

Clinical profile and Prognostic Factors in cases of Acute Respiratory Distress in infants.

Pediatrics

Dr. Swarnim

M.D, Pediatrics. Department of Pediatrics, PGIMER & Ram manohar lohia hospital, New Delhi. India

Dr. Brajesh Kumar Rai

M.D, Pediatrics Department of Pediatrics, Darbhanga Medical College and Hospital, Bihar.

Dr. K. N. Mishra

M.D, Pediatrics Professor, Department of Pediatrics, Darbhanga Medical College and Hospital, Bihar.

ABSTRACT

Background: Acute respiratory infection is a leading cause of morbidity and mortality in infants in developing countries. Hence, the present study was undertaken to study the clinical characteristics, risk factors and prognostic Factors in cases of Acute Respiratory Distress in infants.

Methods: This is a prospective study done in the Department of Pediatrics at a tertiary care hospital in Bihar, India. The study was conducted over a period of two years in which infants presenting with acute respiratory distress as per WHO criteria were evaluated for the clinical profile, risk factors and outcome as per predesigned proforma.

Results: We found a higher incidence of acute respiratory distress among male (55%) infants and infants belonging to lower socioeconomic group (72.5%). Malnutrition (53.3%), lack of exclusive breastfeeding and improper immunization were significantly associated with increased incidence and severity of acute respiratory infections.

Conclusions: The Present study has identified various risk factors among acute respiratory distress cases in infants and predictors of severity and outcome. The burden of morbidity and mortality resulting from these can be reduced by promoting exclusive breastfeeding and immunization, effective management of malnutrition, improving the living standards and educating parents about hazards of smoking.

KEYWORDS:

Infants, Malnutrition, Pneumonia, Bronchiolitis, Breastfeeding

INTRODUCTION:

Acute respiratory infections are one of the principal causes of illness and death in children in developing countries. Low socioeconomic status of parents and malnutrition further increase morbidity and mortality. According to WHO, pneumonia is the single largest infectious cause of death in children worldwide accounting for 16% of all deaths of children under 5 years old. (1) In India, acute respiratory infection is one of the major reason for which children are brought to the hospitals. Hospital record from different states with high infant mortality shows that around 13.6% of all hospital admission and 13% of inpatient deaths in pediatric wards are due to several, anatomical and physiological characteristic of their respiratory tract. (2) Acute lower respiratory tract infections are ranked among the first five leading causes of mortality in children in most of the developing countries. Acute respiratory distress with wheeze in infants is also quite common and presents a substantial diagnostic problem. The excess of morbidity and mortality rates from acute lower respiratory tract infections in the developing world indicate that several risk factors could be responsible. In developing countries malnutrition, lack of breastfeeding, lack of immunization and overcrowding have been reported as the usual risk factors for acute respiratory tract infections. (3-6) Early recognition of a child at risk of respiratory failure and institution of supportive and specific therapy at the earliest depending on the underlying cause can save many lives.

AIMS AND OBJECTIVES

To evaluate the clinical presentation, aetiological factors and to correlate the birth weight, gestational age, sex, place of delivery, perinatal factors with the incidence of bleeding and to study the immediate outcome and short-term (6 months) follow-up of those neonates.

Methods: This prospective study was done in the Department of Pediatrics at a tertiary care hospital in Bihar, India. A detailed history, family history, perinatal problems and thorough clinical assessment, relevant investigations were done for all the children between 2

months to 1 year of age with features of acute respiratory distress who were selected for the present study. Total 120 cases with respiratory distress were taken for the present study.

Clinical criteria for selections of cases :

Respiratory distress : Infants (2 months-1 year) with respiratory rate >50/min with or without presence of other signs of respiratory distress like subcostal and intercostal retraction, flaring of alae nasi, grunting and apneic episodes.

All such infants were included into the study and graded on the basis of their severity into 3 categories –

Mild	Moderate	Severe
Tachypnea, Dyspnea or shortness of birth	Respiratory rate 50-70 per minute, minimal chest wall retraction, flaring of alae nasi	Tachypnea >70 breath/min Apneic episode or irregular respiration, severe chest wall retraction, cyanosis and grunting

Respiratory failure :

Respiratory distress and cyanosis with or without CNS and CVS signs of hypoxemia.

CNS Signs : Restlessness, obtunded sensorium, somnolence, seizure, coma.

CVS signs : Marked Tachy/bradycardia, Hypotension, cardiac arrest.

