# A cross sectional study to determine various risk factors of acute respiratory infection in children of age group 2 months - 5 years admitted in a Tertiary Care Hospital

**Imran Khan**
PGT, Department of Pediatrics, Midnapore Medical College, Midnapore, West Bengal, India.
ORCID ID: https://orcid.org/0000-0003-2704-1796

**Surajit Bhattacharjee**
PGT, Department of Pediatrics, Midnapore Medical College, Midnapore, West Bengal, India.
ORCID ID: https://orcid.org/0000-0003-2214-4964

**Chakita Singh**
PGT, Department of Pediatrics, Midnapore Medical College, Midnapore, West Bengal, India.
ORCID ID: https://orcid.org/0000-0002-7128-9249

**Aditi Chowdhury**
PGT, Department of Pediatrics, Midnapore Medical College, Midnapore, West Bengal, India.
ORCID ID: https://orcid.org/0000-0002-3727-4465

**Prabodh Chandra Mondal**
Associate Professor, Department of Pediatrics, Midnapore Medical College, Midnapore, West Bengal, India.
Corresponding author email: drpcmondalu@gmail.com
ORCID ID: https://orcid.org/0000-0001-8940-5466

*Abstract---*Acute Respiratory Infection (ARI) are the leading cause of morbidity and mortality worldwide, particularly in children younger than five years. Each year about 1.3 million children under 5 years die from acute respiratory infections worldwide. ARI constitute one third of death in under five in low-income countries. This cross sectional study aim is to identify the various risk factors involving of acute respiratory infection in children of age group 2 month to 5 years. This study done among 100 children in the age group of 2 to 60 months in

the study area of Midnapore Medical College and Hospital shows the prevalence of 63(63%) mild ARIs (No Pneumonia), 23 (23%) moderate ARI (Pneumonia) and 14 (14%) severe ARI (Severe Pneumonia) Using IMCI guidelines. Among the children affected with ARI, various risk factors were evaluated, and statistically significant association was calculated between them. Using IMCI guidelines, we have found 63(63%) were mild ARIs (No Pneumonia), 23 (23%) were moderate ARI (Pneumonia) and 14 (14%) were severe ARI (Severe Pneumonia). Out of total 14 cases of severe ARIs, 85.7% were low birth weight. Out of total 14 cases of Severe ARIs, 64.3% lower socioeconomic status. Out of 14 cases of severe ARIs and 63 cases of mild ARIs 64.3% and 73% were exposed to wood smoke respectively. Out of 14 cases of severe ARIs and 23 cases of moderate ARIs, 9 and 14 cases were exposed to cigarette smoke respectively. Out of 14 cases of severe ARIs, 71.4% were mixed breastfeeding practice, out of 14 cases of severe ARIs, 85.7% children had incompletely immunized. Out of 14 cases of severe ARIs and 23 cases of moderate ARIs, 57.1% and 65.2% were malnourished respectively. We found 63% were mild ARIs, 23% were moderate ARIs and 14% were severe ARI. According to this study, fallowing may be considered as risk factors of ARI: Exposure to wood smoke and cigarette smoke, lower socioeconomic status, malnutrition, incomplete immunization, mixed breastfeeding practice and low birth weight.

## 1 Introduction

Acute Respiratory Infection (ARI) are the leading cause of morbidity and mortality worldwide, particularly in children younger than five years. Each year about 1.3 million children under 5 years die from acute respiratory infections worldwide. ARI constitute one third of death in under five in low-income countries (Ujunwa & Ezeonu, 2014). Recent estimates from the World Health Organization (WHO) suggest that ARI is responsible for 20% of deaths in under five children which account for more than 2 million under five children dying of acute respiratory infection annually, of which 90% occur in developing countries (Kumar et al.). It was estimated that worldwide, 7-13% of 156 million yearly pneumonia cases might progress to severe disease and warrant admission. There were about 12 million episodes of hospital admissions for severe and 3 million for very severe ARI which resulted in about 0.3 million deaths in-hospitals in young children. In India an estimated 4 lakh pneumonia deaths occur annually, which is highest among all the countries in the world (IGME, 2021).

