RESEARCH
www.commprac.com
ISSN 1462 2815

STUDY OF PREVALENCE & OUTCOME OF CLINICAL RESPIRATORY DISTRESS IN PAEDIATRIC AGE GROUP- A PROSPECTIVE STUDY IN A TERTIARY CARE TEACHING HOSPITAL

Mohammed Abdul Wasiq [1], Dr. Debashree Priyadarshini [2], J. Bikrant Kumar Prusty [3]* and Mrutunjaya Dash [4]

[1] Assistant Professor, Department of Paediatrics, IMS AND SUM Hospıtal.
ORCID ID: 0000-0002-8920-6819
[2] ORCID ID: 0000-0001-9167-9351
[3] Associate Professor, Department of Pediatrics, IMS & SUM Hospıtal, Bhubaneswar.
*Corresponding Author
[4] ORCİD ID: 0000-0002-9718-500X

DOI: 10.5281/zenodo.11090235

Abstract

Acute respiratory infection (ARI) is one of the frequent cause of mortality in children less than five years of age in India. The under-five morbidity is led by Lower Respiratory Tract Infections(LRTI) world wide. Respiratory distress is the frequent reason of emergency visit in pediatric age group. In December 2019, pneumonia due to a novel coronavirus (SARS-COV-2) emerged in the Wuhan city of China and caused increased number of cases and deaths worldwide. An understanding about epidemiology of the respiratory diseases as well as identification of predisposing risk factors and causative organisms is essential for prevention and successful treatment of mortality related to respiratory infections. This study was done with the aim to identify the prevalence and outcome of respiratory distress in pediatric age group between 1month to 5 years of age. It was a prospective study conducted at IMS and SUM Hospital, Bhubaneswar. The study period was 18 months (01.01.2019 to 30.06.2021). Total 210 children with respiratory distress were enrolled. It was observed that most of the children with respiratory distress belonged to lower socioeconomic class from rural areas. Most of them were born prematurely. Pneumonia was found to be the major cause of respiratory distress in these children during the study period.

Keywords: Pneumonia, Premature Delivery, Prevalence, Outcome.

INTRODUCTION

Acute respiratory infection (ARI) is one of the frequent cause of mortality in children below five years of age, especially in developing nations like India.[1] The under-five morbidity is led by Lower Respiratory Tract Infections(LRTI) world wide.[2] Respiratory tract infection poses a big threat to health sector in developing nations due to high mortality as well as morbidity.[3] It is predicted that India, Bangladesh, Nepal, Indonesia all together accounts to 40% of world wide respiratory infection mortality. Moreover, infants living in dense populated areas and sub-optimally breast fed are prone to suffer from respiratory system related illnesses.[4] In India, Respiratory Infections constitutes around 30% to 45%of total visits to the health care institutes and 20%to 35% of all admissions to the hospital.[5] It constitutes more than two-thirds of all childhood illnesses in slum region of urban areas.[6] Inspite of all these above like statistics, most of the evidences that are reported undervalues the burden of acute respiratory infection in the community.

Respiratory distress is commonly encountered in children seeking admission to pediatric ward. Respiratory distress is not only cause by pathology in Respiratory system but also in other systems like CNS (Gullian Barre Syndrome, Myasthenia

Gravis), CVS (Congestive heart failure). Thus respiratory distress continues to be perplexing and challenging problem in pediatric age group and accounts for high mortality. Respiratory distress is said to be present if a child presents with flaring of ala nasae, increased respiratory rate, retractions of chest wall, grunting, stridor, difficulty in breathing & wheeze related disorder. Fast breathing which is a component of respiratory distress varies with age. In neonates, respiratory rate >60 breaths/min is called as fast breathing while in 2 months to 12 months it is >50 breaths/min and >12months of age fast breathing is >40 breaths/min.

The emergence of new pathogenic organisms like novel coronavirus (SARS-COV-2), re-emergence of disease that was put under control earlier, wide spread of resistance to antibiotics and suboptimal coverage of immunization even after frequent creative efforts are the major factors which ultimately leads to an increased incidence of respiratory infections. The existing data on Respiratory diseases lacks reliable and representative data thus resulting in under estimation of prevalence of respiratory diseases. Respiratory distress is the frequent reason of emergency visit in pediatric age group. An understanding about epidemiology of the respiratory diseases as well as identification of predisposing risk factors and causative organisms is essential for prevention and successful treatment of mortality related to respiratory infections.

As per the MoHFW, 8% of the COVID-19 positive cases in India were contributed by people below 17 years of age [7]. Reports show a lower need for hospital and intensive care unit (ICU) admission and lower mortality rate (0-0.7%) in children in comparison to adults [8]. This could be due to strong innate immune response due to trained immunity, healthier blood vessel endothelium, good alveolar epithelium regeneration capacity and lesser co-morbidities [9].

The aim of the study is to identify the prevalence of clinical respiratory distress in paediatric age group between 1 month to 5 years of age as well as to find the outcome including the morbidity, mortality and prolongation of hospital stay in respiratory distress.

