testing was also applied.

RESULTS

A total of 151 children aged 6 months to 59 months were enrolled in the study. The mean age was 28.4 ± 14.2 months, with 89 (58.9%) males and 62 (41.1%) females. The mean weight was 11.8 ± 3.4 kg, and the mean height was 84.6 ± 12.8 cm. Regarding place of residence, 94 children (62.3%) were from urban areas and 57 (37.7%) from rural areas. Socioeconomic status distribution showed that 82 children (54.3%) belonged to lower socioeconomic status, 51 (33.8%) to middle socioeconomic status, and 18 (11.9%) to upper socioeconomic status (Table 1).

Table 1
Demographic Characteristics of Study Population (n=151)

Variable	Category	Frequency (n)	Percentage (%)	Mean ± SD
Gender	Male	89	58.9	-
	Female	62	41.1	-
Age (months)	6-12	24	15.9	28.4 ± 14.2
	13-24	38	25.2	
	25-36	41	27.2	
	37-48	29	19.2	
	49-59	19	12.6	
Place of Residence	Urban	94	62.3	-
	Rural	57	37.7	-
Socioeconomic Status	Lower	82	54.3	-
	Middle	51	33.8	-
	Upper	18	11.9	-
Weight (kg)	-	-	-	11.8 ± 3.4
Height (cm)	-	-	-	84.6 ± 12.8

Nutritional status assessment revealed that 77 children (51.0%) had normal nutritional status, while 38 (25.2%) had moderate acute malnutrition and 36 (23.8%) had severe acute malnutrition (Table 2).

Table 2
Nutritional Status of Children (n=151)

Nutritional Status	Frequency (n)	Percentage (%)
Normal	77	51.0
Moderate Acute Malnutrition	38	25.2
Severe Acute Malnutrition	36	23.8
Total	151	100.0

Immunization status analysis demonstrated that 112 children (74.2%) were completely immunized, 31 (20.5%) were partially immunized, and 8 (5.3%) were non immunized according to the Expanded Programme of Immunization schedule (Table 3).

Table 3
Immunization Status of Children (n=151)

Immunization Status	Frequency (n)	Percentage (%)
Completely Immunized	112	74.2
Partially Immunized	31	20.5
Non Immunized	8	5.3
Total	151	100.0

A statistically significant association was found between immunization status and nutritional status. Among completely immunized children, 59.8% had normal nutritional status compared to 25.8% in partially immunized and 25.0% in non immunized children. Severe acute malnutrition was documented in 50.0% of non immunized children compared to 17.9% of completely immunized children (Table 4).

Table 4
Association Between Immunization Status and Nutritional Status (n=151)

Immunization Status	Normal n (%)	Moderate Acute Malnutrition n (%)	Severe Acute Malnutrition n (%)	Total n (%)	χ^2 Value	p Value
Completely Immunized	67 (59.8)	25 (22.3)	20 (17.9)	112 (100.0)	18.42	0.001
Partially Immunized	8 (25.8)	11 (35.5)	12 (38.7)	31 (100.0)		
Non Immunized	2 (25.0)	2 (25.0)	4 (50.0)	8 (100.0)		
Total	77 (51.0)	38 (25.2)	36 (23.8)	151 (100.0)		

Table 5
Stratified Analysis of Nutritional Status by Gender, Age Groups, Place of Residence, and Socioeconomic Status (n=151)

Stratification Variable	Category	Normal n (%)	Moderate Acute Malnutrition n (%)	Severe Acute Malnutrition n (%)	χ^2 Value	p Value
Gender	Male	47 (52.8)	21 (23.6)	21 (23.6)	3.86	0.425
	Female	30 (48.4)	17 (27.4)	15 (24.2)	2.14	0.710
Age (months)	6-12	15 (62.5)	5 (20.8)	4 (16.7)	2.18	0.536
	13-24	18 (47.4)	10 (26.3)	10 (26.3)	3.42	0.181
	25-36	20 (48.8)	11 (26.8)	10 (24.4)	4.12	0.127
	37-48	14 (48.3)	7 (24.1)	8 (27.6)	1.89	0.596
	49-59	10 (52.6)	5 (26.3)	4 (21.1)	1.53	0.675
Place of Residence	Urban	54 (57.4)	22 (23.4)	18 (19.1)	12.68	0.013
	Rural	23 (40.4)	16 (28.1)	18 (31.6)	4.21	0.378
Socioeconomic Status	Lower	34 (41.5)	23 (28.0)	25 (30.5)	14.82	0.005
	Middle	30 (58.8)	12 (23.5)	9 (17.6)	3.47	0.482
	Upper	13 (72.2)	3 (16.7)	2 (11.1)	2.18	0.703

