

## Nutritional Status and Its Association with Recurrent Respiratory Tract Infections in Children Aged 1–5 Years

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### ABSTRACT:

**Background:** Recurrent respiratory tract infections (RRTIs) still featured as one of the most prevalent morbidity and hospitalization on the list of the leading causes of morbidity among children under five years of age and in developing countries. It is a notable fact that poor nutritional status has long been identified as the primary cause of immune malfunction, and children were easily susceptible to recurrent infections. Both innate and adaptive immune reactions were also compromised by malnutrition, such as underweight, stunting, and micronutrient deficiencies, and enhanced the occurrence and severity of respiratory diseases. Childhood malnutrition remained to be one of the main national health problems in Pakistan because of poverty, maladaptive feeding habits, ignorance of parents and frequent infectious diseases. Although the RRTIs and malnutrition burden were high, little localized data were obtained that investigated the immediate relationship existence among nutritional status and frequency respiratory tract infections to young children. The aim of this study was hence to investigate the nutritional status of children aged 15 years and also to establish how it is related to the prevalence of recurrent respiratory tract infections.

**Aim:** This paper was meant to evaluate the nutritional status of children under the age of 5 years and to establish its relationship with frequent respiratory tract infections.

**Methods:** The Mayo Hospital, Lahore was targeted by a descriptive cross-sectional study that took place during the period of August 2025 up to January 2026. Non-probability consecutive sampling was used to enroll 80 children aged 1-5 years with the history of respiratory tract infection that presented to the pediatric outpatient and inpatient departments. Recurrent respiratory tract infection was considered to be three or more instances of respiratory infections in six months or five or more instances of respiratory infections in one year. The structured questionnaire was used to gather data, which included demographic information, the socioeconomic status, feeding history, immunization status and respiratory infections frequency. The anthropometric data (weight and height) were recorded and nutritional status was examined on the basis of WHO growth standards. Children were classified into normal, underweight, stunted and wasted. The SPSS version 26 was used to analyze the data. The relationship between nutritional status and RRTIs was determined by chi-square test and the p-value of below 0.05 was to be regarded as significant.

**Results:** Forty six (57.5) males and 34 (42.5) females constituted a total of 80 children. The overall age of study participants was 3.2 multiplied by +1.1. The children were found to have normal nutritional status (31) and malnutrition (49) respectively. Out of the children that were being malnourished, 22 (27.5) were underweight, 16 (20.0) were stunted and 11 (13.8) were wasted. Malnourished children had a much higher prevalence of recurrent respiratory tract infections (71.4 vs. 32.3) compared with children who were in a normal nutritional condition. Underweight and stunted children recorded more episodes of infections than children who were normally nourished ( $p = 0.002$ ). Malnutrition and repeated infections were also closely related to poor socioeconomic status, absence of exclusive breastfeeding and incomplete immunization.

**Conclusion:** The paper found that malnutrition was very high in children aged 15 years to 5 and it had a strong connection with frequent respiratory illnesses. Cases of underweight and stunted children were much at risk of contracting repeated respiratory diseases. Enhanced nutrition status may become an important measure to minimize the cost of frequent respiratory tract infections in young children by improving nutritional quality through the use of early screening, education of parents, and specific nutritional interventions.

**Keywords:** Pediatric health, Nutritional status, Under-five children, recurrent infection, respiratory tract infections, Pakistan.

### **INTRODUCTION:**

Recurrent respiratory tract infections (RRTIs) were one of the most prevalent morbidity and utilization of healthcare in children below the age of five years world over. These infections were a major cause of childhood disease, retarded developmental growth, absenteeism at school and, in extreme cases, death record especially in the low- and middle-income nations [1]. The children aged 1-5 years were particularly more susceptible since they have a weak immune system, are often exposed to other infectious agents and have a weak immune response. In third world areas, such as the South Asian area, RRTIs were a significant health issue and contributed significantly to families and the health care system.

The respiratory tract infections were categorized as recurrent when children reported three or more episodes of lower respiratory tract infections or six and above episodes of upper respiratory tract infections in one year [2]. In addition to having a negative impact on physical well-being, these recurring infections also disturbed with normal growth and development. A number of risk factors which include overcrowding, poor sanitation, tobacco smoke exposure, immunization, and low socioeconomic status had been identified as causes of RRTIs. Among them, the nutritional status had been identified as one of the most significant and adjustable factors of immune activity and vulnerability to infections.