The overall reported incidence of ARIs is 6-8 episode during the first 5 years of life (Oyejide & Osinusi, 1991). There are many socio-cultural, demographic and environmental risk factors that predispose children less than 5 years to acquire Respiratory Tract Infection (RTI). Even though many of this risk factors are preventable (Schluger & Koppala, 2014). Different factors were identified for the

increased risk of LRTIs in children. Of these, poverty, restricted family income, low parental education level, low birth weight, malnutrition, lack of breastfeeding, maternal literacy, smoking, cow dung use for fuel, low socio-demographic status, solid fuels for cooking and heating, immune impaired populations, improved toilet facilities, season, and residence .This study aims at identifying the various risk factors involving of acute respiratory infections in children of age group 2 months to 5 years (Seidu et al., 2019).

## 2 Material and Methods

**Study Area:** Department of Paediatrics, Midnapore Medical College and Hospital, Paschim Medinipur, West Bengal, India.

**Study Population:** All cases of acute respiratory infection between the age group of 2 months to 5 years were admitted during the period from 1st August 2020 to 31st July 2021 in Paediatrics Department of Midnapore Medical College and Hospital.

**Inclusion Criteria:**
- All children in the age group of 2 months to 5 years admitted with acute respiratory infection like -
- Pneumonia
- Bronchiolitis
- Bronchitis
- Wheeze associates Lower Respiratory Tract Infection (WALRTI), croup is included.

**Exclusion Criteria:**
- Respiratory complication due to other causes like congenital heart disease, neurological diseases.
- Foreign body aspiration
- Poisoning, chemical pneumonitis
- Drowning
- Inborn Error of Metabolism
- Metabolic causes
- Immunosuppressive conditions
- The children of those parents who did not give consent to undergo study was excluded.

## 3 Result and Discussion

Patwari & Raina, 2002, found that proportion of pneumonia alone in their study (22.3%) is higher than the proportion of all ARI (17.2%) in the same study. This is because the diagnostic criteria of pneumonia according to Integrated Management of Childhood Illnesses (IMCI) guidelines is highly sensitive and will include some false positive cases of pneumonia, made up of children with a severe URTI because of the presence of cough, difficulty breathing with or danger signs which are sensitive but not specific to pneumonia alone.

In this study, out of 100 cases, Severe ARIs was present in 14 patients, out of which 57.1% were in between 2-24 months, 42.9% were between 25-60 months. Moderate ARIs was present in 23 patients out of which 39.1% were in between 2- 24 months, 60.9% were in between 25-60 months. Mild ARIs were present in 63 patients out of which 54.0% were in between 2-24 months, 46.0% were in between 25-60 months. There is no significant increase in severity of pneumonia in younger age group, Chi square value- 1.730, and p value is 0.421. Out of total 14 cases of Severe ARIs, 64.3% were male, 35.7% were female. Out of 23 cases of Moderate ARIs, 39.1% were male and 60.9% were female. Out of 63 cases of Mild ARIs, 65.1% were male and 34.9% were female respectively.

Another study conducted by, Alexis et al., 2018, found the proportion of ARIs in children under 5 years in the Bamenda Regional Hospital (BRH) was 54.7% (280 children) with a 95% CI (Confidence Interval) of 50.3%–59.0%. Using IMCI guidelines, a total of 166/280 (59%) were mild ARIs (No Pneumonia), 69/ 280 (25%) were moderate ARI (Pneumonia) and 45/ 280 (16%) were severe ARI (Severe Pneumonia) In total, 512 children participated in the study.

Table 1
Proportion of ARI Using IMCI Definition in children bellow 5 years (n=100)

| ARI Using IMCI | No of Cases | Percentage |
|---|---|---|
| Mild ARIs (No Pneumonia) | 63 | 63.0 |
| Moderate ARIs (Moderate Pneumonia) | 23 | 23.0 |
| Severe ARIs (Severe Pneumonia) | 14 | 14.0 |
| Total | 100 | 100.0 |

In our study, out of total 14 cases of severe ARIs, 14.3% were normal birth weight, 85.7% were low birth weight and there was no over birth weight cases. Out of 23 cases of Moderate ARIs, 26.1% were normal birth weight, 69.6% were low birth weight and 4.3 % were over birth weight. On the other hand, out of 63 cases of Mild ARIs, 58.7% were normal birth weight, 38.1% were low birth weight and only 3.2% were over birth weight respectively.

In this study, Socioeconomic status Out of total 14 cases of Severe ARIs, 14.3% were belongs to lower middle-class family, 21.4% were upper lower-class family and 64.3% lower class family. Out of 23 cases of Moderate ARIs, 21.7% were belongs to lower middle-class family, 65.2% were upper lower-class family and
13.1 % were lower class family. On the other hand, out of 63 cases of Mild ARIs, 2% were Upper middle-class family, 23.8% were lower middle-class family, 20.6% were Upper lower-class family and 52.4 % lower middle class of family.