DISCUSSION

The present study evaluated nutritional status and Expanded Programme of Immunization (EPI) completion among children aged 6 to 59 months presenting to a tertiary-care outpatient department. Using World Health Organization (WHO) weight-for-height Z-scores, normal nutritional status was observed in 51.0%, while moderate acute malnutrition and severe acute malnutrition were documented in 25.2% and 23.8%, respectively. This distribution suggests that nearly half of the children had acute forms of undernutrition at presentation, which is clinically concerning given the short-term risks of infection susceptibility, poor recovery, and growth faltering associated with wasting. When compared with the Anganwadi-based findings of Singh et al., where 49.78% were adequately nourished and both moderate and severe acute malnutrition were 16.45% each, the present study demonstrated a higher burden of both moderate and severe acute malnutrition, likely reflecting differences in recruitment setting and case-mix, as the

current sample was drawn from children attending OPD due to medical illness rather than a community service-based population [9].

Immunization coverage in the current study was relatively better than several population-based estimates, with 74.2% completely immunized, 20.5% partially immunized, and 5.3% non-immunized. This proportion was comparable to the 72% complete immunization reported by Singh et al., supporting the interpretation that immunization coverage in service-linked child populations may reach the mid-70% range in similar contexts [9]. However, markedly higher coverage has been reported in some Anganwadi settings, including 99% complete immunization by Abhishek and Sunil and 97.5% appropriate immunization by Debata et al., indicating that structured outreach platforms may achieve substantially higher completion than tertiary-care outpatient streams [1,11]. In contrast, Bhavsar et al. reported only 46.4% complete immunization in an urban slum context, underscoring how social disadvantage, service access

barriers, and caregiver constraints can reduce vaccine completion even within densely populated settings [12]. Similarly, Mehmood et al. found lower full immunization (58%) with higher partial and non-immunization rates (28% and 14%), which is compatible with the observed association between incomplete immunization and poorer health profiles among children presenting to hospital services [13]. Notably, national survey-based evidence from Pakistan reported complete immunization in 39.30% with incomplete immunization in 60.69%, which was substantially lower than the present study and may reflect broader population coverage gaps not captured within a card-verified, hospital-attending sample [3].

A key finding was the statistically significant association between immunization status and nutritional status ($p=0.001$), with normal nutrition observed in 59.8% of completely immunized children versus 25.8% in partially immunized and 25.0% in non-immunized children. Severe acute malnutrition was most prominent among non-immunized children (50.0%) compared with completely immunized children (17.9%). This relationship is biologically and programmatically plausible, as incomplete immunization may increase the risk of vaccine-preventable infections that precipitate acute weight loss, while also functioning as a proxy for broader care barriers affecting feeding practices, timely healthcare seeking, and preventive service uptake. Consistent with this interpretation, Shinsugi and Mizumoto reported higher odds of stunting and wasting among incompletely immunized children, reinforcing the interlinkage between immunization completion and nutritional vulnerability [7]. Although some settings have reported high immunization coverage despite persistent undernutrition, such as the 99% vaccine completion with residual moderate and severe acute malnutrition reported by Abhishek and Sunil, these findings collectively suggest that immunization is necessary but insufficient in isolation for malnutrition prevention, and should be paired with structured nutritional screening and counselling [1].

The stratified analyses further clarified contextual drivers of undernutrition. Children from rural areas demonstrated poorer nutritional status than urban children ($p=0.013$), with severe acute malnutrition rising to 31.6% in rural residents compared with 19.1% in urban residents, suggesting differential food security, healthcare access, and caregiver resources. Similarly, socioeconomic status showed a significant gradient ($p=0.005$), with normal nutritional status increasing from 41.5% in lower socioeconomic groups to 72.2% in upper socioeconomic

groups. These patterns align with broader evidence that household wealth and caregiver education shape both nutrition and immunization outcomes, as shown in large comparative analyses across South Asian populations [4]. The present findings also differ from the underweight prevalence of 19.54% reported by Ahmad et al., likely because the current work specifically quantified acute malnutrition using weight-for-height Z-scores rather than weight-for-age categories, and was conducted in a facility-based sample enriched for intercurrent illness [2].

The strengths of the present study included the use of WHO growth standards with objective anthropometric measurements, card-based verification of immunization status, adequate sample size derived from WHO calculator assumptions, and stratified analyses by residence and socioeconomic status to explore effect modification. However, the cross-sectional design limited causal inference between immunization and nutritional outcomes. Selection bias was also likely because recruitment was OPD-based and used non-probability consecutive sampling, potentially overestimating acute malnutrition compared with community estimates. The requirement for an available EPI card may have inflated complete immunization proportions by excluding children with poor documentation. Additional limitations included the single-centre setting, absence of dietary intake quantification, and lack of adjustment for key confounders such as maternal education, breastfeeding practices, birth weight, recurrent infection history, and household food insecurity, all of which may have contributed to residual confounding in the observed associations.