The present study on hospitalized children with acute respiratory distress has been carried out with a view to recognize and differentiate between four conditions i.e. bronchopneumonia, bronchiolitis, bronchial asthma and foreign body aspiration. Cases of CCF, congenital heart disease, congenital malformation of the airway, croup syndrome, gastroesophageal reflux and pulmonary

tuberculosis were excluded from the study after taking a detailed history and performing a proper clinical examination.

Result:

Among the 120 cases studied, 66 cases were male (55%) and 54 cases (45%) were female. 54.2% (65 cases) were found to be below 6 months of age. Most of the infants in study group were from rural areas (73.3%); only 32 cases belonged to an urban area.

Socio-economic status of the parents based on modified Kuppu Swamy scale showed 87 cases (72.5%) from a low socio-economic group. Rest of the infants was from a middle socio-economic group. None of the infants came from high socio-economic group. 64 cases (53.3%) in the present study had a weight less than 2 SD (malnutrition). Only 34.2% infants were breastfed or feeding at the time of the study.

The majority of patients (65, 54.2%) were diagnosed as bronchopneumonia; out of which 35 belonged to 7 month – 12 month age group. Bronchiolitis was the second most common illness, found in 48 patients (40%) and a large fraction (35 cases out of 48) were under 7 month of age. Bronchial asthma was diagnosed in 4 cases (3.3%) and only 3 infants (2.5%) presented with foreign body aspiration. All infants with asthma and foreign body aspiration were between 9-12 months of age. A strong association was seen between malnutrition (wt < 2SD) and bronchopneumonia. Out of 65 cases of bronchopneumonia, 47 cases had weight < 2SD i.e. were malnourished. No significant association was observed between bronchiolitis and low body weight. None of the infants with asthma and foreign body aspiration was malnourished.

Among the clinical manifestation, cough was the most prominent symptom and chest retraction was the most common presenting sign in our study. We found that following signs were the bad prognostic factor for recovery: Toxic appearance, malnutrition, cyanosis, respiratory rate > 70/min, apneic attack, refusal to feed, features of CCF, vomiting, convulsion, leucopenia and massive consolidation on chest x-ray.

A total of 11 infants (9.2%) died in our study. Most of the deaths were observed among infant less than 7 months of age and bronchopneumonia was the most common cause of mortality especially in the malnourished infant. The majority of the infants recovered over a short period of time but complicated cases stayed for a longer duration. The most common complication associated with bronchiolitis was recurrent wheezing without respiratory distress while empyema was seen as a complication in two cases of bronchopneumonia.

Discussion

The present study was conducted in the Department of Pediatrics of a tertiary care hospital in Bihar, India over a period of two years. There was a male preponderance in our study. Present observation is similar to the observation of Khatua (1977) and Mu et al (1991). (7,8) In their study, Khatua et al studied children with bronchiolitis having respiratory distress along with wheezing and found that 63.5% of all children were male with a male to female ratio of 1.7:1. (7) 65 cases (54.2%) were found to be below 7 months of age while a number of cases between 7 months-12 months were 55 (45.8%).

A significant observation in our study was that 87 cases (72.5%) were from the low socio-economic group. Denny et al. also observed the same pattern of increased risk of respiratory infections associated with the low socio-economic status of parents. (9) Denny et al (1986) demonstrated that overcrowding, a large number of siblings, increased population density increases the risk for lower respiratory tract infection. (9)

We found that 53 % infants in our study were malnourished (64/120). We also observed that 81% (47/56 infants) with bronchopneumonia had malnutrition, whereas only 35 % (17/48) cases of bronchiolitis

suffered from malnutrition. Thus significant association was observed between malnutrition and incidence and severity of pneumonia.

James et al (1972) and Tupasi et al (1990) also observed a similar pattern of increased incidence of pneumonia in malnourished children with low body weight. (10,11) Tupasi et al (1990) also documented an association between poor nutritional status and higher rates of hospitalization for pneumonia. (11)

In the present study, 65 cases (54.2%) were diagnosed as bronchopneumonia, 48 cases (40%) as bronchiolitis while asthma and foreign body aspiration were diagnosed in 3 % and 2.5% cases respectively. In their study, Kumar et al (2002) reported 50% of the infants were with a final diagnosis of bronchopneumonia while bronchiolitis and bronchial asthma constitute 34% and 16% respectively. (2)

