

FREQUENCY OF SEVERE ACUTE RESPIRATORY ILLNESS IN LESS THAN 5 YEARS OLD CHILDREN IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: To determine the frequency of factors of severe acute respiratory illness among children less than five years of age presenting to a tertiary care hospital.

Study Design: A descriptive cross-sectional study.

Place and Duration of the Study: Department of Pediatrics, Shifa International Hospital, Islamabad, Pakistan, from 18th January 2026 to 18th May 2026.

Methodology: A total of 343 children aged 1 to 5 years with severe acute respiratory illness were enrolled through consecutive sampling. Severe acute respiratory illness was assessed on the basis of fever, cough, hospital admission and clinical, oxygen saturation, radiological and laboratory findings. Demographic and associated factors were recorded. Data were analysed using Statistical Package for the Social Sciences version 26. Chi-square test was applied. A p-value ≤ 0.05 was considered statistically significant.

Results: All 343 (100%) enrolled children fulfilled the criteria for severe acute respiratory illness. The mean age was 3.04 ± 1.15 years and mean weight was 12.52 ± 3.24 kg. Males were 205 (59.8%) and females were 138 (40.2%), while 188 (54.8%) children belonged to rural areas. Household crowding was present in 124 (36.2%), poor socioeconomic status in 111 (32.4%), illiterate mother in 115 (33.5%), household smoking exposure in 123 (35.9%), domestic animals in 92 (26.8%), and severe acute malnutrition in 38 (11.1%) children.

Conclusion: Severe acute respiratory illness was frequent among the studied children, with household crowding, socioeconomic disadvantage, maternal illiteracy and household smoking being common factors.

KEYWORDS: Children, Household crowding, Respiratory illness, Severe acute respiratory illness, Smoking, Socioeconomic factors

INTRODUCTION

Respiratory illness among young kids aged five years and under is still a gigantic public health problem due to associated morbidity and mortality. Respiratory illness in young kids is caused by a complex of factors. Respiratory syncytial virus is a common cause of low-severity respiratory illness among young kids.¹

Overnutrition among young infants was correlated with higher leptin levels, viral coinfection, and increased respiratory infection severity.² In addition, acute lower respiratory tract infections (ALRIs) in young children aged five years and younger, hence experiencing high morbidity and mortality.² Viral and bacterial etiologic agents contribute immensely to respiratory disease among young children. Both viral and bacterial etiologic agents of respiratory infections among young children aged five years and younger were established in studies.³

Human metapneumovirus (hMPV) was also determined as one of the leading causes of respiratory illness in kids, from mild respiratory illness to fatal lower respiratory tract lesions including bronchiolitis and pneumonia.⁴ environmental factors also lead to respiratory illness in kids. As an example, passive smoke from caregivers who smoke was related with respiratory infectious attacks in young children aged five years and younger.⁵

Air pollution is also known to threaten the risk of respiratory infections by impairing immune responses in the respiratory system.⁶ Furthermore, life-threatening illness, including respiratory illness, is of significant concern in young children, who are five years or below, with up to 50%-60% of admissions requiring transport to pediatric critical care units.⁷ proper management and preventive strategies need to invoke the importance of respiratory disorders in the most vulnerable age bracket.⁸

Acute severe respiratory illness among young children less than five years old is a major health problem because of the high morbidity and mortality associated with it. Among young children, risk and severity of respiratory illness are increased due to infections, pollution and smoking. Furthermore acute severe respiratory illness requires the admission of a significant number of such patients into intensive care unit. Therefore estimating the prevalence of acute severe respiratory illness among children less than five years of age in a tertiary care center is important to define the local burden of this problem.

METHODOLOGY

This cross-sectional study was conducted from 18 January 2026 to 18 May 2026 in the Department of Pediatrics Shifa International Hospital Islamabad. A total of 343 children were included in the study. The sample size was calculated by using World Health Organization sample size calculator with 95% confidence interval, 2% margin of error and expected prevalence of household smoking exposure of 3.7% among children below 5 years presenting with respiratory illness.⁹ Patients were selected through non-probability consecutive sampling technique.

Children of both genders aged 1 to 5 years were included who had severe acute respiratory illness according to the specified criteria. Children having history of cystic fibrosis, bronchopulmonary dysplasia, asthma, HIV/AIDS, tracheoesophageal fistula, laryngeal cleft, congenital diaphragmatic hernia or heart diseases were excluded from the study.

Before starting data collection informed consent was taken from parents or legal guardians after explaining the purpose of study, expected benefits and possible risks. Demographic information including age, gender, weight and residential status was obtained and recorded. Relevant history was taken from parents or guardians regarding household crowding, socioeconomic status, presence of domestic animals, immunization status and smoking exposure. Maternal literacy status was also asked from the mother. EPI card was checked where available for confirmation of immunization status. Anthropometric assessment was performed including weight and mid-upper arm circumference, and weight to height measurement was assessed according to the age of child.