MATERIALS & METHODS

The study was conducted in tertiary health care centre, IMS & SUM Hospital, Bhubaneswar, Odisha. Required relevant necessary informations were retrieved from all cases of respiratory distress among paediatic age group (1 month- 5 years) seeking treatment in paediatric department of IMS & SUM Hospital, Bhubaneswar for 30 months (January 2019 to June 2021). A convenient sample size of 210 children presenting with clinical respiratory distress admitted to our department were taken for study.

Children between 1 month to 5 years with respiratory rate more than as per their expected age and or with nasal flaring, grunting, wheeze, ronchi, crepitations, retraction were included in the study whereas Neonates (< 1 month of age), children with surgical cause of respiratory distress, cerebral palsy and developmental delay were excluded.

All the data were collected and entered into Microsoft Excel 10.0 & analyzed in SPSS trial version 18. Descriptive statistics like mean, percentage, frequencies and tests of significance like Chi-Square test were used & the statistical significance level was fixed at $P<0.05$.

RESULTS

During the study period of 18 months, total 500 children between 1month to 5years were admitted in our ward out of which 150 child presented with respiratory distress. Thus the prevalence of respiratory distress among children admitted in our hospital was 30%. Out of 150 children admitted 137 got discharged whereas 13 children died.

The children were divided into three age groups- less than 1 year, 1-3 years and 3-5 years of age. Respiratory distress was commonly seen in 3-5 years of age group (58.7%) and number of deaths were also more in that age group (7 out of 13) followed by 1-3 years of age group (6 out of 13). On the basis of gender, respiratory distress seems to be more prevalent among boys (58.7%) but death was reported more among girls (9 out of 13).

On taking the antenatal history it was found that most of the children with respiratory distress had premature delivery (<37 weeks) i:e 54.7% and death was also common among them (12 out of 13). It was statistically significant (p value 0.004). The mean duration of hospital stay was 7.46 $\pm$ 5.01 days.

Though respiratory distress is commonly encountered in malnourished children, in our study no such significant association was found. Most of the children with respiratory distress were of normal nutritional status. The Mean Weight- 12.61 + 2.86 kg and Mean Height- 94.91 + 9.6 cm.

On the basis of domiciliary and socio-economic status, respiratory distress and mortality due to it was found to be more prevalent among children belonging to rural area (p value 0.096) and lower socio-economic class (p value 0.11).

Pneumonia was found to be the leading cause of respiratory distress (34.6%) and only cause of death (13) in our study. It was statistically significant (p value 0). Other causes of respiratory distress included meningitis, scrub typhus, DKA, asthma, bronchiolitis, reactive airway disease.

Most of the children presented with fever, cough and tachypnea. Other clinical manifestation included inability to feed, nasal flaring, chest retractions and dyspnea. In Chi-square analysis there was significant association of nasal flaring, dyspnea, tachypnea chest retraction symptom with the outcome. (P value- 0.003, 0, 0.01, 0.02 respectively)

Most of the children with respiratory distress presented without any adverse events. Among the reported adverse events seizure (15%) followed by requirement of blood transfusion (10%) is commonly seen. Other adverse events were shock, renal failure, sepsis. Here P value was 0. The mean Hemoglobin was 10.32 + 1.68 g/dl, Mean TLC was 14212.1 + 4610.2 /cumm and mean CRP was 4.46 + 5.34. Thus respiratory distress was found to be more common among anemics.

37% of children with respiratory distress required ventilator support and all deaths that occurred during study period were on ventilator support. (P value 0)

Total admissions	Respiratory distress cases	Deaths
500	150 (137 discharged)	13
Age		
<1 year	7 (4.7%)	0
1-3 years	55 (36.7%)	6
3-5 years	88 (58.7%)	7
Gender		

Boy	88 (58.7%)	4
Girl	62 (41.3%)	9
Gestational Age (P-0.004)		
Preterm (<37 wks)	82 (54.7%)	12
Term (>37 wks)	68 (45.3%)	1
Nutritional status		
Good nutrition	95 (63.3%)	6
Malnutrition	55 (36.7%)	7
Domiciliary Status (P-0.096)		
Rural	95 (63.3%)	11
Urban	55 (36.7%)	2
Socioeconomic status (P-0.11)		
Lower	104 (69.3%)	12
Upper	46 (30.6%)	1
Causes (P value 0)		
Pneumonia	52	13
Others	98	0
Adverse events (P value- 0)		
Present	42	13
Absent	95	0
Ventilator Support (P value- 0)		
Required	56	13
Not required	94	0

DISCUSSION

The present study was conducted in Department of Pediatric, IMS & SUM Hospital, Bhubaneswar over a period of 30 months. The prevalence of respiratory distress in pediatric age group from 1 month to 5 years of age is 210 out of 500 children admitted in our tertiary care hospital. Out of 150 children admitted, 137 were discharged and 13 died during the study period. In a study done by S Ganesh Kumar[10] on prevalence of acute respiratory infection among below five children in urban and rural areas of Puducherry, the prevalence of respiratory infection was found to be 59.1% whereas in our study it is 30%.