A significant association between lack of breastfeeding and risk of respiratory infections was found in our study. Only 41 cases (34.2%) in our study were breastfed. This finding can be explained by the study done by Prentice et al. and Palmeira et al. who reported that breastfeeding protects against pneumonia by providing antibacterial and antiviral factors. (12,13) Palmeira et al. who reported that colostrums contains high concentrations of various protective factors with anti-infective action, such as enzymes (lysozyme, lactoferrin etc.), immunoglobulins, cytokines, complement system components, leukocytes, oligosaccharides, nucleotides, lipids, and hormones that interact with each other and with the mucous membranes of the upper respiratory tracts of infants, providing passive immunity as well as stimulation for the development and maturation of the infant's immune system. (13) Similarly in their study, Vitoria et al (1987), in Brazil, reported non breastfed children were 3.6 times more likely to die of pneumonia compared to exclusively breastfed children. (14) Lack of primary immunization was also found to be a major risk factor for the development of respiratory infections in infancy. In the current study, 88.4% of infants with bronchopneumonia had fever > 1000F. We found that presence of fever > 1000F had 88.4% sensitivity and 77% specificity for the diagnosis of bronchopneumonia in infants with respiratory distress and chest wheezing. Similar observation was made by Kumar et al (2002), who reported that 88% of infants with bronchopneumonia had fever > 1000F, with 88% sensitivity, 76.4% specificity and positive predictive value of 84.6%. (2) In our study, leucocytosis was found in 69.2% of infants with bronchopneumonia. This finding was almost similar to that observed by Kumar et al (2002) (2). They reported leucocytosis in 72% of infants with bronchopneumonia. Opacities on the chest radiograph were observed in 86.5% cases of pneumonia with a sensitivity of 86.5% and specificity of 79%. which was akin to observations of Kumar et al (2002) who had reported that opacity on the chest radiograph have 100% sensitivity and 64.7% specificity in cases of pneumonia. (2) Cough was the commonest presenting symptom in our study, found in 108 infants out of 120 while most common sign seen was chest retraction (117 cases). Earlier Wright et al (1989), Shaw et al (1991), Mishra et al (1993) and Kumar et al (2002) found similar data and reported cough as common symptom seen in patients with pneumonia, bronchiolitis, asthma and FBA. (2,15-17)

The majority of cases (82%) recovered completely out of which 64.2% cases were discharged after recovery whereas 18% infants were discharged on request during recovery. Out of 120 selected cases mortality was seen in 11 cases (9.2%). The data from the present study shows that all 11 infants who died had cyanosis and refusal to feed. Both these clinical features i.e. cyanosis and refusal to feed were the most common poor prognostic factors with a positive predictive value of 53% and 25% respectively. Ill or toxic look was also seen in the majority of infants who died. Among 7 deaths due to bronchopneumonia, 4 infants had weight below 2SD. This data was consistent with the observation of Tuposi et al (1990) who reported that severely malnourished children with pneumonia were more

likely to have fatal outcome.(11) Rahman et al (1990), Yoon et al (1997) also reported high case fatality rate among malnourished children hospitalized with pneumonia in Bangladesh and Philippines respectively. (18,19) Rice et al. reported the strongest and most consistent relation between malnutrition and an increased risk of death with acute respiratory infection. (20)

Out of 65 cases of bronchopneumonia, 2 infants developed empyema as complication. These two empyema cases were treated with chest tube drainage for 10 days along with antibiotics. Both these cases completely recovered and were normal on follow-up.

Among 3 cases of bronchial asthma, two cases were readmitted with the similar episodes of symptoms following upper respiratory tract infection.

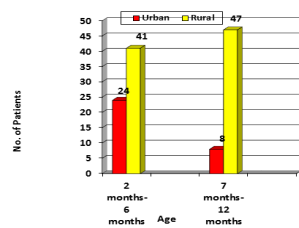
Only 4 out of 35 cases of bronchopneumonia (11.5%) were readmitted on follow-up.

