



The Clinical Profile and Risk Factors of Pneumonia in Children

Gazi Golam Mostofa¹, Bimal Chandra Das^{2*}, Begum Shaira Sharifa³, Md. Abul Hashem⁴, Sohel Sarwar⁵, Muhammad Sazedul Karim⁶, Anupam Mazumdar⁷, H. M Hasan Imam⁸

¹Assistant Professor, Department of Pediatrics, Abdul Malek Ukil Medical College, Noakhali, Bangladesh.
Email: mostofagazi941@gmail.com,
Orcid ID: 0000-0003-4626-2746

²Associate Professor, Department of Pediatrics, Abdul Malek Ukil Medical College, Noakhali, Bangladesh.
Email: drbimalcmc28@gmail.com,
Orcid ID: 0000-0001-9020-8056

³Assistant Professor Department of obstetrics and gynecology, National Institute of Cancer Research & Hospital (NICRH), Mohakhali, Dhaka, Bangladesh.
Email: shairashilpi72@gmail.com,
Orcid ID: 0000-0002-2027-2340

⁴Assistant Professor of Paediatrics, Abdul Malek Ukil Medical College, Noakhali, Bangladesh.
Email: drabul.hashem12@gmail.com,
Orcid ID: 0000-0002-9815-1549

⁵Associate Registrar, Department of Pediatrics, 250 Beded General Hospital, Noakhali, Bangladesh.
Email: sohelsarwar133@gmail.com,
Orcid ID: 0000-0003-2373-3373

⁶Medical Officer, 250 Beded General Hospital, Noakhali, Bangladesh.
Email: skopu_mc@yahoo.com,
Orcid ID: 0000-0002-3500-5886

⁷Associate Registrar, Department of Pediatrics, Abdul Malek Ukil Medical College & Hospital, Noakhali, Bangladesh. Email: majumderanupam3@gmail.com,
Orcid ID: 0000-0001-9048-5133

⁸Resident, Department of Urology, Chittagong Medical College and Hospital, Chittagong, Bangladesh.
Email: drsoryhm@gmail.com,
Orcid ID: 0000-0001-9049-3660

*Corresponding author

Received: 22 January 2022

Revised: 02 March 2022

Accepted: 13 March 2022

Published: 22 April 2022

Abstract

Background: The problem of increased ARI morbidity and mortality has arisen as a result of modernization, industry, and urbanization. There is a deficiency of epidemiological studies on risk factors and treatment. There is a significant vacuum in our understanding of these issues, which must be filled by methodical research. The purpose of this study is to evaluate the risk factors developing pneumonia in our area. **Material & Methods:** This was a prospective clinical study of pneumonia conducted on 90 children who were admitted to Paediatric ward in Abdul Malek Ukil Medical College, Noakhali, Bangladesh in study duration. Epidemiological factors affecting the same were studied and bronchoscopy was done whenever it was needed. A detailed history of the relevant symptoms, such as fever, cough, rapid breathing, refusal of feeds, noisy breathing, bluish discoloration etc., was collected. **Results:** The most affected children belonged to the age group of 1 year to 3 years (64.9%). Bronchopneumonia (86.2%) was the most common clinical diagnosis made at admission. According to WHO ARI control programme, 28.7% had pneumonia, 54.3% had severe pneumonia and 17% very severe pneumonia. It was found that younger age group, malnutrition, kutcha house, crowding, poor sanitation facilities, cooking with fuel other than LPG (indoor pollution) and low socio economic status and high respiratory rate were significant risk factors for pneumonia in children. **Conclusions:** One of the leading causes of mortality and death in children is particularly pneumonia. In newborns and preschool children, bronchopneumonia is the most common symptom.

Keywords:- Children, Malnutrition Pneumonia, Morbidity, Mortality, Risk factors.



