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A PROSPECTIVE OBSERVATIONAL STUDY OF STUDY OF RISK FACTORS FOR SEVERE PNEUMONIA AMONG CHILDREN IN A TERTIARY CARE HOSPITAL

Paediatrics

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ABSTRACT

Background: According to the DALY, acute respiratory illnesses cause 8.2% of all disabilities and account for 19.0% of all paediatric fatalities under the age of five. Children's morbidity and mortality are primarily caused by acute respiratory infections (ARI). It is a significant contributor to under-five mortality globally and in India. **Objectives:** To assess the risk factors associated with respiratory disease and detect mortality and morbidity among children between the age of 2 months to 5 years. **Methods:** It is a prospective observational study conducted in the Department of Paediatrics of a Tertiary care hospital. All cases of acute respiratory diseases between the age group of 2 months to 5 years admitted to the hospital during the period June 2018 to May 2021 were enrolled for the study. The study was approved by the Institutional Ethics Committee and informed consent was obtained from the parents. A total of 305 cases were studied. SPSS (v22.0) was used for analysis. **Results:** Nearly 50% (155 cases) belonged to age group of 2-6 months and 50% cases were from one year to five years of age. Sex wise distribution shows that nearly 62% of cases were male with Male: female ratio was 1.38. Out of 305 study patients around 65.5% were diagnosed as Pneumonia in which only 16% had very severe pneumonia and 34% had severe pneumonia. Among ARI 38% are lower respiratory tract infection followed by Bronchiolitis. Maximum deaths were seen in children belonged to very severe pneumonia category (11) and it was found to be statistically significant ($p<0.05$). Among ARI it was seen that Bronchiolitis shown 4 deaths but it was not significant there could be other risk factors for these deaths. Mortality was higher among males and it was significant ($p<0.05$). As per WHO classification high death rate seen in very severe pneumonia and it was significant. Children with grade 3 and 4 PEM has higher mortality. **Conclusion:** Factors like previous history of similar morbidities, inappropriate immunization for age, PEM grade 3 and 4 were significantly associated with severity of pneumonia. While severity of illness, PEM grade 3 and 4 and associated illness were the important risk factors for mortality.

KEYWORDS

Acute respiratory infection, Mortality, Pneumonia, Undernutrition, Risk factors

INTRODUCTION-

Acute respiratory infection (ARI) is one of the conditions for which individuals most frequently seek medical care, especially in children under the age of five [1,2]. Every year, 1.3 million infants under the age of five die as a result of ARIs [3]. ARO is responsible for one-third of under-five mortality in low-income nations [4]. The World Health Organization (WHO) estimates that respiratory infections cause 6% of the world's disease load, which is more than malaria, ischemic heart disease, cancer, or diarrheal disease combined [5]. According to Disability Adjusted Life Years, acute respiratory illnesses account for 8.2% of all disabilities and 19% of all paediatric deaths in children under the age of five. (DALY).

According to estimates, South East Asian nations like India, Bangladesh, Indonesia, and Nepal account for 40% of all ARI deaths worldwide, 90% of which are caused by pneumonia, a bacterial infection. In industrialized nations, the prevalence of pneumonia may be as low as 3-4%, but it can be as high as 20-30% in underdeveloped nations. In India, the Reproductive and Child Health programme currently includes the routine case management of ARI and the avoidance of pneumonia-related fatalities (RCH)[1-3]. A number of risk factors make younger age groups of children more susceptible to ARI. Most of these risk factors can be changed. The development of ARI in children is significantly influenced by environmental factors, such as the rainy season, second-hand smoke exposure, and housing standards, such as rural or urban residence, overcrowding, and use of smoking chulhas [6]. Due to low birth weight and hunger, children are particularly impacted in underdeveloped nations [7]. The prevalence of ARIs in a specific area may also be influenced by vaccination rates.

The majority of risk factors causing ARI are modifiable, and there aren't many research in this area that focus on these causes; thus, the current study was done to determine the prevalence of various associated risk factors and how they affect ARI outcomes.

MATERIALS AND METHODS-

A prospective observational study was conducted in the Department of Paediatrics of a Tertiary care hospital. All cases of acute respiratory diseases between the age group of 2 months to 5 years admitted to the hospital during the period June 2018 to May 2021 were enrolled for the study. The study was approved by the Institutional Ethics Committee and informed consent was obtained from the parents.