Severe acute respiratory illness was assessed among the enrolled children on the basis of history, clinical examination, oxygen saturation, radiological and laboratory findings. A child was considered to have severe acute respiratory illness when there was acute respiratory illness with fever of 38°C or more, cough started within previous 10 days and requirement of hospital admission, along with any 2 clinical findings including respiratory rate more than 20 breaths per minute, oxygen saturation less than 92% or radiological evidence of pulmonary involvement such as consolidation or ground-glass opacities. Laboratory abnormalities were also assessed, including C-reactive protein more than 10 mg/L, procalcitonin more than 0.5 ng/mL, total leukocyte count more than 11,000 cells/ μ L and lymphocyte count less than 1,500 cells/ μ L, with at least 2 abnormal laboratory findings considered supportive for the condition.

Household crowding was considered when more than 4 persons were living in one room for the last 1 year. Poor socioeconomic status was considered when parent's monthly income was less than Rs 20,000. Presence of domestic animals was considered when any pet or livestock was present in the household for the last 1 year. Not immunized was considered when the child had received no vaccination according to Expanded Programme of Immunization, confirmed from EPI card or history. Illiterate mother was considered when the mother was unable to read or write. Smoking exposure was considered when any person in the household smoked at least 1 cigarette per day for the last 1 year. Severe acute malnutrition was considered when the child had at least 1 of the specified anthropometric finding including mid-upper arm circumference less than 115 mm or weight to height Z-score less than -3.

The collected information was entered and analysed through IBM SPSS Statistics version 26. Categorical variables including gender, residential status, household crowding, poor socioeconomic status, presence of domestic animals, not immunized, illiterate mother, smoking and severe acute malnutrition were presented as frequencies and percentages. Quantitative variables including age and weight were presented as mean $\pm$ standard deviation. Age, gender, weight and residential status were stratified and post-stratification analysis was performed. Chi-square test or Fisher's exact test was applied as appropriate. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

A total of 343 children under 5 years of age were included in the study. The mean age of the patients was 3.04 ± 1.15 years, and the mean weight was 12.52 ± 3.24 kg. Majority of the children were male, accounting for 205 (59.8%) of the total, while 138 (40.2%) were female. Regarding residential status, 188 (54.8%) children belonged to rural areas and 155 (45.2%) were from urban areas (Table-I).

Table- I: Patient Demographics

Demographics	Mean $\pm$ SD / n (%)
Age (years)	3.04 ± 1.15
Weight (kg)	12.52 ± 3.24
Gender	
Male n (%)	205 (59.8%)
Female n (%)	138 (40.2%)
Residential Status	
Rural n (%)	188 (54.8%)
Urban n (%)	155 (45.2%)

Among the identified risk factors, household crowding was present in 124 (36.20%) children, and poor socioeconomic status was noted in 111 (32.40%) cases. Presence of domestic animals was reported in 92 (26.80%) of the patients. Only 27 (7.90%) children were not immunised. Illiterate mother was identified as a factor in 115 (33.50%) cases, whilst severe acute malnutrition was found in 38 (11.10%) children. Smoking in the household was observed in 123 (35.90%) cases (Table-II).

Table- II: Frequency of Factors for Severe Acute Respiratory Illness in Children Under 5 Years

Factors	Frequency	% age
Household Crowding	124	36.20%
Poor Socioeconomic Status	111	32.40%
Presence of Domestic Animals	92	26.80%
Not Immunized	27	7.90%
Illiterate Mother	115	33.50%
Severe Acute Malnutrition	38	11.10%
Smoking	123	35.90%

On stratified analysis, age group showed statistically significant association only with smoking, where children above 3 years had higher frequency of smoking exposure, that was 74 (41.6%) compared to 49 (29.7%) in those aged 3 years or below ($p = 0.022$), whilst all other factors shown no significant association with age. No significant associations were found between gender or weight category and any of the studied factors (all p -values > 0.05). Residential status demonstrated significant associations with household crowding ($p < 0.001$), poor socioeconomic status ($p < 0.001$), and illiterate mother ($p < 0.001$), where rural residents had considerably higher proportions of these factors compared to urban residents (Table-III).