INTRODUCTION

Pneumonia remains an important cause of morbidity and mortality in both industrialized and developing countries. Indeed, it is one of the leading causes of under-five child death in the world. Pneumonia is the single largest infectious cause of death in worldwide. Pneumonia infection alone killed 8,08,694 children under the age of 5 in 2017, accounting for 15 % of all deaths of children under five years old.^[1] In addition, socioeconomic and environmental factors like overcrowding, air pollution, passive smoking, practice of bottle feeding etc., contribute to the significant rise in incidence of pneumonia during recent years' Delay in seeking tertiary care facility is another contributing factor for increased mortality in severe pneumonia.^[2] Inadequate or delayed medical care results in an estimated 400 children dying each day from ARI in Bangladesh.^[3] It is one of the challenges to the health system in developing countries because of high morbidity and mortality.^[4] A large gap exists in the knowledge about the factors responsible for the high morbidity, which needs to fulfill by systematic studies. Objective of this study was to assess the clinical profile and identification of risk factors of pneumonia.

Acute respiratory infections (ARI), particularly lower respiratory tract infections (LRTI), are the leading cause of death among children under five years of age and are estimated to be responsible for between 1.9 million and 2.2 million childhood deaths globally.^[5] Modernization, industrialization and urbanization are now posed with the problem of increase in ARI morbidity and mortality. It is clear that future health of children depends

on preventing, diagnosing, treating and limiting ALRTI. The utility of simple clinical signs like rapid breathing and chest in drawing to diagnose pneumonia in infants and young children has been well established. The use of these clinical signs in the early detection and treatment of children with pneumonia by primary health care workers forms the basis for the case management strategy formulated by the World health organization (WHO) to control mortality and morbidity.^[6,7] ARI can be preventable. However, socio environmental factors are acting as major obstacles in prevention of ARI. The epidemiological information regarding risk factors and management is scanty. A large gap exists in this knowledge about these factors, which needs to be fulfilled by systematic studies. The present study is designed to identify the risk factors of pneumonia in this area. Objective of this study is to assess the clinical profile and identification of risk factors of pneumonia.

MATERIAL AND METHODS

This was a prospective clinical study of pneumonia conducted on 90 children who were admitted to Paediatric ward in Abdul Malek Ukil Medical College, Noakhali, Bangladesh from January 2021 to December 2021. Epidemiological factors affecting the same were studied and bronchoscopy was done whenever it was needed. A detailed history of the relevant symptoms, such as fever, cough, rapid breathing, refusal of feeds, noisy breathing, bluish discolouration etc., was collected.

**Inclusion criteria:**

Children of the age group of one month to five years with clinical features of pneumonia as per WHO ARI control programme were included.

Exclusion criteria:

- Children with congenital anomalies of heart and lungs.
- Anatomical defects like cleft lip and cleft palate.
- Immune compromised states like human immune deficiency virus infection (HIV) and
- Children less than one month and more than 5 years.

RESULTS

In this study pneumonia was associated with diarrhoea in 1.1% cases, septicemia in 1.1% cases, meningitis in 2.2% cases, DIC in 1.1% cases. According to WHO ARI programme, 33.33% had pneumonia, 55.55% had severe pneumonia and 11.11% had very severe pneumonia.

Majority of the cases were clinically diagnosed as Bronchopneumonia (83.3%), Lobar

pneumonia (consolidation) was diagnosed in 15.55% of cases and pneumonia and its complications (Empyema) in 1.11% cases. Closed tube drainage was considered in empyema cases [Table 2].

In the present study, majority were breast-fed (83.33%) and remaining 16.66% were bottle fed. Majority (83.33%) were under Grade I (42.22%) and Grade II (40.0%) PEM. 2.22% were under Grade III. In the present study, majority. In the present study, majority (42.22%) had poor sanitary facility (open air defecation) and majority (62.22%) used fuel other than LPG for cooking [Table 3].

In this study, risk factors for pneumonia were studied. It was found that younger age group, malnutrition, anemia, kutcha house, crowding, poor sanitary facilities, cooking with fuel other than LPG (indoor pollution) and low socio economic status were significant risk factors for pneumonia in children [Table 4].