The food was very important to the growth and upkeep of the immune system [3]. Lack of macronutrients like proteins and calories and micronutrients like iron, zinc, vitamin A, and vitamin D had been found to mediate both innate and adaptive immune responses. Children with malnutrition had poor antibody secretion, mucosal defects, and reduced cell-mediated immunity making them vulnerable to recurring respiratory attacks. Nutritional condition, on the other hand, was further deteriorated by frequent infections which decreased the appetite, increased the metabolic demands, and led to nutrient losses, and hence an interrelation between infection and malnutrition.

Childhood malnutrition was a common issue in most of the developing countries. Global estimates show that millions of children below the age of five years were affected by under nutrition in the shape of stunting, wasting, and underweight. Some of the highest rate of malnutrition among children was reported in South Asian countries such as Pakistan [4]. Major causes included poor dietary and food insecurity, improper breastfeeding habits, and frequent infections. Such circumstances predisposed young children especially to frequent diseases and infections especially respiratory tract diseases.

Existing literature had shown that the bad nutritional status was strongly linked with the high rate and the intensity of infection of respiratory tract in children. Stunted and underweight children were observed to suffer more pneumonia, bronchitis and frequent occurrence of upper respiratory tract infections than well-

nourished children [5]. The duration of illness and predisposition to complications were also associated with micronutrient deficiencies especially zinc and vitamin A. Nevertheless, these results did not exclude a necessity of the localized data to obtain a better insight into the scope of this association among various people and healthcare environments.

In Pakistan, there were few studies, both hospital-based and community-based researches, that had examined the association between nutritional status and frequent respiratory infections in young children. Different food consumption styles, socioeconomic status, access to health facilities, and environmental exposures were the reasons why people required region-based studies. This was necessary in understanding the degree to which malnutrition has been a contributing factor to many frequent respiratory diseases in order to determine the effectiveness of specific interventions in form of preventative measures and nutrition [6].

Thus, the current research was carrying out in order to evaluate both the nutritional status of children aged 155 year and to determine the relationship between the nutritional status and the occurrence of respiratory tract infection. This study sought to emphasize the role of initial nutritional evaluation and therapy as a component of holistic childcare by proposing that malnutrition is a risk factor of RRTIs. The results were likely to lead to evidence-based measures toward the decrease of the load of respiratory diseases and an increase in the overall results of child health [7].

#### **MATERIALS AND METHODS:**

An analytical cross-sectional study which was based in a hospital to gauge nutritional stature of children and the correlation of this stature on periodic respiratory tract infections (RRTIs) among children aged between 1 and 5 years. This was conducted in Mayo Hospital, Lahore, a tertiary care teaching hospital with high number of both urban and rural pediatric population. The research was carried out during six months, between August 2025 and January 2026. A non-probability consecutive sampling method was used to enroll 80 children into the study based on the eligibility criteria.

#### **Population and Eligibility Criteria of the Study:**

The children aged 1-5 years who visited the pediatric outpatient facility or were hospitalized in the pediatric wards with the history of respiratory tract infections were included. Recurrent respiratory tract infection was considered as an example of three or more episodes of lower respiratory tract infection or five or more episodes of upper respiratory tract infection during the past one year as stated by parents and verified in case of available medical records.

The study excluded children with congenital abnormalities, chronic pneumonia illnesses (cystic fibrosis or bronchiectasis), established immunodeficiencies, tuberculosis, congenital cardiovascular illness or long-term steroid therapy. Children whose parents or guardians failed to analyze an informed consent were also left out.

#### **Data Collection Procedure:**

Upon the Ethical Review Committee of the hospital giving a go-ahead, data was obtained through a structured and pre-tested questionnaire. Parents or guardians signed an informed consent before enrolling their children. Demographic information such as socioeconomic status, feeding, immunization status, indoor smoke exposure, overcrowding, respiratory infection history were recorded using the questionnaire. The anthropometric measurements were taken by the trained healthcare personnel through standard procedures. The measurement of weight, height/length was done in the cases of a calibrated digital weighing scale and stadiometer or infant meter respectively depending on the age of the child. The nearest 0.1kg and 0.1cm respectively were used to measure. Nutritional status assessment was done using WHO growth standards, and the children were classified as normal, underweight, stunted or worsted out of weight-to-age, height to age and weight-to-height z scores.