Whereas recurrent wheeze without any respiratory distress was seen among 9 infants (32.1%) having diagnosis of bronchiolitis during 2 months follow-up period. This is similar to observation made by Korppi et al who reported increased bronchial hyperreactivity after infantile pneumonia and bronchiolitis, present in 62% and 45% of the bronchiolitis group and pneumonia group respectively. (21)

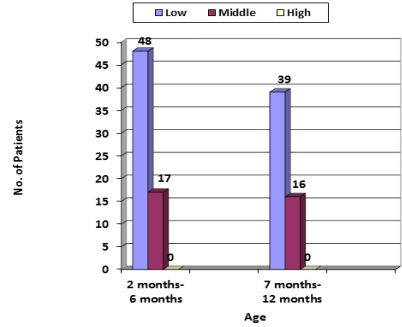
Conclusion: Acute respiratory infections are a significant cause of illness and death during infancy. Malnutrition, poverty, lack of breast feeding, lack of immunization and overcrowding were found to be important risk factors for acute respiratory infection in our study Symptoms and signs mentioned in the WHO ARI control program are very sensitive in detecting the acute respiratory infection cases. Thus we conclude that infants with respiratory distress can be diagnosed early as bronchopneumonia, bronchiolitis, asthma and foreign body aspiration up to reasonable extent on the basis of clinical features and simple investigations like total and differential leucocyte counts and chest x-ray. Timely initiation of suitable treatment significantly reduces morbidity and mortality. Availability of proper nutrition and prompt treatment of malnutrition and anemia, improving the living standards and educating parents about hazards of smoking, increasing the immunization coverage and promoting exclusive breast feeding can help in reducing the disease burden.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

Graph 1. Distribution of cases in different age and sex group



Graph 2. Distribution of cases on Urban and Rural ground



Graph 3. Socio-economic status of parents of infant based on the modified Kuppu Swamy Scale.

	2 month – 6 month		7 month – 12 month		Total
Bronchopneumonia	5(30)	16.6%	2(35)	5.7%	07
Bronchiolitis	2(35)	5.7%	1(13)	7.7%	03
FBA	00	00	1(3)	33.3%	01
Asthma	00	00	0(4)	0	-
Total	7(65)	-	4(55)		11

TABLE 1: Percentage distribution of mortality among infants in the study due to different conditions

TABLE 2: Age wise presentation of common symptoms associated with acute respiratory distress among selected cases

Symptoms	2 months – 6 months	7 months – 12 months	Total
Fever	28	44	72
Dyspnea	65	55	120
Wheeze	65	55	120
Previous URI	43	27	70
Nasal discharge	42	22	64
Cough	52	50	102
Refusal to feed	27	12	39
Grunting	20	12	32
Vomiting	22	12	34
H/O of recurrent attack of wheeze without fever	00	04	04
Family history of atopy/asthma among sibling/parent	00	04	04
H/O of foreign body aspiration	00	02	02

TABLE 3: Common signs among selected patients with acute respiratory distress

Signs	2 months – 6 months	7 months – 12 months	Total
Sick appearance or Toxic look	15	10	25
Cyanosis	12	8	20
Apneic attack	5	00	5
Chest retraction	65	52	117
RR (50-60) breath/min.	15	10	25

RR (61-70) breath/min.	35	25	60
RR (> 70) breath/min.	25	08	33
Flaring of alae nasi	44	36	80
Convulsion	4	1	5
Crepitation	22	33	55
Decreased breath sound	7	5	12

TABLE 4: Distribution of signs among different causes of acute respiratory distress among infant admitted in Pediatric ward

Signs	Bronchiolitis	Bronchopneumonia	Bronchial Asthma	FBA	Total
Sick appearance or toxic look	10	14	-	01	25
Chest retraction	47	64	03	03	117
Cyanosis	08	11	-	01	20
Crepitation	14	40	-	01	55
Convulsion	02	02	-	01	05
Decreased Breath sound	06	04	01	01	12

TABLE 4: Distribution of symptoms among different causes of acute respiratory distress in selected infants

Symptoms	Bronchiolitis	Bronchopneumonia	Bronchial Asthma	FBA	Total
Previous URI	38	26	3	-	67
Nasal discharge	37	24	1	-	62
Cough	44	43	4	2	93
Fever (1000F)	13	58	-	1	72
Grunting	9	20	-	1	30
Refusal to feed	10	25	2	1	38
Vomiting	13	19	-	-	32
H/O recurrent attack of wheeze without fever	-	-	4	-	04
F/H of atopy/asthma among parent/ sibling	02	-	02	-	04
H/O foreign body aspiration	-	-	-	02	02

TABLE 5: Outcome of acute respiratory distress among infant admitted in pediatric ward

Recovered and discharged	77 (64 %)
Discharge on request during recovery	22 (18.3 %)
Left against medical advice (LAMA)	10 (8.3 %)
Expired	11 (9.2%)
Total	120

