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RISK FACTORS FOR ACUTE LOWER RESPIRATORY TRACT INFECTION IN 1-5 YEAR OLD CHILDREN- A CASE CONTROL STUDY

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ABSTRACT

Background: In children under five years old, acute lower respiratory tract infections are a leading cause of death. Finding the modifiable risk factors for severe ALRTI can significantly lessen the burden of ALRTI.

Aim: The purpose of the current study was to evaluate the risk factors for acute lower respiratory tract infections in children younger than five years old.

Methods: The World Health Organization's (WHO) case definition of ALRTI was used in this investigation. Participants in the research who visited the paediatric outpatient department for vaccinations and those who had an ALRTI acted as controls. The possible risk variables in cases and controls were recorded using a premade organised proforma.

Results: 256 pediatric subjects—101 cases and 155 control subjects—were evaluated for the current investigation. Significant risk factors for ALRTI were found to include a family history of the disease, improper immunisation age, cooking with non-LP gas, severe malnutrition, upper respiratory tract infections in siblings, and not nursing. ALRTI is not significantly influenced by the following non-risk factors: kind of housing, insufficient calorie intake, anaemia, number of children at home, parental age, education level, and gender of the child.

Conclusion: The current study comes to the following conclusions: severe malnutrition, upper respiratory tract infections in siblings, improper immunisation age, cooking on non-LPG media, family history of ALRTI, and not nursing were all important risk factors for ALRTI that needed to be watched out for.

Keywords: Breastfeeding, malnutrition, passive smoking, pneumonia, respiratory tract infection.

INTRODUCTION

Acute lower respiratory tract infections, or ALRTIs, account for the majority of deaths in paediatric children younger than five years old. It has been identified as the leading cause of mortality worldwide, with reports indicating a greater occurrence among patients from developing countries, particularly India.1. A literature review aimed at assessing the epidemiology of acute lower respiratory tract infections in developing countries identified several risk factors for the illness, including low birth weight, malnutrition, lack of breastfeeding, vitamin A deficiency, and passive smoking. These findings were further corroborated by additional research in the literature.2

Additional risk factors were added to the list of previously mentioned risk factors by the data from recent and current research. Such as poor socioeconomic level, air pollution, young age, crowding, advanced birth order, big family size, and non-allopathic treatment in the early stages of acute lower respiratory tract infection.3,4

Several recent literature reviews have demonstrated the significant impact of indoor air pollution as one of the main risk factors for acute lower respiratory tract infections in children. The risk factors that have been discussed may all be changed and improved. By altering these variables, the concerningly high incidence of acute lower respiratory tract infections that affect children worldwide might be further reduced.5, 6 In order to evaluate the risk factors for acute lower respiratory tract infection in paediatric individuals younger than five years old, the current study was conducted.

MATERIALS AND METHODS

In order to determine the risk factors for acute lower respiratory tract infections in paediatric individuals less than five years old, a prospective clinical investigation was conducted. Study participants came from the Institute's Department of Paediatrics. Prior to research participation, the parents of all participants provided their verbal and written informed permission.

Children with severe acute lower respiratory tract infections (ALRTIs) who were admitted to the Institute and did not have an underlying chronic illness were included in the trial. An acute respiratory tract infection was defined as the presence of a cough, with or without a fever, lasting less than two weeks. Lower chest in-drawing presence with a respiratory rate of >60/min, >50/min, and >40/min in babies under the age of 2, 3/12 months, and 13-60 months was considered severe ALRTI.

The research also included healthy children under the age of five who went to the outpatient department of paediatrics to get vaccinations as controls. Clinical review, including a thorough history taking and physical examination to evaluate several possible risk factors stated in a premade structured proforma, was conducted for both the control and the cases. The age of the parents was recorded in years completed, whereas the age of the child subjects was recorded in completed months. The years of education for both the mother and father were mentioned. If a parent could not read or write, they were considered illiterate. For the purpose of evaluation, the mother's age was classified as <25 or >25 years, the father's as <30 or >30 years, and the child's age as <1 or >1 year. When a kid receives all vaccine doses in accordance with the National Immunisation Schedule for his or her age, the vaccination history and schedule were recorded to determine if the child was fully immunised.7

The family members' smoking history as well as the specifics of the cooking fuel utilised were noticed and documented. Along with the family history of pneumonia or bronchitis in the research patients, the history of upper respiratory tract infections in the last two weeks in the father, mother, grandparents, and siblings was also evaluated and recorded. The parents of every research participant also took note of the information on the type of home, whether it was thatched or cemented.