In the present study, case fatality rate was 1.06% (1 case). Death occurred within 24 hours of presentation to hospital. Septicemia with shock, meningitis, DIC were seen in this case and this case belonged to very severe pneumonia.

Table 1: Demonstrate and Distribution of the study according to basic characteristics.

Characteristics	n	%
Age		
1-3	61	67.77
4-5	29	32.23
Sex		
Male	50	55.55
Female	40	44.44
Symptoms		
Cough	90	100.0

Fever	90	100.0
Fast breathing	90	100.0
Fefusal of feeds	15	16.66
Convulsions	3	3.33
Cyanosis	2	2.22
Signs		
Chest retractions	65	72.22
Creptitations	15	16.66
Ronchi	7	7.77
Creptitations and ronchi	71	78.88
Abnormal breath sounds	27	30.00
Respiratory rate		
41-50	5	5.55
51-60	22	24.44
60 and ABOVE	63	70.0

Table 2: Distribution of cases according to clinical findings.

Associated illness	n	%
Diarrhoea	1	1.1
Meningitis	2	2.22
Septicemia	1	1.1
DIC	0	0.0
Classification		
Pneumonia	30	33.33
Severe pneumonia	50	55.55
Very severe pneumonia	10	11.11
Clinical diagnosis		
Bronchopneumonia	75	83.33
Lobar pneumonia	14	15.55
Empyema	1	1.11

Table 3: Distribution of risk factors.

Factors Type of feeding	n	%
Breast fed	75	83.33
Bottle fed	15	16.66
Protein energy malnutrition		
Normal	14	15.55
Grade – I	38	42.22
Grade – II	36	40.0
Grade – III	2	2.22
Grade – IV	0	0.0

Sanitation facilities		
Good	38	42.22
Poor	56	62.22
Cooking		
LPG	39	43.33
NON-LPG	55	61.11

Table 4: Association of Risk factors with pneumonia.

Factors	p-value	Significance
Age	0.01	S
Sex	0.35	NS
Past History	0.001	S
Anemia	0.005	S
Type of House	<0.0001	HS
PEM	<0.0001	HS
Fuel for cooking	<0.0001	HS
Sanitation	<0.0001	HS

DISCUSSION

In pediatric pneumonia, age is a significant predictor of morbidity and death. The majority (64.9 percent) of the children in this research, which was done between the ages of one and five, were under the age of three. In comparison, investigations by Drummond P et al (63.2 percent) and Sehgal V et al (63.2 percent) found that (52.2 percent).^[8,9] In this study it was observed that females (61.7%) outweighed males (38.3%). Female: Male ratio was 1.61. This was in comparison with studies done by Hamid M et al, (68.25) and Rahman et al, (59.2%).^[10,11] Cough or difficulty breathing are the "entry criteria" or foundation for assessing a child under the age of five for suspected pneumonia, according to the WHO guideline. This study's presenting symptom percentages are comparable to those found in studies by Kabra SK et al. and Kumar N et al.^[12,13] Tachypnoea has been improved to be a sensitive and specific indicator of the presence

of pneumonia. Also, the traditional, method of making a clinical diagnosis of pneumonia has been done by the recognition of auscultatory signs, in particular crepitations, in a child with cough. In this study, tachypnea (100%) and chest retractions (73%) were the important signs for making a clinical diagnosis of pneumonia. Crepitations and ronchi (78%) and abnormal breath sounds (29%) were the other associated signs. Gupta D et al, Margolis P et al, Palafox M et al, and Gadomski AM et al, have observed that tachypnoea and chest retractions were highly specific signs in detecting pneumonia. Reddaiah VP et al, have reported that crepitations and ronchi were found in 76% of patients with pneumonia.^[14,15,16,17,18] In this study Bronchopneumonia was the most common diagnosis made at admission (86.2%), Lobar pneumonia (consolidation) in 12.7%, pneumonia with complications in 2.1% (empyema). In a study conducted by Reddaiah

