NUTRITIONAL STATUS OF CHILDREN WITH SEVERE PNEUMONIA

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ABSTRACT

Background: Severe pneumonia is a major cause of morbidity and mortality among children, particularly in low- and middle-income countries. Poor nutritional status may increase susceptibility to severe infections and adversely affect clinical outcomes in children with pneumonia. However, the relationship between nutritional status and severe pneumonia in children remains important to evaluate in local healthcare settings. Therefore, this study aims to determine the association between nutritional status and severe pneumonia among children presenting to Ayub Teaching Hospital, Abbottabad. **Materials and Methods:** A cross sectional study was Conducted from 1st November 2025 to 31 january 2026 at the Pediatrics Department of Ayub Teaching Hospital, Abbottabad A total of 168 children aged 1–5 years with severe pneumonia were included. Demographic and clinical data were recorded. Nutritional status was assessed using weight for age, height for age and weight for height according to standard growth charts. Data was analysed using SPSS version 26. Mean and standard deviation were calculated for quantitative variables while frequencies and percentages were used for categorical variables. Chi square test or Fisher exact test was applied and p value ≤0.05 was taken as significant. **Results:** Mean age was 2.90 ± 1.17 years and mean weight was 11.24 ± 2.74 kg. Males were 86 (51.2%) and females 82 (48.8%). Underweight was found in 63 (37.5%) children, stunting in 107 (63.7%) and wasting in 60 (35.7%). Significant association was seen between underweight and socioeconomic status (p=0.013) and educational level (p=0.010), while age (p=0.873), gender (p=0.577) and residence (p=0.341) showed no significant association.**Conclusion:** High burden of malnutrition was observed among children with severe pneumonia, especially stunting. Socioeconomic and educational factors were important contributors.

Keywords: Child, Child Nutrition Disorders, Pneumonia, Socioeconomic Factors, Wasting.

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INTRODUCTION:

Pneumonia among pediatric patients is one of the major causes of mortality and morbidity worldwide, especially in developing countries(1). This condition is an infection of the lung tissue that affects mostly infants and children aged less than five years(2). The main causative organisms include bacteria like Streptococcus pneumoniae and viruses such as Respiratory Syncytial Virus(3). Signs and symptoms of pneumonia include cough, fever, breathing difficulties, and chest retractions; in severe cases, patients may experience hypoxia and problems feeding(4). Nutritional problems in children suffering from severe pneumonia can be common, with underweight children being one of the most common forms in such patients(5). The term “underweight” means having low weight for age and involves both chronic and acute undernutrition(6). Underweight children are more susceptible to diseases due to poor immunity, thereby making them prone to diseases like pneumonia. Underweight affects immunity by decreasing the function of cellular immunity, antibodies, and even mucosal immunity, hence facilitating infection(7).

Stunting and wasting represent key markers of nutritional deficiencies in children suffering from severe pneumonia(8). Stunting refers to poor height-to-age measurements and indicates chronic nutritional deficiency, while wasting

represents poor weight-to-height ratios and indicates acute nutritional deficiency(9). The two conditions occur very frequently among hospitalized children with severe pneumonia. Children who suffer from wasting show signs of severe losses of both fatty and lean tissues; thus, they become weak and unable to endure infections(10). However, even though children suffering from stunting seem healthy, they continue to face the effects of malnutrition. Despite several cases of pneumonia in children reported in Abbottabad, there are no data available that correlate the nutritional condition of children and the severity of pneumonia they suffer from. This issue requires further investigation since the understanding of this relationship will help detect the risk at an earlier stage and improve the approach to the management of such patients. Therefore, the purpose of this study is to identify the nutritional condition of children with severe pneumonia in Abbottabad.

MATERIALS AND METHODS:

This cross sectional study was carried out at the Paediatrics Department of Ayub Teaching Hospital from 01 November 2025 to 31 january 2026. Approval was taken from the institutional ethical review committee of the hospital before start of data collection, and study was conducted according to ethical principles. The total sample size was 168 which was calculated by using WHO sample size calculator taking 95% confidence level, 6% margin of error and expected frequency of stunting as 31.1% in children with severe pneumonia(11).Children of both genders aged 1 to 5 years and presenting with severe pneumonia were included. Severe pneumonia was labelled when child had temperature >101°F measured by thermometer along with increased respiratory rate more than 60 breaths/min in age <2 months, more than 50 in age 2 months to 1 year and more than 40 in age 1 to 5 years, along with radiographic evidence showing patchy consolidation in one or both lungs.Children having chronic respiratory diseases such as asthma, cystic fibrosis or bronchopulmonary dysplasia on history were excluded. Children with congenital heart disease or other congenital anomalies were also excluded. Patients having immunodeficiency disorders and those with severe comorbid conditions like malignancy, chronic kidney disease or liver disease were not included. Written informed consent was taken from parents or guardians before enrolment after proper explanation of study purpose and benefits. At time of inclusion, demographic details including age, gender, parent's socioeconomic status, parents educational level and residential status were recorded. Detailed history was taken and clinical examination was performed in all cases. Diagnosis of severe pneumonia was made on clinical assessment and supported by radiological findings.