Table-III: Association of Factors with demographics

Subgroups	Household Crowding		Poor Socioeconomic Status		Domestic Animals		Not Immunized		Illiterate Mother		Severe Acute Malnutrition		Sn
	No n(%)	Yes n(%)	No n(%)	Yes n(%)	No n(%)	Yes n(%)	No n(%)	Yes n(%)	No n(%)	Yes n(%)	No n(%)	Yes n(%)	
≤3 years	104 (63.0%)	61 (37.0%)	113 (68.5%)	52 (31.5%)	124 (75.2%)	41 (24.8%)	151 (91.5%)	14 (8.5%)	108 (65.5%)	57 (34.5%)	146 (88.5%)	19 (11.5%)	11 (70.0%)
>3 years	115 (64.6%)	63 (35.4%)	119 (66.9%)	59 (33.1%)	127 (71.3%)	51 (28.7%)	165 (92.7%)	13 (7.3%)	120 (67.4%)	58 (32.6%)	159 (89.3%)	19 (10.7%)	10 (58.3%)
p-value*	0.761		0.747		0.427		0.685		0.701		0.804		0.0
Male	137 (66.8%)	68 (33.2%)	139 (67.8%)	66 (32.2%)	148 (72.2%)	57 (27.8%)	190 (92.7%)	15 (7.3%)	131 (63.9%)	74 (36.1%)	186 (90.7%)	19 (9.3%)	12 (62.5%)
Female	82 (59.4%)	56 (40.6%)	93 (67.4%)	45 (32.6%)	103 (74.6%)	35 (25.4%)	126 (91.3%)	12 (8.7%)	97 (70.3%)	41 (29.7%)	119 (86.2%)	19 (13.8%)	92 (66.7%)
p-value*	0.161		0.936		0.617		0.642		0.219		0.193		0.4
≤12 kg	99 (63.5%)	57 (36.5%)	106 (67.9%)	50 (32.1%)	116 (74.4%)	40 (25.6%)	142 (91.0%)	14 (9.0%)	102 (65.4%)	54 (34.6%)	138 (88.5%)	18 (11.5%)	10 (66.7%)
>12 kg	120 (64.2%)	67 (35.8%)	126 (67.4%)	61 (32.6%)	135 (72.2%)	52 (27.8%)	174 (93.0%)	13 (7.0%)	126 (67.4%)	61 (32.6%)	167 (89.3%)	20 (10.7%)	11 (62.5%)
p-value*	0.892		0.911		0.652		0.489		0.697		0.804		0.3
Rural	101 (53.7%)	87 (46.3%)	110 (58.5%)	78 (41.5%)	132 (70.2%)	56 (29.8%)	170 (90.4%)	18 (9.6%)	101 (53.7%)	87 (46.3%)	166 (88.3%)	22 (11.7%)	11 (66.7%)
Urban	118 (76.1%)	37 (23.9%)	122 (78.7%)	33 (21.3%)	119 (76.8%)	36 (23.2%)	146 (94.2%)	9 (5.8%)	127 (81.9%)	28 (18.1%)	139 (89.7%)	16 (10.3%)	10 (66.7%)
p-value*	<0.001		<0.001		0.172		0.197		<0.001		0.685		0.1

*Chi-Square Test

DISCUSSION

A total of 343 children were enrolled, with mean age of 3.04 ± 1.15 years and male predominance was observed as 205 (59.8%) children were male. Majority of children belonged to rural areas 188 (54.8%), which reflect the limited access to healthcare and poor environmental conditions in such settings. Overcrowding within the family was detected among 124 children (36.20%), a situation that is very significant due to the fact that overcrowding encourages the spread of respiratory infections through close contact, hence making young children susceptible to infection as their immunity is still developing. On a related note, low socioeconomic status was noted in 111

children (32.40%), and this is due to the fact that such households find it difficult to meet basic necessities like proper feeding and health care needs.

Illiterate mothers were found in 115 cases (33.50%), an important criterion considering the considerable contribution of mother's education in the health-seeking behavior and vaccination of the children. Presence of smoking was observed in 123 families (35.90%), and it is known that passive smoking leads to the weakening of the defense mechanism of the respiratory mucosa in children, making them vulnerable to serious infections. Living place had a considerable relationship with the criteria of crowdedness in the family, low socioeconomic status, and illiteracy of mothers (all $p < 0.001$).

The present study findings were comparable to several previously published studies. Household crowding was identified in 124 (36.20%) children in the present study, which is in agreement with findings of Taksande *et al.*¹⁰ who reported overcrowding in 53.2% of ARI cases and Gupta *et al.*¹¹ who also identified overcrowding as an independent risk factor (OR 1.21, 95% CI 1.03–2.21) for severe pneumonia. The higher proportion in those studies may be attributable to their rural hospital-based settings where overcrowding is more prevalent and transmission of respiratory pathogens occurs more readily *via* close contact between household members. Aljebory *et al.*¹² similarly reported household crowding and indoor air pollution as significant risk factors for respiratory tract infections in children under five, further supporting the notion that dense living conditions promotes sustained circulation of respiratory pathogens within families.