Alexis et al., 2018 found children aged more than 12 months, males, children with low birth weight, poor paternal education and children with younger fathers (≤30 years), accounted for a higher proportion of ARIs than their comparative groups. However, the difference was not statistically significant (p>0.05). Children with poorly educated mothers had significantly higher proportion of ARIs (p<0.001) with an OR of 3.13.

In the case of low birthweight, while all studies used a case definition of birthweight less than 2500g. Victora et al., 1994, used a cut-off of <2000g to define low-birth-weight. Similarly, there was a considerable difference in the age groups of included participants across studies. While 19 studies reported outcomes for 0-59 months age range, 17 studies only included a narrow age range (0-11 months or 0-23 months). In our study, total 14 cases of severe ARIs, 85.7% were LBW, 14.3% were normal birth weight. Out of 23 cases of moderate ARIs, 69.6% were low birth weight, 26.1% were normal birth weight, 4.3% were over birth weight. On the other hand, out of 63 cases of Mild ARIs 58.7% were normal birth weight, 38.1% were LBW only 3.2% were over birth weight respectively.

Prajapati, 2012, reported in their study Birth weight and occurrence of ARI has been found to be correlated. Severity of ARI was very high in low birth weight baby (36.1%) as compared to normal birth weight baby (17.3%). This difference was statistically significant (p<0.001).

In our study, out of 100 cases 45% cases were Malnourished and 55% cases were normal nutritional status. Out of total 14 cases of Severe ARIs, 57.1% were Malnourished, out of 23 cases of Moderate ARIs, 65.2% were Malnourished, out of 63 cases of Mild ARIs, 34.9% Malnourished.
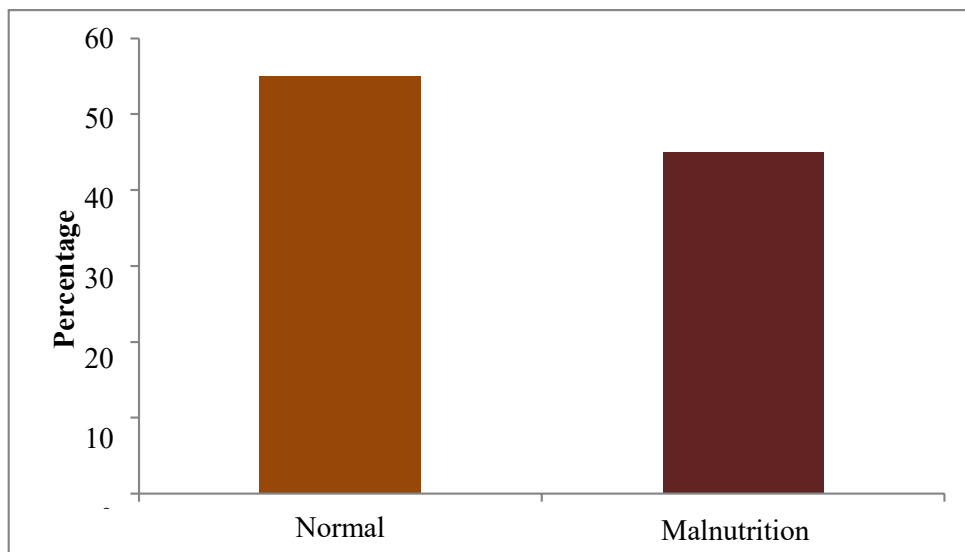


Figure 1: Nutritional status of the children bellow 5 years

In our study, out of 100 cases 45% cases were Malnourished and 55% cases were normal nutritional status (Figure 1). Out of total 14 cases of severe ARIs, 57.1% were malnourished, out of 23 cases of moderate ARIs, 65.2% were malnourished, out of 63 cases of mild ARIs, 34.9% malnourished.