CONCLUSION

This study highlights a substantial burden of acute malnutrition among children aged 6 to 59 months presenting to a tertiary-care outpatient setting, alongside notable gaps in immunization completion. Nutritional status was significantly better among children who were fully immunized, suggesting that vaccine uptake may reflect broader access to preventive child health services and timely healthcare seeking. Rural residence and lower socioeconomic status were associated with poorer nutritional outcomes, indicating persistent inequities in child health. These findings support the need for integrated strategies combining routine growth monitoring, caregiver counselling, and strengthened immunization tracking to improve early childhood health and reduce preventable morbidity.

REFERENCES

1. Abhishek S V, Sunil BN: Assessment of Nutrition and Immunization Status of Children Attending to Anganwadis at Field Practice Area of a Rural Medical College, Karnataka. *J Clin Biomed Sci*. 2023, 13:50–5. <https://doi.org/10.58739/jcbs/v13i2.23.12>
2. Ahmad D, Afzal M, Imtiaz A: Effect of socioeconomic factors on malnutrition among children in Pakistan. *Futur Bus J*. 2020, 6:1–11. <https://doi.org/10.1186/s43093-020-00032-x>
3. Asif AM, Akbar M, Tahir MR, Arshad IA: Role of Maternal Education and Vaccination Coverage: Evidence From Pakistan Demographic and Health Survey. *Asia-Pacific J Public Heal*. 2019, 31:679–88. <https://doi.org/10.1177/1010539519889765>
4. Banerjee S, SubirBiswas, Roy S, Pal M, Hossain MG, Bharati P: Nutritional and immunization status of under-five children of India and Bangladesh. *BMC Nutr*. 2021, 7: <https://doi.org/10.1186/s40795-021-00484-6>
5. Fadare O, Amare M, Mavrotas G, Akerele D, Ogunniyi A: Mother's nutrition-related knowledge and child nutrition outcomes: Empirical evidence from Nigeria. *PLoS One*. 2019, 14: <https://doi.org/10.1371/journal.pone.0212775>

6. Rahman MS, Mushfiquee M, Masud MS, Howlader T: Association between malnutrition and anemia in under-five children and women of reproductive age: Evidence from Bangladesh demographic and Health Survey 2011. PLoS One. 2019, 14:
<https://doi.org/10.1371/journal.pone.0219170>
7. Shinsugi C, Mizumoto A: Associations of nutritional status with full immunization coverage and safe hygiene practices among thai children aged 12–59 months. Nutrients. 2022, 14:
<https://doi.org/10.3390/nu14010034>
8. Siddiqa M, Shah GH, Mayo-Gamble TL, Zubair A: Determinants of Child Stunting, Wasting, and Underweight: Evidence from 2017 to 2018 Pakistan Demographic and Health Survey. J Nutr Metab. 2023, 2023:
<https://doi.org/10.1155/2023/2845133>
9. Singh M, Yadav P, Rehan R, Chowdhury SR, Vaidya VM, Patil RS, Patil KH: Assessment of the status of malnutrition and immunization coverage in under-five children attending Anganwadis. Indian J Child Health. 2020, 7:216–9.
<https://doi.org/10.32677/ijch.2020.v07.i05.006>
10. Tanveer M, Hohmann A, Roy N, Zeba A, Tanveer U, Siener M: The Current Prevalence of Underweight, Overweight, and Obesity Associated with Demographic Factors among Pakistan School-Aged Children and Adolescents—An Empirical Cross-Sectional Study. Int J Environ Res Public Health. 2022, 19:
<https://doi.org/10.3390/ijerph191811619>
11. Debata I, Ranganath TS, Priya KJ, Tejas J: A cross-sectional study of anthropometry and immunization coverage of Anganwadi children in a rural area of Karnataka. J Fam Med Prim Care. 2023, 12:1679–84.
<https://doi.org/10.4103/jfmpc.jfmpc.370.23>
12. Bhavsar S, Mahajan H, Kulkarni R: Assessment of the Nutritional Status and Immunization Coverage of Anganwadi Children in Rafiq Nagar, Mumbai. Public Heal Res. 2013, 2:229–34.
<https://doi.org/10.5923/j.phr.20120206.09>
13. Mehmood S, Ahmad I, Khan M: Nutritional status of children under 5 years of age. J Islam Med Dent Coll. 2022, 5:50–53.