Inclusion criteria- Acute respiratory disorders like pneumonia, bronchiolitis, bronchitis, and Wheeze Associated Lower Respiratory Tract Infection (WALRI) were diagnosed in all children between the ages of 2 months and 5 years who were included in the study as per WHO guideline as below"

Table 1- WHO classification of ARI in children presenting with cough and/or difficulty breathing

Acute Respiratory Infection (ARI)	Signs
No Pneumonia (Cough and cold only)	Respiratory rate per minute: <50 – infants 2-11 months <40 – children 12-59 months
Non severe pneumonia	Respiratory rate per minute: >50 – infants 2-11 months >40 – children 12-59 months No LCI
Severe Pneumonia	LCI with or without rapid breathing
Very Severe Disease	Unable to drink, convulsions, abnormally sleepy or difficulties waking, stridor in a calm child or clinically severe malnutrition

Exclusion criteria-

The study excluded infants younger than two months of age, children with immunocompromised conditions, congenital heart and lung anomalies, structural malformations such cleft lip and cleft palate, and children with congenital heart and lung anomalies.

According to the WHO ARI protocol, children were divided into four categories: "No Pneumonia," "Non-Severe Pneumonia," "Severe Pneumonia," and "Very Severe Pneumonia" (Table 1). [8]. Acute Lower Respiratory Infections were collectively referred to as non-severe pneumonia, severe pneumonia, and very severe pneumonia (ALRI). Acute Upper Respiratory Infections are a collective term for non-serious bacterial infections that do not include pneumonia (just a cough and cold) (AURI).

Sample size estimation-

Sample size was calculated according to prevalence (27%) of ARI in a pilot study [9]. The prevalence was thus taken as 27%, with a margin of error of 5% and 95% confidence interval. The calculated sample size was 303. A total of 305 cases were studied.

Methodology-

A thorough history of the symptoms, which included fever, cough, rapid breathing, refusal to take food, wheezing, etc., was taken. Each youngster underwent a thorough evaluation, which included anthropometry. Assessments focused on the child's overall health, breathing rate, existence of a fever and other cyanosis symptoms, and pallor. The central nervous system, cardiovascular system, and pulmonary system were all thoroughly examined. Any septicemia, meningitis, or congestive heart failure that might have been present was documented. According to BG Prasad scale, socioeconomic status was determined. All patients underwent tests for hemoglobin, total WBC count, differential WBC count, ESR, chest X-ray, and blood culture. To determine the prognosis and the efficacy of the treatment, investigations were repeated as necessary. Antibiotics were given to all patients.

Statistical Analysis-

The statistical analysis was performed using SPSS for windows, version 22.0 software (Mac, and Linux). The findings were present in number and percentage analyzed by frequency, percent, and Chi-square test. A Chi-square test was used to find the association among variables. The critical value of *P* indicating the probability of significant difference was taken as <0.05 for comparison.

RESULTS

Table 2- Demographic details of study participants

Age groups (months)	No. (%)	
2-6	155 (50)	
7-12	60 (20)	
13-60	90 (30)	
Total	305	
Gender		
Male	189 (62)	
Female	116 (38)	
Immunization status of all cases		
Immunized	205 (67)	
Partially immunized	37 (12)	
Unimmunized	63 (21)	
Feeding practice		
Breast fed	243 (79)	
Bottled fed	62 (21)	
Protein energy malnutrition		
Normal	36 (13)	
Grade 1	28 (9)	
Grade 2	181 (59)	
Grade 3	39 (13)	
Grade 4	21 (6)	
Socioeconomic status (modified Prasad's classification)		
1.	Grade 1	28 (9)
2.	Grade 2	121 (40)
3.	Grade 3	93 (30)
4.	Grade 4	51 (17)
5.	Grade 5	12 (4)

As per table 2 nearly 50% (155 cases) belonged to age group of 2-6 months and 50% cases were from one year to five years of age. Sex wise distribution shows that nearly 62% of cases were male with male: female ratio was 1.38. Immunization status shows that 67 % were completely immunized, 21% were unimmunized and 12% were partially immunized. Most of the children were breast fed i.e. 243 (79%) and only 62 (21%) were bottle fed. 59% of the cases were grade 2 PEM. The socioeconomic status according to Modified Prasad's classification showed 70% were belonged to grade 2 and 3.