Table 2
Nutritional Status

| Nutritional Status | Total No of cases | Mild ARIs (No Pneumonia) (n=63) | | Moderate ARIs (Moderate Pneumonia) (n=23) | | Severe ARIs (Severe Pneumonia) (n=14) | |
|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % |
| Normal | 55 | 41 | 65.1 | 8 | 34.8 | 6 | 42.9 |
| Malnourished | 45 | 22 | 34.9 | 15 | 65.2 | 8 | 57.1 |
| Total | 100 | 63 | 100.0 | 23 | 100.0 | 14 | 100.0 |
| Statistical Inference | Chi-square-7.218 P Value-0.027* | | | | | | |

Kaushik et al., 1995 examinations of 1600 children aged less than 5 years (under-fives) were conducted to examine the relationship between acute respiratory infection (ARI) and malnutrition. 42.25% of all children had an ARI within the last 15 days. Most ARIs (73.4%) were considered mild (cough and cold with no pneumonia). Pneumonia accounted for 19.5% of all ARI cases, which were considered moderate. In our study, out of 14 cases of Severe ARIs, 85.7% child had incomplete immunization, out of 23 cases of Moderate ARIs, 26.1% had incomplete immunization, out of 63 cases of Mild ARIs, cases they had full immunization.

Cattaneo, 1994, reported vaccines have a great potential for reducing these deaths. Immunization against measles and pertussis, already reaching more than 70% of infants in developing countries, contributes to the prevention of more than one million childhood deaths. New conjugate vaccines against Haemophilus influenzae type b, if shown to be effective against pneumonia in developing countries, could reduce acute lower respiratory infection (ALRI) deaths by 4%. A further 10% reduction could be obtained by the availability of an effective conjugate vaccine against Streptococcus pneumoniae. A safe vaccine against respiratory syncytial virus could also prevent 10% of ALRI deaths. The potential role of other bacterial and viral vaccines needs to be clarified.

In our study found the distribution of breastfeeding practice out of total 14 cases of severe ARIs, 71.4% were mixed breastfeeding practice, 28.6% were exclusive breastfeeding practice. Out of 23 cases of Moderate ARIs, 30.4% were belongs to mixed breastfeeding practice, 69.5% were exclusive breastfeeding practice. On the other hand, out of 63 cases of Mild ARIs, 14.3% were mixed breast feeding Practice, 85.7% were exclusive breastfeeding practice, respectively. Arifeen et al., 2001, reported higher risk of ARI among non-exclusively breastfed children could also be because of being deprived of broad-based beneficial effect of exclusive breastfeeding in prevention of infectious diseases, such as diarrhea, that often contribute to development of malnutrition, further leading to immunologic insufficiency.

In our study, distribution of exposure to wood smoke out of total 14 cases of severe ARIs, 35.7% were not exposed to wood smoke, 64.3% were exposed to wood smoke out of 23 cases of moderate ARIs, 43.5% were exposed to wood

smoke, 56.5% were not exposed to wood smoke and on the other hand out of 63 cases of Mild ARIs, 73% were exposed to wood smoke, and 27.0% were not exposed to wood smoke, cigarette smoke out of total 14 cases of Severe ARIs, 64.3% were exposed to cigarette smoke, 35.7% were not exposed to Cigarette smoke out of 23 cases of moderate ARIs, 60.9% were exposed to cigarette smoke, 39.1% were not exposed to cigarette smoke and on the other hand out of 63 cases of mild ARIs, 34.9% were exposed to cigarette smoke, and 65.1 % were not exposed to cigarette smoke. Arifeen et al., 2001, found passive cigarette smoking from there study, was found to be a significant risk factor of ARI increasing the odds by 4.67 (1.91–11.40) compared to children who were not passive smokers.

## 4 Conclusion

This hospital-based study on the children admitted to Department of Paediatrics Medicine of Midnapore Medical College and Hospital, Paschim Medinipur from 1st August 2020 to 31st July 2021. Total 100 cases of acute respiratory infection children were included between age group 2 months to 5 years. The study reveals that the proportion of children who suffered from ARI, we found 63% were mild ARIs, 23% were moderate ARIs and 14% were severe ARI. According to this study, fallowing may be considered as risk factors of ARI: Wood smoke, out of 100 cases of ARIs 65% cases were exposed to wood smoke, out of 14 cases of severe ARIs and 63 cases of mild ARIs 64.3% and 73% were exposed to wood smoke respectively. Cigarette smoke: Out of 100 cases of ARIs 45% cases were exposed to cigarette smoke, out of 14 cases of severe ARIs and 23 cases of moderate ARIs, 9 and 14 cases were exposed to cigarette smoke respectively. Breastfeeding practice: Out of 100 cases of breastfeeding practice, 26 cases were mixed breastfeeding practice, out of 14 cases of severe ARIs, 71.4% were mixed breastfeeding practice. Immunization status: Out of 100 cases of ARIs 18% cases had incomplete immunization, out of 14 cases of severe ARIs, 85.7% children had incompletely immunized. Nutritional Status: Out of 14 cases of severe ARIs and 23 cases of moderate ARIs, 57.1% and 65.2% were malnourished respectively. Socioeconomic status: Out of 14 cases of severe ARIs, 23 cases of moderate ARI s and 63 cases of mild ARIs, 64.3% had lower socioeconomic status, 65.2% were upper lower socioeconomic status and 52.4% were lower socioeconomic status respectively. Birth weight: Out of 14 cases of severe ARIs and 23 cases of moderate ARIs, 85.7% and 69.6 % were low birth weight respectively.