Each child's nutritional status was assessed based on the WHO child growth standards. The weight and heights were individually measured and then charted on a growth chart. Information about the underweight, stunting, and wasting were documented. An underweight was determined by the weight-for-age being 2 standard deviations less than the WHO median. Stunted children had their heights less than 2 standard deviations from the WHO standard. Children were considered wasted if their weight-for-age was 2 standard deviations less than the WHO standard. All collected data was entered and analysed using SPSS version 26. Quantitative variables like age and weight were presented as mean ±SD. Categorical variables such as gender, socioeconomic status,

educational level, residential status, underweight, stunting and wasting were presented as frequencies and percentages. Stratification was done for age, gender, socioeconomic status, educational level and residential status. Post stratification chi square test or Fisher exact test was applied and p value ≤0.05 was taken as statistically significant.

RESULTS:

The mean age of children was 2.90 ± 1.17 years and mean weight was 11.24 ± 2.74 kg. Among total participants, males were 86 (51.2%) while females were 82 (48.8%). Regarding socioeconomic status, majority were poor 81 (48.2%), followed by middle class 62 (36.9%) and rich 25 (14.9%). In educational level, uneducated were 53 (31.5%), primary 46 (27.4%), secondary 52 (31.0%) and higher education 17 (10.1%). Most of the children belonged to rural areas 107 (63.7%) while urban were 61 (36.3%) (Table-I).

Table-I: Patient Demographics

Demographics	**Mean ± SD / n (%)**
Age (years)	2.90 ± 1.17
Weight (kg)	11.24 ± 2.74
Gender	
Male n (%)	86 (51.2%)
Female n (%)	82 (48.8%)
Socioeconomic status	
Poor n (%)	81 (48.2%)
Middle n (%)	62 (36.9%)
Rich n (%)	25 (14.9%)
Educational level	
Uneducated n (%)	53 (31.5%)
Primary n (%)	46 (27.4%)
Secondary n (%)	52 (31.0%)
Higher n (%)	17 (10.1%)
Residence status	
Rural n (%)	107 (63.7%)
Urban n (%)	61 (36.3%)

Regarding nutritional status, underweight was present in 63 (37.5%) children while 105 (62.5%) were not underweight. Stunting was observed in 107 (63.7%) children and absent in 61 (36.3%). Wasting was present in 60 (35.7%) children whereas 108 (64.3%) had no wasting, with total sample size of 168 (Table-II).

Table-II: Frequency of Nutritional Status Among Children with Severe Pneumonia n=168

Nutritional Status	**Frequency**	**% age**
Underweight		
Yes	63	37.50%
No	105	62.50%
Total	168	100%
Stunting		
Yes	107	63.70%
No	61	36.30%
Total	168	100%
Wasting		
Yes	60	35.70%
No	108	64.30%

Total	168	100%

On stratification analysis, underweight was found in ≤3 years age group in 35 (38.0%) and in >3 years in 28 (36.8%) with no significant association (p=0.873). Among males, 34 (39.5%) were underweight compared to 29 (35.4%) females, also not significant (p=0.577). Significant association was observed with socioeconomic status (p=0.013), where underweight was highest in poor 36 (44.4%), followed by middle 24 (38.7%) and least in rich 3 (12.0%). Educational level also showed significant association (p=0.010), with underweight more common in primary 23 (50.0%) and uneducated 22 (41.5%) compared to secondary 17 (32.7%) and higher 1 (5.9%). Residence status showed no significant association (p=0.341), where rural had 43 (40.2%) underweight and urban had 20 (32.8%) (Table-III).

Table-III: Association of Underweight with Demographic Factors

Demographic Factors	**Underweight Yes n(%)**	**Underweight No n(%)**	**pvalue**
Age (years)			
≤3	35 (38.0%)	57 (62.0%)	0.873
>3	28 (36.8%)	48 (63.2%)	
Gender			
Male	34 (39.5%)	52 (60.5%)	0.577
Female	29 (35.4%)	53 (64.6%)	
Socioeconomic status			
Poor	36 (44.4%)	45 (55.6%)	0.013
Middle	24 (38.7%)	38 (61.3%)	
Rich	3 (12.0%)	22 (88.0%)	
Educational level			
Uneducated	22 (41.5%)	31 (58.5%)	0.010
Primary	23 (50.0%)	23 (50.0%)	
Secondary	17 (32.7%)	35 (67.3%)	
Higher	1 (5.9%)	16 (94.1%)	
Residence status			
Rural	43 (40.2%)	64 (59.8%)	0.341
Urban	20 (32.8%)	41 (67.2%)	

Chi-square/Fisher Exact Test applied

DISCUSSION:

In this study, 63 children were found to have underweight (37.5%), 107 had stunting (63.7%), and 60 had wasting (35.7%). High prevalence of stunting suggests chronic malnutrition that arises due to poor dietary intake over a period of time along with infections. Wasting is related to acute malnutrition and could arise from recent episodes of infections such as pneumonia, which causes reduced consumption and increases metabolic rates. Underweight was prevalent in a significant proportions of individuals indicating the combined impact of chronic and acute nutritional problems. Underweight prevalence was significantly more common among low socioeconomic status individuals (36, 44.4%) than middle (24, 38.7%) and high-income group (3, 12.0%). This difference could be explained by poor access to nutrition and unhealthy living conditions, leading to infections among poor individuals. Similarly educational attainments demonstrated significant association with underweight as underweight was found to be more prevalent in primary (23, 50.0%) and uneducated individuals (22, 41.5%). This

differences might be explained by ignorance about child feeding practices and nutrition requirements.