All individuals' ages at the time of the supplemental feeding and nursing history introduction were also noted. Prior to the present sickness, the parents recalled what foods the youngster typically ate, which allowed us to estimate the child's calorie consumption. Additionally, when the colour of the creases in the palm matched the colour of the remaining palm, the kid participants' pallor was evaluated and classified as severe anaemia.8

Up until the age of two, the infantometer was used to measure the kid's length to the closest millimetre. After that, the child was forced to stand on a stadiometer in order to measure their height. A beam-style weighing scale was used to determine the child's weight, and the result was recorded to the closest 100 grammes. Age-independent measures, such as the weight ratio in kilogrammes multiplied by 100 and the measurement of height or length in cm2, were employed to determine the severity of malnutrition. A ratio of 0.14 was considered normal or mild malnutrition.9

The chi-square test and SPSS software version 21.0 (IBM Corp., Armonk, NY, USA) were used for the statistical analysis of the collected data. The statistics were presented as percentage, frequency, mean, and standard deviation. An acceptable p-value for statistical significance was <0.05.

RESULTS

The goal of this prospective clinical study was to evaluate the risk factors for acute lower respiratory tract infections in children ages five and younger. Children with severe acute lower respiratory tract infections (ALRTTIs) who had no underlying chronic diseases were included in the research. There were 155 controls and 101 children with ALRTI. In both the research participants and the controls, there were more men than women, and these differences were statistically significant (p=0.02). With p=0.25, the ages of the two groups were similar. With regard to the mother's and father's educational backgrounds, there was a statistically significant difference between the two groups (p=0.000). The mother's age was substantially higher in the ALRTI group (p=0.01) compared to the controls (p=0.13), whereas the father's age was similar. Compared to controls, subjects with ALRTI had a substantially greater number of children at home who were >=2 (p=0.002).

Subjects with ALRTI showed a significantly greater positive LRTI family history (p=0.000). Grandparents' ALRTI history was statistically non-significant (p=0.103), whereas positive histories in siblings demonstrated a strong connection with ALRTI (p=0.000). While there was no significant link between the father's URTI and ALRTI, the mother's URTI had a significant correlation (p=0.005) with ALRTI. Additionally, a p-value of 0.000 indicated a statistically significant connection between ALRTI and individuals whose immunisations were not finished by age (Table 1).

Upon evaluating the relationship between dietary parameters and ALRTI in research participants, it was shown that individuals with inadequate caloric intake had greater ALRTI than those with appropriate caloric intake (p=0.01). Additionally, there was a substantial increase in ALRTI (p=0.000) among participants who had severe malnutrition.

Table 2 summarises the considerably increased prevalence of ALRTI seen in participants using cooking fuel other than LPG (p=0.007). The study subjects' risk factors for ALRTI were determined to be: a family history of LRTI; inappropriate immunisation; severe malnutrition; no breastfeeding or for less than 4 months; URTI in siblings; mothers with URTI history; and use of cooking fuel other than LPG, with adjusted odds ratios of 5.13, 2.83, 1.83, 1.62, 24.05, 6.51, and 2.49 associated with each risk factor, respectively. The 95% confidence interval (CI) for each of the following values was 1.57-4.98, 1.12-2.98, 1.21-2.15, 7.6-74.2, 2.71-15.59, and 1.49-4.14, in that order. Table 4 displays the corresponding p-values as follows: 0.000, 0.000, 0.01, 0.001, 0.000, 0.000, and 0.000.

DISCUSSION

Children with severe acute lower respiratory tract infections (ALRTTIs) who had no underlying chronic diseases were included in the research. There were 155 controls and 101 children with ALRTI. Both research participants and controls had more men than women, with a statistically significant difference (p=0.02) between the sexes. With p=0.25, the ages of the two groups were similar. With regard to the mother's and father's educational backgrounds, there was a statistically significant difference between the two groups (p=0.000). The mother's age was substantially higher in the ALRTI group (p=0.01) compared to the controls (p=0.13), whereas the father's age was similar. Compared to controls, subjects with ALRTI had a substantially greater number of children at home who were >=2 (p=0.002).

Subjects with ALRTI showed a significantly greater positive LRTI family history (p=0.000). A positive history in siblings demonstrated a significant association to ALRTI with p=0.000, but the grandparents' ALRTI history was statistically non-significant at p=0.103. While there was no significant link between the father's URTI and ALRTI, the mother's URTI had a significant correlation (p=0.005) with ALRTI. Additionally, a p-value of 0.000 indicated a statistically significant connection between ALRTI and patients whose immunisations were not finished by age. These results were equivalent to those of studies conducted by Jackson S. et al. (10) in 2013 and Arun A. et al. (11) in 2014, in which the authors evaluated participants using demographic information similar to that of the current study.

After examining the relationship between dietary characteristics and ALRTI in research participants, it was discovered that, with p=0.01, ALRTI was greater in those with insufficient caloric intake than in those with sufficient caloric intake. Furthermore, those who had severe malnutrition had considerably greater ALRTI (p=0.000). The patients who did not breastfeed had a substantially higher ALRTI score of zero. Comparing participants with extreme pallor to controls, who had fewer subjects with pallor (p=0.000), the former group had a greater frequency of ALRTI. The association between dietary variables and ALRTI in the research participants was also seen in the study conducted by

Tazinya AA et al. (2018) and Schlaudekar EP et al. (2011), whose results were in line with the findings of the current study.