## References

Aarushi, Naveen Nandal and Anuradha, Satyam Computers Scam- Pre and Post Analysis, International Journal of Psychosocial Rehabilitation, Volume 24, Issue 6, pp. 1817-1824.

Arifeen, S., Black, R. E., Antelman, G., Baqui, A., Caulfield, L., & Becker, S. (2001). Exclusive breastfeeding reduces acute respiratory infection anddiarrhea deaths among infants in Dhaka slums. *Pediatrics,* 108(4): e67-e. 10.1542/peds.108.4. e67.

Cattaneo, A. (1994). Current role of vaccination in preventing acute respiratory infections in children in developing countries. *Monaldi Archives for Chest Disease*, 49(1), 57-60.

Kaushik, P. V, Singh, J. V., Bhatnagar, M., Garg, S. K., & Chopra, H. (1995). Nutritional correlates of acute respiratory infections. *Indian Journal of Maternal and Child Health,* 6(3):71-72.

Kumar, A., Saha, E., Patra, D., & Chakraborty, S. Outcome of acute lower respiratory tract infection in children. *Indian Medical Gazette*, 394-399.

Oyejide, C. O., & Osinusi, K. (1991). Incidence of acute lower respiratory infection in a low socioeconomic country. *Niger Journal of Paediatrics,* 8-21.

Patwari, A. K., & Raina, N. (2002). Integrated Management of Childhood Illness (IMCI): a robust strategy. Indian Journal of Paediatrics, 69(1), 41-48.

Prajapati, B., Talsania, N., Lala, M. K., & Sonalia, K. N. (2012). A study of risk factors of acute respiratory tract infection (ARI) of under five age group in urban and rural communities of Ahmedabad district, Gujarat. Healthline, 3(1), 16-20.

Schluger, N. W., Koppala, R. (2014). Lung disease in a global context. A call for public health action. Annals of the American Thoracic Society, 11(3), 407-416.

Seidu, A. A., Dickson, K. S., Ahinkorah, B. O., Amu, H., Darteh, E. K. M., & Kumi-Kyereme, A. (2019). Prevalence and determinants of acute lower respiratory infections among children under-five years in sub–Saharan Africa: evidence from demographic and health surveys. *SSM Population Health,* 8,100443.

Sreenivasa Rao VeerankI,"A Hybrid Cloud and Cluster Computing Paradigm for Life Science Applications", International Conference on Soft Computing and Intelligent Technologies [ICSCIT–2021]", ISBN: 978-93-91535-15-5,2021, sreeni.bi@gmail.com, http://proceeding.conferenceworld.in/ICSCIT2021/44.pdf.

Tazinya, A. A., Halle-Ekane, G. E., Mbuagbaw, L. T., Abanda, M., J Atashili, J., & Obama, M. T. (2018). Risk factors for acute respiratory infections in children under five years attending the Bamenda Regional Hospital in Cameroon. *BMC Pulmonary Medicine,* 18(7), DOI 10.1186/s12890-018-0579-7.

The Inter-agency Group for Child Mortality Estimation (IGME). (2011). Estimates of under-five mortality rates by country, Available at www.childmortality.org.

Ujunwa, F., & Ezeonu, C. (2014). Risk factors for acute respiratory tract infections in under -five children in Enugu Southeast Nigeria. *Annals of Medical and Health Science Research*. 4(1), 95-99.

Victora, C. G., Fuchs, S. C., Flores, J. A., Fonseca W, Kirkwood B. (1994). Risk factors for pneumonia among children in  a  Brazilian  metropolitan area. *Pediatrics,* 93, 977-985.