Table 3- Disease categories

Diagnosis	Number (%)
Pneumonia	200
Non severe	100 (50)
Severe	68 (34)
Very severe	32 (16)
ARI	105
Bronchiolitis	38 (36)
CROUP	27 (26)
LRTI	40 (38)

As per table 3 based on WHO criteria out of 305 study patients around 50% were diagnosed as Pneumonia in which only 16% had very severe pneumonia and 34% had severe pneumonia. Among ARI 38% are lower respiratory tract infection followed by Bronchiolitis.

Table 4- Disease Prognosis

Diagnosis	Death (%)	Survived (%)	p-value
Pneumonia (200)	12 (6)	188	0.01*
Non severe	00 (0)	100 (50)	
Severe	01 (0.2)	67 (33)	
Very severe	11 (5.8)	21 (10)	
ARI (105)	04 (2)	101	0.11
Bronchiolitis	04 (2)	34 (34)	
CROUP	00 (0)	27 (26)	
LRTI	00 (0)	40 (38)	

As per table 4 out of 305 study patients maximum deaths were seen in children belonged to very severe pneumonia category (11) and it was found to be statistically significant ($p<0.05$). Among ARI it was seen that Bronchilitis shown 4 deaths but it was not significant there coud be other risk factors for these deaths.

Table 5- Risk factors in all study participants

Factors		Death	Survived	p-value
Age				0.01*
<1 year		13	202	
>1 year		3	147	
Gender				0.01*
Males		12	177	
Females		04	112	
Severe pneumonia		01	67	0.01*
Very severe pneumonia		11	21	
ARI		04	101	0.11
PEM	Grade 2	11	178	0.01*
	Grade 3	01	38	
	Grade 4	03	18	
Feeding	Breast fed	00	243	0.01*
	Bottle fed	16	46	
Immunization				0.01*
Complete		00	205	
Unimmunized		16	100	

As per table 5 risk factors are estimated which shows children less than 1 year of age are at increased for developing respiratory infection with high mortality and it was significant. Among gender mortality among male children were higher and it was significant ($p<0.05$). As per WHO classification high death rate seen in very severe pneumonia and it was significant. Children with grade 3 and 4 PEM has higher mortality. No mortality was seen in breast feed babies who show the importance of breast feeding in counter respiratory infection and it was statistically significant. ($p<0.05$)

DISCUSSION-

Clinical childhood pneumonia is brought on by a confluence of host, environmental, and infection-related risk factors. The case fatality rate of the present study was 5.2%. Among 305 studied patients (16 patients died due to significant risk factors as stated in the present study). 70% of cases belonged to less than 1 year in the present study. In a case-control research conducted it was discovered that malnutrition, smoking at home, anemia, infant age under 6 months, and smoking were all significant risk factors for developing severe pneumonia. [8] Young age, vaccinations, malnutrition, and a history of severe ARI were also discovered to be important risk factors for developing severe pneumonia. [9]

It was found that babies who were not exclusively breastfed had a higher frequency of ARI cases in the present study. When compared to newborns who were exclusively breastfed for six months, the mortality rate in the same group was higher [10,11] Numerous other investigations shows same observation. In babies breastfed for three months, six months, and nine months, respectively studies observed a 40%, 29.2%, and a 27.2% decrease in ARI incidence with prolonged duration of breastfeeding [12]. Patients who began weaning before four months exhibited a higher incidence of ARI than those who did so after four months, according to study (37.5% vs 13.46%). [13].

The case fatality rate in the current study was 5.2% (16 cases), with 55.5% (5 cases) of the fatal cases taking place within 24 hours. Case fatality rates of 10.45%, 12.8%, and 7.7% were reported by other

studies respectively, in other research. [13-15] Comparable to none of previous studies, the current study's case fatality ratio is lower. Congenital heart disorders (CHD) are a major contributor to pneumonia mortality. As pneumonia and CHD are not included in this study, this may be the most likely explanation for the study's low case fatality rate. By comparing children who died with those who survived, a significant predictor of mortality was found. Complete immunisation was seen in 205 (37.6%) cases, while a large proportion were incompletely immunised (100) several other studies reported increased incidence of pneumonia in unimmunised population [12,13,16].

CONCLUSION-

This study discovered that the risk variables examined had a substantial impact on the severity of pneumonia, including past history of a similar illness, improper immunization for age, anemia, PEM grades 3 and 4. To avoid pneumonia morbidity and mortality in ALRTI among children indoor air pollution must be reduced. Although sickness severity, PEM grades 3 and 4, and accompanying illnesses were the key risk factors for fatality. Children between 2-12 months are most vulnerable. Very severe pneumonia and bronchiolitis had a poor outcome.

Conflict of Interest- None declared

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