REFERENCES:

1. Fact sheet of Pneumonia [Internet]. World Health Organization. 2017 [cited 22 April 2017]. Available from: <http://www.who.int/mediacentre/factsheets/fs331/en/>
2. Kumar N., Singh N., Lochan K.K., Garg R., Sarwal D. Clinical evaluation of acute respiratory distress and chest wheezing in infants Indian Pediatr. 2002; May 39(5):478-83.
3. Igor R, Cynthia B P, Zrinka B, Kim M & Harry C. Epidemiology and etiology of childhood pneumonia. Bull World Health Organ 2008;86:408–416.
4. Cunha AL. Relationship between acute respiratory infection and malnutrition in children under 5 years of age. Acta paediatrica 2000;89:608-09.
5. Yadav S, Khinchi Y, Pan A, Gupata SK, Shah GS, Baral DD, et al. Risk Factors for Acute

Respiratory Infections in Hospitalized Under Five Children in Centre Nepal. J Nepal Paediatr Soc 2013;33(1):39-44.

6. Prasad DP, Chandrashekhar HG, Madhavi VR. Study of Risk Factors of Acute Respiratory Infection (ARI) in Underfives in Solapur. National Journal of Community Medicine 2010;2(1):64- 67.
7. Khatua SP (1977) Acute bronchiolitis (a study of 205 cases). Indian Pediatrics 14, 285–294
8. Mu LC, Sun DQ, He P. Radiological diagnosis of aspirated foreign bodies in children : review of 343 cases J Laryngol Otol. 1990 Oct; 104(10):778-82.
9. Denny FW, Coiler AM, Henderson FW : Acute respiratory infections in day care, Rev Infect Dis 8:527-532, 1986.
10. James JW. Longitudinal study of the morbidity of diarrheal and respiratory infections in malnourished children. Am J Clin Nutr. 1972 Jul;25(7):690-4.
11. Tupasi T E, Velmonte M A, sanvictores M E G. Determinants of morbidity and mortality due to acute respiratory infections : Implications for intervention. The Journal of infections diseases 1988; 157:615-23
12. Prentice A, Ewing G, Roberts SB, Lucas A, MacCarthy A, Jarjou LM, Whitehead RG. The nutritional role of breast-milk IgA and lactoferrin. Acta Paediatr Scand. 1987 Jul;76(4):592-8.
13. Palmeira P, Carneiro-Sampaio M. Immunology of breast milk. Rev Assoc Med Bras (1992). 2016 Sep;62(6):584-593. doi: 10.1590/1806-9282.62.06.584.
14. Victora CG, Kirkwood BR, Ashworth A, Black RE, Rogers S, Sazawal S, Campbell H, Gove S. Potential interventions for the prevention of childhood pneumonia in developing countries: improving nutrition. Am J Clin Nutr. 1999 Sep;70(3):309-20.
15. Wright AL, Taussig LM, Ray CG, Harrison HR, Holberg CJ. The Tucson Children's Respiratory Study. II. Lower respiratory tract illness in the first year of life. Am J Epidemiol. 1989 Jun;129(6):1232-46.
16. Shaw K.N, Bell L.M, Sherman NC, Outpatient assessment of infants with bronchiolitis. Am.J.Dis.Child 1991; 145: 151-155.
17. Mishra S, Kumar H, Anand VK. ARI control programme : Result in hospitalized children. J Trop Pediatr 1993; 39:288-292.
18. Rahman M et al. Acute lower respiratory tract infections in hospitalized patients with diarrhea in Dhaka, Bangladesh. Review of Infectious Diseases, 1990, 12: S899–S906.
19. Yoon PW et al. The effect of malnutrition on the risk of diarrheal and respiratory mortality in children < 2 y of age in Cebu, Philippines. American Journal of Clinical Nutrition, 1997, 65: 1070–1077.
20. Rice AL, Sacco L, Hyder A, Black RE. Malnutrition as an underlying cause of childhood deaths associated with infectious diseases in developing countries. Bull World Health Organ. 2000;78(10):1207-21.
21. Korppi M, Kuikka L, Reijonen T, Remes K, Juntunen-Backman K, Launiala K. Bronchial asthma and hyperreactivity after early childhood bronchiolitis or pneumonia. An 8-year follow-up study. Arch Pediatr Adolesc Med. 1994;148(10):1079–1084.