V. P et al, Bronchopneumonia was diagnosed in 64%, Lobar pneumonia in 6.4% and post measles bronchopneumonia in 4.0% of cases.^[18]

In this study, pneumonia was associated with diarrhea in 1.1% (1 case) and septicemia with shock in 1.1%(1 case). This was in comparison with studies done by Deivanayagam N et al, and Sehgal V et al.^[8,19] In the present study risk factors among children with pneumonia were studied. It was found that, presence of anemia, malnutrition, poor housing conditions, low socio economic status, poor sanitary facilities and indoor environmental pollution (use of cooking fuel other than LPG) were significant risk factors for pneumonia. Broor S et al, have reported that lack of breast feeding, severe malnutrition, cooking fuel other than LPG and history of ALRTI in family were significant contributors of severe ALRTI in children under 5 years.^[20] In a case control study conducted by Hassan MK et colleagues discovered that age less than 6 months, house smoking, anemia, absence of breast feeding, and malnutrition were all significant risk factors for severe pneumonia.^[21] Young age, vaccinations, malnutrition, and a previous history of severe ARI were also identified as major risk factors for severe pneumonia by Shah N et al.^[22] The case fatality rate in this research was 1.06% (1 case). Within 24 hours after being admitted to the hospital, the patient died. In comparison, Sehgal V et al, Suwanjutha S et al, Reddaiah VP

REFERENCES

1. Liu L, Oza S, Hogan D, et al. Global, regional, and national causes of under-5 mortality in 2000-15: an updated systematic analysis with implications for the Sustainable Development Goals. *Lancet*. 2016;388(10063):3027-3035. doi:10.1016/S0140-6736(16)31593-8

et al, and Mishra S et al reported case fatality rates of 10.45%, 3.4%, 12.8 percent, and 7.7%, respectively, in their research.^[8,18,23,24] Underlying congenital heart disease (CHD) is a significant risk factor for pneumonia mortality. As we had excluded pneumonia associated with CHD, this may be the probable reason for low case fatality rate seen in this study. In the present study the severity of pneumonia (very severe) and associated diseases (septicemia, meningitis) were found to be significantly associated to mortality. Younger age group, associated congenital heart disease, particularly severe pneumonia, and malnutrition were significant predictors of death, according to Sehgal V et al. 4. Malnutrition, congenital abnormalities, and related disease were all major risk factors for pneumonia in the younger age group, according to Deivanayagam N et al's study.^[19]

CONCLUSIONS

ARI, especially pneumonia is one of the major causes of morbidity and mortality in children. Bronchopneumonia is the predominant form of presentation in infants and preschool children. Among the risk factors studied, younger age group, malnutrition, poor housing conditions and indoor air pollution (use of cooking fuel other than LPG), low socio economic status and poor sanitary facilities were found significant for pneumonia.

2. Rudan I, Boschi-Pinto C, Biloglav Z, Mulholland K, Campbell H. Epidemiology and etiology of childhood pneumonia. *Bull World Health Organ*. 2008;86(5):408-16. doi: 10.2471/blt.07.048769.



