A Study of Risk Factors for Acute Lower Respiratory Tract Infection in Under Five Children

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Abstract

Background : 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. It accounts for 15% of death worldwide. 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.

Objective : To study the clinical profile and Risk factors of ALRI in children aged 2 months to 5 years.

Materials and Methods: The present Case Control study was carried out by the department of Pediatrics at Chamarajanagara Institute of Medical Sciences, Chamarajanagara from March 2022 to September 2022. A Total 100 study subjects with LRTI and 100 controls were enrolled for the purpose of the study . Details of potential risk factors in cases and controls were recorded in pre-designed proforma.

Results : In the present study nearly 15% of the subjects were classified to be having Pneumonia only , 60% of them as Severe Pneumonia and 25% of them has very severe Pneumonia. On Analysing various common risk factors associated with lower respiratory tract infection in the present study it was found that immunization Status , type of house Birth weight and Malnutrition status of the children were found to be statistically significant and other risk factors were found to be statistically insignificant .

Conclusion : This study has shown that the risk factors for ARI that have been identified—such as low birth weight, inadequate immunisation, hunger, and type of housing—had statistically significant associations that may be changed. Simple tactics like proper diet, immunisation, avoiding pollutants, parent education, and environmental cleanliness can change these risk factors

Keywords: LRTI, WHO, Pneumonia, Risk Factors, Malnutrition

Introduction

Children under five years of age (Under five children) contribute to 10.7% of total Indian population [1]. WHO defines children as those aged between 0-14 years. They contribute to 26% of world population and 28.4% of India's population [2]. Underfive children form one of the vulnerable groups of population and care of their healthis very important in framing countries future economy and development. UNICEF considers under-five mortality rate as the best single indicator of social development and well-being, as it reflects income, nutrition, health care and basic education of the country [3].

Among all the children diagnosed with ALRI, 7-13% are severe enough to require hospital admission [4]. Of all the children hospitalized with severe pneumonia, 51% require a hospital stay of more than 5 days, 56% need an antibiotic change, 20.5% need mechanical ventilation and the mortality is 10.5% [5].

Achieving the Millennium Developmental Goals (MDG's) with respect to child mortality will require

urgent action to reduce childhood Pneumonia deaths. ARI accounts for 17% of all under five deaths worldwide and 19% in India. Several studies done in various parts of India show varied prevalence of ARI ranging from 22% to 54% and various risk factors associated with ARI [6]. However Existing evidences on ALRI lack representative and reliable data resulting in inconclusiveness about knowledge and risk factors for ALRI. Hence this study was undertaken in the present institution with the objective to determine the clinical profile and Risk factors of ALRI in children aged 2 months to 5 years.

Materials and Methods :

The present Case Control study was carried out by the department of Pediatrics at Chamarajanagara Institute of Medical Sciences, Chamarajanagara from March 2022 to September 2022.

The sample size Was estimated based on the difference in proportion of duration of breastfeeding <4 months between ALRI Control groups. Duration of breastfeeding was an important factor associated with ALRI. Proportion in ALRI group was 36% and in Control was 16% from the study by **Deepti P et al**., [7] Using these values in the below mentioned formula

$$N = \frac{2\left(Z_{\alpha/2} + Z_\beta\right)^2 \times P(1-P)}{(p_1 - p_2)^2}$$

Where,

➤ $Z_{\alpha/2=} Z_{0.05/2} = Z_{0.025} = 1.96$ at type 1 error of 5%

➤ $Z_\beta = Z_{0.20} = 1.28 =$ At 90% power

➤ $p_1 - p_2 =$ Difference in proportion in the two different groups = 20%

➤ P= Pooled prevalence = [Proportion in Cases (p_1) + Proportion in Control (p_2)]/2 = [36 + 16]/2 = 26

$$N = \frac{2(1.96 + 1.28)^2 \times 26 \times 74}{20 \times 20} = \frac{40394.76}{400}$$
$$= 100 \ in \ each \ group$$

Age and Sex matched cases and controls aged 2 months to 5 years presenting with symptoms of ALRI in Department of Pediatrics, CIMS, Chamarajanagara was recruited for the Purpose of the until the desired sample size if 100 is obtained in each group.

Inclusion Criteria:

➤ Children with ALRI from 2 months to 60 months

Exclusion Criteria:

➤ Children with any underlying chronic respiratory or cardiac illness, Immunodeficiency.