The present study enrolled 168 children with severe pneumonia with mean age of 2.90 ± 1.17 year and mean weight of 11.24 ± 2.74 kg. Males constituted 86 (51.2%) and female 82 (48.8%). These demographic finding are broadly consistent with Kharisma et al(12). whose crosssectional study of 68 under-five children with pneumonia reported the majority aged 0–11 month and females constituting 55.9%, though the latter differed slightly from the present findings where male predominance was observed. Similarly Bulsara et al(13). reported male predominance of 236 (63.10%) among 374 children admitted with pneumonia and/or diarrhoea which aligns well with the current finding of 86 (51.2%) males suggesting that male sex may confer some susceptibility to lower respiratory infections in early childhood possibly attributable to anatomical and immunological differences(14, 15).

Regarding nutritional status underweight was identified in 63 (37.5%) stunting in 107 (63.7%), and wasting in 60 (35.7%) of children with severe pneumonia. These rates are notably high and corroborate earlier observation. Yadav et al(16). reported undernutrition in 69 (40.6%) of 170 children with pneumonia, a figure very close to the 37.5% underweight prevalence observed in the present study suggesting a consistently high burden of undernutrition in this population across different settings. Arpitha et al(15). observed pneumonia in 65% of children with significant malnutrition and reported very severe pneumonia in 30% of that group which is in agreement with the present observation that a substantial proportion of children with severe pneumonia carried some form of nutritional deficit. Howie et al(17). further reinforced this finding in their case-control study demonstrating that malnutrition was strongly associated with severe pneumonia (aOR 8.7, 95% CI 4.2–17.8, p<0.001) and the high stunting prevalence of 107 (63.7%) in the current sample may partly reflect this strong aetiological link. Rizone et al. [18] also confirmed a significant association between nutritional status and pneumonia severity (p<0.001, prevalence ratio 4.3023) which is in line with the burden of malnutrition documented here.

The stratification analysis showed that underweight had no significant association with age (p=0.873) or gender (p=0.577), findings that are consistent with Rizone et al(18). who similarly reported no significant association between age (p=0.081) or gender (p=1.000) with pneumonia severity, suggesting that these variables may not independently determine nutritional vulnerability in younger paediatric cohorts with severe pneumonia. In contrast, a significant association was found with socioeconomic status (p=0.013), where the highest proportion of underweight children belonged to poor families 36 (44.4%) and the lowest to rich families 3 (12.0%). Morshed et al(19). similarly identified low income as a notable risk factor in their case-control study of children under five with pneumonia, supporting the current observation that poverty serves as a principal determinant of malnutrition in this population. Yang et al(20). likewise identified low income (less than 3000 yuan) as an independent risk factors for malnutrition in patients with severe pneumonia and their predictive model

demonstrated an excellent AUC of 0.974 further validating the economic dimension of nutritional risk. The reasons for this association is likely multifactorial, encompassing food insecurity, poor hygiene, overcrowding, and limited healthcare access all of which are disproportionately prevalent among lowerincome families in developing setting such as that of the present study.

Educational level also demonstrated a significant association with underweight (p=0.010), with underweight most common among children whose mothers had primary 23 (50.0%) or no formal education 22 (41.5%), whilst it was considerably less frequent in those with higher education 1 (5.9%). This finding is in agreement with Nalwanga et al(21). whose qualitative study identified that caregivers' limited understanding of appropriate feeding practices during illness contributed substantially to nutritional deterioration in children with severe pneumonia. Moreover, Ginsburg et al(22). highlighted that undernutrition contributes to approximately 50% of child deaths globally, and a large share of this burden falls on populations with limited maternal education, corroborating the present result. The study was done in one location only; therefore, generalization of results is not possible for other populations. The sample size used may not be representative of the total burden of the problem in the population. Due to the crosssectional nature of the study, it cannot demonstrate causation between nutrition and the severity of pneumonia. Some of the data were taken from medical charts, thus exposing the study to risks of inaccurate data. Other variables, including diet and environment, were not considered in the study.

CONCLUSION:

The research indicates that there is a strong correlation between malnutrition and the severity of pneumonia among children. Children who have poor nutrition tend to have a greater chance of becoming severely ill and suffering complications. There are also socioeconomic and educational factors that greatly affect the nutritional status of children.

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CONFLICT OF INTEREST:

Author declare that no conflict of interest is present in this study.

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