Poor socioeconomic status was noted in 111 (32.40%) cases, which is consistent with Altaf *et al.*¹³ who reported poor socioeconomic status in 650 (85.41%) children with lower respiratory tract infections, and Gupta *et al.*¹¹ who identified it as a significant independent contributor (OR 6.12, 95% CI 2.42–35.48). Abdel Mohsen *et al.*¹⁴ also concluded that poor socioeconomic status was an important contributor to morbidity and mortality in children with ARI, noting that protein-energy malnutrition was present in 60% of their cases. The relatively lower proportion in present study may reflect the mixed urban-rural composition of the study population, where a considerable number of urban residents had comparatively better financial circumstances.

Illiterate mother was found in 115 (33.50%) cases, which corresponds with observations of Taksande *et al.*¹⁰ who found maternal illiteracy in 54% of ARI cases (OR 2.57, 95% CI 1.47–4.34) and Gupta *et al.*¹¹ who reported low maternal literacy in 57.9% of cases (OR 9.46, 95% CI 7.31–19.0). Similarly, Adeel *et al.*¹⁵ also confirmed significant association between maternal education and ARIs ($p < 0.001$), and Klu *et al.*¹⁶ reported approximately 56.6% of ARI-affected children had illiterate mothers, with maternal literacy identified as a significant predictor in multinomial regression analysis. The relatively lower proportion of illiterate mothers in present study compared to above studies may be due to difference in study settings and socioeconomic backgrounds of enrolled population, as urban residents in present study were more likely to have received formal education.

Smoking exposure was present in 123 (35.90%) households, which is somewhat lower than Abdul-Aziz *et al.*¹⁷ who reported family smoking in 141 (52.81%) children with lower respiratory tract infections. Shah *et al.*¹⁸ also noted passive smoking in 162 (27.8%) children, though it was not significantly associated with pneumonia severity in their study ($p = 0.125$). In contrast, Aljebory *et al.*¹² identified smoke exposure as one of the most recurrent and significant risk factors for respiratory tract infections, and Ladani *et al.*¹⁹ similarly highlighted passive smoking as an important environmental contributor to severe ARI in under-five children. The variation in smoking prevalence across studies may relate to cultural and regional differences in household smoking habits, as well as differences in how smoking exposure was defined and recorded across different study settings.

Only 27 (7.90%) children were not immunised in present study, which is comparatively lower than Taksande *et al.*¹⁰ who found incomplete immunisation significantly associated with ARI (OR 2.17, 95% CI 1.32–4.04) and Gupta *et al.*¹¹ who reported inappropriate immunisation as the strongest independent predictor (OR 38.04, 95% CI 14.59–110.18). Ladani *et al.*¹⁹ also reported incomplete immunisation as a significant risk factor for severe ARI ($p = 0.04$), while Adeel *et al.*¹⁵ confirmed significant associations between BCG, pentavalent, measles and pneumococcal vaccination and ARI occurrence (all $p < 0.05$). The lower proportion of unimmunised children in present study may reflect relatively better vaccination coverage in the study area, possibly due to ongoing national immunisation programmes and improved outreach activities in recent years.

Residential status shown significant association with household crowding, poor socioeconomic status and illiterate mother (all $p < 0.001$) in present study, which is in line with Adeel *et al.*¹⁵ and Klu *et al.*¹⁶ who also reported rural residence as significantly associated with ARI severity and its risk factors. Altaf *et al.*¹³ similarly reported rural residence in 463 (60.84%) of their study children, with residence showing highly significant association with LRTI ($p = 0.00001$). This association can be explained by the fact that rural areas generally lack adequate sanitation, healthcare access and educational facilities, all of which contribute to clustering of multiple risk factors and thereby higher burden of respiratory illness in young children.²⁰

There are several limitations associated with the current study that should be noted while analyzing the outcomes. First of all, single center conducting reduces the ability of results generalization. Second, the cross-sectional research design does not allow to define the causal relationship between the found risk factors and severe acute respiratory disease in children. Finally, the use of self-reported information about some variables such as smoking and socioeconomic status is associated with recall bias.

CONCLUSION

In this current study, household crowding, lower SES, illiterate mothers, and tobacco smoke are identified as the primary contributing variables to acute respiratory diseases among children under the age of five years. The residential variable is found to be associated with various other risk factors, particularly in rural settings, as limited access to health care services, education, and basic sanitation services contributes to the increased burden of diseases.

DECLARATIONS

Ethical Approval

Ethical permissions for conducting this research was taken from the Institutional Ethical Committee of the hospital before starting the study.

Patients' Consent

All participant were informed properly about the research and written consent was taken before their participation.

Competing Interests

The authors declares that there was no conflict of interest associated with this research.

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