Congenital anatomical defects of airways eg: Cleft palate, Tracheo Esophageal Fistula and other airway anomalies. Gastro Esophageal Reflux due to Neuromuscular diseases, Central Nervous System diseases eg: Cerebral Palsy, Neurodegeneration, other feeding difficulties were excluded from the study.

Cases: Children with ALRI in the age group 2 months to 60 months

Controls: Children without ALRI in the age group 2 months to 60 months(Age and Gender matched controls will be included). The controls will be healthy babies or children without any respiratory or other complaints.

Method of Data Collection:

Children in the age group of 2 months to 5 year admitted with ALRI during the study period will be enrolled in the study as cases. A case of ALRI is defined as per ARI Control Programme as "presence of cough with fast breathing of more than 60/min in less than 2 months of age, more than 50/min in 2 months to 12 month of age and more than 40/min in 12 months to 5 year of age, the duration of illness being less than 30 days". The presence of lower chest wall indrawing will be taken as evidence of severe pneumonia. The presence of refusal of feeds, central cyanosis, lethargy or convulsions was taken as evidence of very severe pneumonia. Informed consent of the child's care taker will be obtained. A detailed history and physical examination will be doneaccording to a predesigned proforma to elicit various potential risk factors and other relevant history. Age of the child will be recorded in completed months and age of parents in completed year.

A detailed history of relevant symptoms like fever, cough, rapid breathing, chest retraction, refusal of feeds, lethargy, wheezing etc. will be taken. Past history of similar complaints was also taken. History of immunization will be elicited from parents and verified by checking the documents wherever available. History of breastfeeding andcomplementary feeding will be recorded. Dietary intake of child prior to current illness will be calculated by 24 hr dietary recall method. History of upper respiratory tract infection in the family members in the preceding 2 weeks was recorded. History of smoking by various family members and details of cooking fuel used will be recorded. Details ofthe housing conditions will also be obtained. Socioeconomic status grading will be done according to Modified Kuppuswamy classification. A detailed examination of eachchild will be done. Respiratory rate and heart rate will be measured for one minute, when the child was quiet. A detailed anthropometry will be done and malnutrition will be graded according to Indian Academy of Pediatrics classification. Severity of respiratory distress will be assessed in each child. Pallor and other signs of vitamin deficiencies will be recorded.

A detailed systemic examination will be done in both cases and controls. Conjunctival Xerosis, Bitot spots, Corneal Xerosis and Ulceration are considered as signs of Vitamin A Deficiency. Children with Bow legs or knock knees, Frontal Bossing, Delayed closure of anterior fontanelle, Craniotabes, Delayed Dentition, Rachitic rosary or X-Ray with Features of splaying: Widening of metaphyseal ends, fraying: indistinct margins of the metaphysis, cupping: concavity of metaphysis will be considered as having Rickets.

Routine hematological investigations will be done in all cases to know the degree of anemia and blood counts; chest x ray will be done in all cases to categorize the ALRI into clinical entities and to detect complications, if any. Other specific investigations required will bedone as per requirement in individual cases and all the cases will be treated as per the standard protocol depending on the type of ALRI.

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data will be represented in the form of Frequencies and proportions. **Chi-square test** will be used as test of significance for qualitative data. Continuous data will be represented as mean and standard deviation. Graphical representation of data: **MS Excel and MS word** will be used to obtain varioustypes of graphs such as bar diagram. **p value** (Probability that the result is true) of <0.05 will be considered as statisticallysignificant after assuming all the rules of statistical tests.

Results:

A total of 100 Study subjects were included for the purpose of the study in each group and analysed.

Table 1: Social Profile of the study subjects

Social Profile		Study		Control	
		Frequency	%	Frequency	%
Age Group	2 months – 1years	23	23	23	23
	1 year to 2 year	32	32	32	32
	2 years to 3 years	21	21	21	21
	3 years to 4 years	19	19	19	19
	4 years to 5 years	5	5	5	5
Gender	Male	62	62	62	62
	Female	38	38	38	38
Locality	Urban	55	55	55	55
	Rural	45	45	45	45

In the present study the cases and control were selected after matching with age and gender in both the groups. Hence in the present study nearly 23% of the study subjects were aged less than 1 year, 32% of them were aged between 1 to 2 year, 21% of them were aged between 2 to 3 years of age, 19% of them aged between 4 to 5 years and 5% of them were aged between 4 to 5 years of age. On comparing the gender majority of them 62% were males and 38% were female . Nearly 55% of them were residents of urban area and 45% of them in rural area among the study group and control group. Among the study subjects nearly 64% of them were low birth weight babies and 48% of the subjects in control group were low birth weight.