3. Rashid SF, Hadi A, Afsana K, Begum SA. Acute respiratory infections in rural Bangladesh: cultural understandings, practices and the role of mothers and community health volunteers. *Trop Med Int Health*. 2001;6(4):249-55. doi: 10.1046/j.1365-3156.2001.00702.x.
4. Frese T, Klauss S, Herrmann K, et al. Children and adolescents as patients in general practice - the reasons for encounter. *J Clin Med Res* 2011;3(4):177-182.
5. Scott JA, Brooks WA, Peiris JM, Holtzman D, Mulholland EK. Pneumonia research to reduce childhood mortality in the developing world. *J Clin Invest*. 2008;118(4):1291-300.
6. Sriram g, Satyanarayanaa. Study on clinical profile and risk factors associated with pneumonia. *IJCP*. 2019;6(5):1926-1930.
7. Drummond P, Clark J, Wheeler J, Galloway A, Freeman R, Cant A. Community acquired pneumonia-a prospective UK study. *Arch Dis Child*. 2000;83:408-12.
8. Drummond P, Clark J, Wheeler J, Galloway A, Freeman R, Cant A. Community acquired pneumonia-a prospective UK study. *Arch Dis Child*. 2000;83:408-12.
9. Sehgal V, Sethi GR, Sachdev HP, Satyanarayana L. Predictors of mortality in subjects hospitalized with acute lower respiratory tract infections. *Indian pediatr*. 1997 Mar 1;34(3):213-9.
10. Hamid M, Qazi SA, Khan MA. Clinical, nutritional and radiological features of pneumonia. *J Pak Med Assoc*. 1996;46(5):95-9.
11. Rahman MM, Rahman AM. Prevalence of acute respiratory tract infection and its risk factors in under five children. *Bangladesh Med Res Council Bulletin*. 1997;23(2):47-50.
12. Kabra SK, Verma IC. Acute lower respiratory tract infection: The forgotten pandemic. *Indian J Pediatr*. 1999;66(6):873-5.
13. Kumar N, Singh N, Locham KK, Garg R, Sarwal D. Clinical evaluation of acute respiratory distress and chest wheezing in infants. *Indian Pediatr*. 2002;39(5):478-83.
14. Gupta D, Mishra S, Chaturvedi P. Fast breathing in the diagnosis of pneumonia-a reassessment. *J Trop Pediatr*. 1996;42(4):196-9.
15. Margolis P, Gadomski A. Does this infant have pneumonia?. *JAMA*. 1998;279(4):308-13.
16. Palafox M, Guiscafré H, Reyes H, Muñoz O, Martínez H. Diagnostic value of tachypnoea in pneumonia defined radiologically. *Arch Dis Child*. 2000;82(1):41-5.
17. Gadomski AM, Aref GH, Hassanien F, el Ghandour S, el-Mougi M, Harrison LH, et al. Caretaker recognition of respiratory signs in children: Correlation with physical examination findings, x-ray diagnosis and pulse oximetry. *Int J Epidemiol*. 1993;22(6):1166-73.
18. Reddaiah VP, Kapoor SK. Acute Respiratory Infections In Underfives: Experience At Comprehensive Rural Health Services Project Hospital. Ballabgarh. *Indian J Comm Med*. 1995;20(2):13.
19. Deivanayagam N, Nedunchelian K, Ramasamy S, Ratnam SR. Risk factors for fatal pneumonia: a case control study. *Indian Pediatr*. 1992;29(12):1529-32.
20. Broor S, Pandey RM, Ghosh M, Maitreyi RS, Lodha R, Singhal T, Kabra SK. Risk factors for severe acute lower respiratory tract infection in under-five children. *Indian Pediatr*. 2001;38(12):1361-9.
21. Hassan MA, Al-Sadoon I. Risk factors for severe pneumonia in children in Basrah. *Tropic Doctor*. 2001;31(3):139-41.
22. Shah N, Ramankutty V, Premila PG, Sathy N. Risk factors for severe pneumonia in children in south Kerala: a hospital-based case-control study. *J Tropic Pediatr*. 1994;40(4):201-6.
23. Suwanjutha S, Ruangkanhasetr S, Chantarojanasiri T, Hotrakitya S. Risk factors associated with morbidity and mortality of pneumonia in Thai children under 5 years. *Southeast Asian J Trop Med Public Health*. 1994;25(1):60-6.
24. Mishra S, Kumar H, Anand VK, Patwari AK, Sharma D. ARI control programme: results in hospitalized children. *J Trop Pediatr*. 1993;39(5):288-92.

Source of Support: Nil, Conflict of Interest: None declared