During the study period, 60 children were rtPCR positive for novel coronavirus (SARS-COV-2). The most commonly reported symptoms in children aged ≤5 years were fever (42%), cough (31%), headache (17%), diarrhea (14%), and sore throat (11%). 3 children were critically ill requiring mechanical ventilation support out of which 1 child died. In our study most pediatric COVID-19 patients have a good prognosis, and in mild cases, recovery takes 8 to 16 days after the onset of the disease.

The children between 1 month to 5 years of age were categorized into 3 groups i:e below 1 year, 1-3 years & 3-5 years of age. Most of the respiratory cases were reported between 3-5 years of age group. There were no deaths reported in infants whereas all 13 deaths were seen between 1-5 years of age (6 deaths in 1-3 years of age & 7 deaths in 3-5 years of age). A community-based study in a coastal village of Karnataka, India reported the incidence of death due to pneumonia to be significantly higher among infants [11]. However, in our study there was no death reported in infants.

In our study, respiratory distress is commonly seen in boys (58.7%) than girls (41.3%) and more deaths were seen among girls (9 out of 13) than boys (4 out of 13). In a study by Matthew E. Falagas [12], respiratory tract infection was found more

commonly among boys than girls and mortality rate was also high among boys whereas in our study respiratory distress is commonly seen in boys but death rate is high among girls.

More than 50% of children admitted for respiratory symptoms had birth history of premature delivery i:e 54.7% , majority of the children who died were prematurely delivered i:e 12 out of 13. The mean duration of hospital stay was found to be 7.46 + 5.01 days. (P value-0.004). Similar findings were also reported by Prajapati et al.[13], Mitra [14] and Fonseca et al.[15].

In our study respiratory distress is commonly seen in children with good nutritional status (63.3%). In a study by Leonor Rodriguez[16] and TR Martin[17], respiratory infection is strongly associated with malnourished children unlike in our study.

Respiratory distress is commonly seen in children coming from rural areas (63%) than urban areas (37%). Similarly most of the children who died were from rural areas (11 out of 13). In a study done by S Ganesh Kumar[10] on prevalence of acute respiratory infection among under five children in urban and rural areas of Puducherry, respiratory infections were found to be more prevalent among children from urban areas unlike our study. However another study by Dhananjaya Sharma[18], respiratory infections were found to be more common among children from rural areas.

Studies done by Prajapati et al.[13] and Goel et al.[19] showed there was statistically significant association of respiratory distress and death with lower socioeconomic status [p value-0.001] whereas in our study respiratory distress and death were also commonly seen in lower socio-economic group but it was not statistically significant [p value-0.11].

Pneumonia was found to be the major cause of respiratory distress in children admitted in our hospital. Other causes included tonsillitis, asthma, bronchiolitis, tuberculosis, acute suppurative otitis media and reactive airway disease. The non-respiratory cause of respiratory distress were meningitis, scrub typhus, DKA and congestive heart failure. Pneumonia was found to be the only cause of all deaths due to respiratory distress during the study period (P value 0) According to WHO, 2 million children below 5 years of age die due to pneumonia each year [20]. In India the overall incidence of respiratory distress was found to be 6.7% conducted by Department of Pediatrics, JIPMER, Puducherry.[21]

During the study period most of the children presented with fever, cough and tachypnea. Other symptoms include inability to feed, nasal flaring, retraction and dyspnea. In Chi-square analysis there was significant association of nasal flaring, dyspnea, tachypnea chest retraction symptom with the outcome. (P value- 0.003, 0, 0.01, 0.02). In a study done by Hannah V Thornton [22] there was significant association of retraction with RSV infection.

Out of 150 children, 95 had uneventful events during the course of treatment. 23 children (15%) had seizure and 15 (10%) required blood transfusion owing to anemia. 9 children developed shock and 5 children developed renal failure. Other adverse events seen were sepsis, osteomyelitis and DVT. On Chi-square analysis, P value was 0. Study done by Jan H. Van Zeijl [23] showed significant association of seizure with respiratory distress. Study by D. Stepan[24] showed significant association of anemia with development of respiratory infection.

In our study out of 150 children, 56 children required ventilator support. All were invasive mode of ventilation. All children (13) who died during the study period were on ventilator support. (P value- 0) In a study done by Julio A Farias[25] on mechanical ventilation in pediatric intensive care unit, it was observed that 55% of children with respiratory distress required mechanical ventilator support and it was statistically significant (p value-0.001) like our study.

Good sample size enrollment and use of predefined case definitions are the strength of the study. Single center cohort and retrospective nature of the study remain as its limitation. Moreover, the prevalence and outcome of respiratory distress in children should be studied in multicenter setting.

CONCLUSION

Respiratory distress is the most common cause of mortality and morbidity in children below 5 years of age. Prevalence is high among children coming from rural area and belonging to lower socio-economic class family. Preterm delivery has major impact in the development of respiratory distress in later childhood period. Prevention of respiratory distress can be done by preventing sepsis, premature delivery and birth asphyxia related events at the time of delivery. In our study it was also found that pneumonia is the leading cause of death in children admitted with respiratory distress in our hospital Hence early diagnosis and timely intervention can decrease the mortality due to respiratory distress.

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