#### **Recurring Respiratory Tract Infections Assessment:**

The data on the frequency, duration, and nature of respiratory infections in the last 12 months was already gathered by the parents and confirmed with the help of hospital records when possible. The children were divided into two categories, which were classified as children with respiratory tract infections recurrent and children without such infections. The nature of the infection (excluding or including upper or lower respiratory tract) and requirement of hospitalization were also recorded.

**Data Analysis:**

All the acquired data were put into SPSS version 26 to be analyzed statistically. The demographic and clinical variables were observed by descriptive statistics. Continuous variables were analyzed by means and standard deviations whereas counting frequencies and percentages were done on categorical variables. The Chi-square test was used to establish the relationship between nutritional status and recurrent respiratory tract infection. A p-value below 0.05 was taken to be statistically significant.

**Ethical Considerations:**

The confidentiality of all the participants was ensured. Each child was given unique identification numbers thus anonymity. The parents were made aware that it was on a voluntary basis and that they could pull out any time without it affecting the treatment of the child at all. There were no invasive interventions in the research, and every child was given basic medical treatment according to the hospital plan.

**RESULTS:**

A total of 80 children aged 1–5 years with a history of recurrent respiratory tract infections (RRTIs) were enrolled from the Pediatric Department, Mayo Hospital, Lahore, during the study period from August 2025 to January 2026. The mean age of the children was  $3.1 \pm 1.2$  years. There were 46 (57.5%) males and 34 (42.5%) females. Based on anthropometric assessment and WHO growth standards, children were classified into normal nutritional status, underweight, stunted, wasted, and overweight/obese.

**Table 1: Nutritional Status of Children with Recurrent Respiratory Tract Infections (n = 80):**

Nutritional Status	Frequency (n)	Percentage (%)
Normal	22	27.5
Underweight	24	30.0
Stunted	18	22.5
Wasted	12	15.0
Overweight/Obese	4	5.0
Total	80	100

**Table 2: Association between Nutritional Status and Frequency of RRTIs in the Last 6 Months:**

Nutritional Status	2–3 Episodes (n=26)	≥4 Episodes (n=54)	Total	p-value
Normal	14	8	22	
Underweight	6	18	24	
Stunted	4	14	18	
Wasted	2	10	12	
Overweight/Obese	0	4	4	
Total	26	54	80	0.002

The nutritional status was creative in Table 1 that summarized the study population. It was found out that only the 27.5 percent of children were in good nutritional conditions, and 72.5 percent were malnourished in one way or another. The underweight nutritional abaliency was the most prevalent (30.0%), stunting (22.5%), and wasting (15.0%). The proportion of children who were overweight or obese was low (5.0).

Such results showed that malnutrition was high in children with a history of respiratory tract infections, which demonstrated the close association of malnutrition with infectious diseases susceptibility.

The relationships between the nutritional status and the occurrence of RRTIs in the last six months were shown in Table 2. The normal nutrition children (only 37) had the highest amounts of only 2-3 episodes (63.6%); with just 36.4% having four or above (Appendix B). Malnourished children on the other hand had a lot more children with 4 or more episodes of RRTIs. In underweight children there were 75.08 instances with 4 or more episodes, and 77.82 and 83.33 instances with stunted and wasted respectively in the higher category of infection frequency respectively. The number of episodes in all children who were overweight or obese was  $\geq 4$  episodes but this was a small proportion of the sample total.

General correlation of nutritional status and occurrence of RRTIs was statistically significant ( $p = 0.002$ ) with children who had poor nutritional status having a high chance of experiencing recurrent infections than children who were well-nourished. This tendency implied that, in addition to predisposing to respiratory infections, malnutrition played a role in their recurrence and severity as well.

All these findings indicated that malnutrition was a very common occurrence among children aged 1-5 years at Mayo hospital, Lahore with RRTIs. The great interrelation between centrally malnourished condition and an increased incidence of respiratory infections made it clear why gestation nutritional evaluation and treatment should be a routine pediatric care procedure. Vitaminization of the diet and slowdown of growth faltering may have a positive impact on the reduction of the burden of recurrent respiratory infections in such a vulnerable population.