Grandparents' smoking was shown to have no discernible impact on research participants' ALRTI in the correlation analysis of environmental variables and ALRTI (p=0.07). The father and mother's smoking did not significantly affect the incidence of ALRTI (p=0.25 and 0.31, respectively), according to similar data. When comparing the number of participants with ALRTI between thatched and cemented dwelling types, thatched housing had a considerably greater number than cemented housing (p=0.001). Those who utilised cooking fuel other than LPG had a p-value of 0.007, which indicates a substantially increased prevalence of ALRTI. The findings of Banda B et al. (2015) and Zou S et al. (2021) were consistent with our results where a comparable correlation is being reported by the authors for ALRTI and environmental factors as reported in the results of this study.

The study results showed that concerning the risk factors for ALRTI in study subjects, With adjusted odds ratios of 5.13, 2.83, 1.83, 1.62, 24.05, 6.51, and 2.49, respectively, it was observed that the risk factors found associated with ALRTI were family history of LRTI, inappropriate immunisation, severe malnutrition, no breastfeeding or for less than 4 months, URTI in siblings, mothers with a history of URTI, and use of cooking fuel other than LPG. 2.98-8.80, 1.57-4.98, 1.12-2.98, 1.21-2.15, 7.6-74.2, 2.71-15.59, and 1.49-4.14 were the corresponding 95% CIs (confidence intervals).

These results were consistent with those of studies conducted by Cardoso AM et al. (16 in 2013) and Kerai S et al. (17 in 2019), in which the authors revealed risk variables comparable to those found in this investigation for ALRTI in participants under the age of five.

CONCLUSIONS

Within the bounds of its limitations, the current study concludes that severe malnutrition, upper respiratory tract infections in siblings, inappropriate immunisation age, cooking on non-LPG media, and lack of breastfeeding were significant risk factors for ALRTI that warrant surveillance. However, bigger sample sizes and longer monitoring periods are needed for future longitudinal investigations.

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TABLES

Variables	**ALRTI**				**OR**	**95% CI**	**p-value**
	Yes (n=101)	**%**	**No (n=155)**	**%**			
Gender							
Females	27	26.73	56	36.12	0.8	1.00-2.22	**0.02**
Males	74	73.26	99	63.87	1.49		
Age (months)							
<=12	63	62.37	104	67.09	0.79	0.54-1.15	0.25
>12	38	37.62	51	32.90	0.8		
Father's education							
Illiterate	18	17.82	9	5.80	3.53	1.92-6.51	**0.000**
=10 years	32	31.68	48	30.96	1.28	0.85-1.91	
>10 years	51	50.49	98	63.22	63.1		
Mother's education							
Illiterate	35	34.65	31	20	2.80	1.79-4.36	**0.000**
=10 years	31	30.69	38	24.51	1.90	1.22-2.94	
>10 years	35	34.65	86	55.48	0.8		
Father's age (years)							
<=30	68	67.32	96	61.93	1.29	0.88-1.89	0.13
>30	33	32.67	59	38.06	0.8		
Mother's age							
<=25	61	60.39	71	45.80	1.75	1.21-2.52	**0.01**

>25	40	39.60	84	54.19	0.8		
Children number							
<2	39	38.61	16	10.32	1.76	1.19-2.59	**0.002**
>=2	61	60.39	139	89.67	0.8		
Father URTI							
Yes	1	0.99	2	1.29	3.16	0.92-16.68	0.07
No	100	99	153	98.70	0.8		
Mother URTI							
Yes	18	17.82	4	2.58	7.30	3.42-15.55	**0.005**
No	83	82.17	151	97.41	0.8		
Immunization							
Completed by age	30	29.70	79	50.96	0.39	0.26-0.57	**0.000**
Incomplete by age	71	70.29	76	49.03	0.8		

Table 1: Relationship between demographic data and ALRTI in study subjects

Variables	ALRTI				p-value
	Yes (n=101)	Yes (%)	No (n=155)	No (%)	
Smoking (grandparents)					
Yes	1	0.99	4	2.58	0.07
No	100	99	151	97.41	
Smoking (Father)					
Yes	32	31.68	42	27.09	0.25
No	69	68.31	113	72.90	
Smoking (Mother)					
Yes	1	0.99	0	0	0.31
No	100	99	155	100	
Housing type					
Thatched	13	12.87	7	4.51	**0.001**
Cemented	88	87.12	148	95.48	
Fuel for cooking					
LPG	64	63.36	123	79.35	**0.007**
Other	37	36.63	32	20.64	

Table 2: Correlation of environmental factors and ALRTI in study subjects

Risk factors	OR (Odds ratio)	95% CI	p-value
Family LRTI history	5.13	2.98-8.80	**0.000**
Inappropriate immunization	2.83	1.57-4.98	**0.000**
Severe malnutrition	1.83	1.12-2.98	**0.01**
No/<4 months breastfeeding	1.62	1.21-2.15	**0.001**
URTI in siblings	24.05	7.6-74.2	**0.000**
Mother with URTI	6.51	2.71-15.59	**0.000**
Cooking fuel other than LPG	2.49	1.49-4.14	**0.000**

Table 3: Risk factors for ALRTI in study subjects