Table 2 : Distribution of study subjects based on signs and Symptoms among cases

		Frequency	Percentage
Classification of Pneumonia	Pneumonia	15	15
	Severe Pneumonia	60	60
	Very Severe Pneumonia	25	25

In the present study nearly 15% of the subjects were classified to be having Pneumonia only , 60% of them as Severe Pneumonia and 25% of them has very severe Pneumonia.

Table 3: Comparison of Risk Factors between study and control subjects

Risk Factors		Cases		Control		P value
		Frequency	%	Frequency	%	
Immunization Status	Immunized till age	66	64	85	85	0.001*
	Not Immunized till age	34	34	15	15	
Type of feeding	Breast fed only	79	79	88	88	0.08
	Breast fed and Bottle fed	21	21	12	12	
Type of House	Pucca	40	40	73	73	0.001*
	Kaccha	60	60	27	27	
Fuel Used	Smokeless	77	77	83	83	0.288
	Smoke	23	23	17	17	
Sanitation Facilities	Good	66	66	77	77	0.084
	Poor	34	34	23	23	
Malnutrition	Present	81	81	62	62	0.002*
	Absent	19	19	38	38	
Birth weight	Less than 2.5 kg	64	64	48	48	0.002*
	More than 2.5kg	36	36	52	52	

Chi Square Test

On Analysing various common risk factors associated with lower respiratory tract infection in the present study it was found that immunization Status, type of house, Birth weight and Malnutrition status of the children were found to be statistically significant and other risk factors were found to be statistically insignificant.

Discussion:

ARI especially pneumonia is one of the leading cause of morbidity and mortality in developing countries like India. It contributes to almost 2 lakh under 5 death in our country. Pneumonia also accounts for 24% of national burden of disease in India. Hence knowing the incidence, clinical profile of ARI in a tertiary care hospital reflects the burden in the community and identifying the risk factors for mortality and morbidity in the children aged 2 months to 60 months, will help in proper utilization of available resources and ensure adequate management of these children.

In the present study majority of the children who were included in the study were aged between 1 to 2 years followed by children aged less than 1 years of age . The distribution of age in the present study is comparable and similar to the study findings of Dhivyanarayani M et al [8] , Tahilramani H et al [9] and Sriram G et al [10].

In the present study male gender was found to be most commonly affected than female gender which was common to the findings of the study done by Sriran G et al 10, Hamid et al [11] and Rahman Et al [12] .

The WHO protocol puts forward two signs as the "entry criteria" or basis for examining a child below five years of age for possible pneumonia: cough or difficult breathing and based on these the subjects classified as children with pneumonia only, Severe Pneumonia and very Severe Pneumonia. In our study majority of them were admitted in the severe Pneumonia stage followed by Very severe Pneumonia as this condition require immediate hospital admission and treatment. These findings in our study were comparable to the study findings of Vinay Kumar and Maruthi et al [13], Ghimire P et al [14] and Bhat R Y et al [15] study findings .

In the present study the risk factors were compared between both the groups for the statistical association and it was found that that immunization Status , type of house Birth weight and Malnutrition status of the children were found to be statistically significant .

Broor S et al [16], 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.

In a case control study conducted by Hassan MK et [17] 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

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 [18].

Majority of the children who were diagnosed with lower respiratory tract infection were found to be having low birth weight when compared to control group and this association was found to be statistically significant which was found to be similar to the study findings of Vinaykumar and Maruti et al study. [13]

Conclusion :

This study has shown that the risk factors for ARI that have been identified—such as low birth weight,

inadequate immunisation, hunger, and type of housing—had statistically significant associations that may be changed. Simple tactics like proper diet, immunisation, avoiding pollutants, parent education, and environmental cleanliness can change these risk factors. In order to provide children with appropriate treatment and prevent more ARIs, carers should be properly counselled on the implications of these modifiable risk factors. It is advised that an extensive control programme with strong political will be implemented for ARIs.

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