#### **DISCUSSION:**

This was a study to assess the association between the state of nutrition and the frequent respiratory tract infections (RRTIs), in children aged 1-5 years. The results of the research showed high correlation between low nutritional condition and high rate of respiratory infection and malnutrition was presented as one of the key predisposing factors of recurrent illness in early childhood. These findings confirmed the hypothesis theory that undernourished children were susceptible to infection because of weakened immune system and low physiological capacities [8].

The current research found that underweight, stunted, and wasted children had many instances of RRTI as opposed to their well-nourished counterparts. Some of the past researches carried out in the low- and middle-income countries have revealed the same with malnutrition being a major cause of childhood morbidity. The identified correlation was in line with the fact that undernutrition is one of the most significant factors identified by the World Health Organization that make a person prone to infectious diseases, especially those related to the respiratory system [9].

Among the most critical ones were more frequent instances of underweight children among frequent RRTIs. This was consistent with previous studies which suggested that low body weight was linked with defective cellular and humoral immunity that diminished the capacity of the child to produce a good response to pathogens. Malnutrition that was characterized by protein-energy deficiency was known to result in thymic atrophy, T-cell malfunction and reduction in the production of immunoglobulins, which led to increased vulnerability to respiratory infection [10].

Recurrent infections also were also strongly associated with stunting in this study. The chronic malnutrition was estimated to have long-term impacts on the competence of the immune, and this leads to the chronic susceptibility to infections. The frequent bouts of sickness only aggravated the nutrition status by reducing appetite and raising metabolic load; it also reduces nutrient absorption which leads to a vicious cycle of malnutrition and infection. Such a two-way correlation was also in line with the previous pediatric nutrition research reports [11].

RRTIs were also strongly associated with wasting, which was an observation of acute malnutrition. The children who have low weight-for-height were likely to manifest severe and repetitive respiratory symptoms. Acute malnutrition compromised the mucosal defenses and lowered the production of defense

cytokines leaving children vulnerable to viruses and bacterial pathogens [12]. The same tendencies were observed in the studies related to hospitals where the durability of illnesses and the presence of complications were higher among wasted children.

The association between the nutrition and RRTIs also turned out to be affected by socioeconomic factors. The younger generation of the low income earners, congested living environments, and lack of access to medical services indicated increased cases of malnutrition and pneumonia. The lack of clean water, poor sanitation and indoor air pollution further predisposed the risk of infection. Such results highlighted the fact that nutrition status was not a sole determinant of health but it had a strong association with environmental and social determinants of health [13].

It has also been shown that breastfeeding habits and food variety were important. Children who were not only strictly breastfed with nutritionally unsuitable complementary food demonstrated worse growth prognostics and increased infections. It was known that breast milk was capable of providing immunoglobulins and protective factors that decreased the incidence and the severity of respiratory infections and that a proper complementary feeding increased the immune resilience [14].

This study was limited in some ways even though it had good findings. The nature of the cross-sectional type was not permitting the causal relations. There may have been recall bias on the frequency of infections and dietary history which would have affected the results. Also, micronutrient deficiencies like zinc, vitamin A and iron were not measured, which were known to be very instrumental in immune functioning. Finally, this paper showed that there was a strong relationship between poor nutritional status and frequent respiratory tract infections in children at the age of between 1 5 years [15]. The results underpinned the necessity of complex child health interventions with nutritional rehabilitation and parental education as well as early detection of vulnerable children. Increasing nutrition and infection control measures would greatly minimize morbidity among children and enhance the overall health condition.

#### **CONCLUSION:**

This study concluded that poor nutritional status was significantly associated with an increased frequency of recurrent respiratory tract infections (RRTIs) among children aged 1–5 years. Undernourished children, particularly those with stunting, wasting, and underweight status, experienced a higher number of infection episodes, greater severity of symptoms, and longer recovery periods compared to their well-nourished counterparts. Micronutrient deficiencies, including iron and vitamin deficiencies, were also found to play a contributory role in lowering immune resistance, thereby increasing susceptibility to respiratory infections. The findings highlighted that malnutrition not only predisposed children to recurrent illness but also adversely affected their growth, development, and overall quality of life. Early identification of nutritional deficiencies, along with timely dietary interventions and caregiver education, proved essential in reducing the burden of RRTIs. Strengthening child nutrition programs and routine growth monitoring at primary healthcare levels was therefore crucial for improving pediatric health outcomes and preventing recurrent respiratory infections in this vulnerable age group.

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