Study Of Risk Factors Associated With Acute Lower Respiratory Tract Infection In Children At Tertiary Care Centre (6 Months- 60 Months)

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Abstract: Background: Acute Lower Respiratory Tract Infection (LRTI) is the major cause of morbidity and mortality among children in developing countries. The present study is an attempt to understand the various risk factors associated with acute LRTI; using these observations strategies can be implemented to reduce the burden of the disease. Objectives (1) To determine association of risk factors like socio-demographic, environmental, Natal and Nutritional with acute LRTI (2) To categorize the studied risk factors as Definite, Probable and Possible factors. Material & Methodology: Study was conducted at tertiary care hospital over one year. Children of age between 6 months to 60 months admitted in pediatric wards with acute LRTI were included and those who had chronic illness were excluded. It is questioner based observational cross sectional study. Detailed history of exposure to various risk factors were taken on the basis of predesigned Proforma. Data was analyzed as per standard statistical method and significance was noted. Result: Total 241 children were enrolled and total 20 risk factors were studied; divided into socio demographic, environmental, perinatal and nutritional headings. We found exposure to biomass fuel, passive smoking, and lack of exclusive breastfeeding, LBW and malnutrition as definitive risk factor as their association with LRTI was significant ($p < 0.05$). We observed and categorized other factors into possible and probable category as per the occurrence. Conclusion: We have categorized the risk factors as: Definite, Possible and Probable. Since these risk factors are potentially preventable, health policies targeted at reducing their prevalence provide a basis for decreasing the burden of LRTI in children. [Shah B Natl J Integr Res Med, 2021; 12(2):06-11]

Key Words: Pneumonia, Malnutrition, Passive smoking

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Introduction Acute Lower Respiratory Tract Infections (LRTI) is the major cause of morbidity and mortality among children in developing countries, accounting for about 30% of mortality in children under 5 years of age[1,2,3].

Hospitalization for acute Lower Respiratory Infections in young children poses a substantial burden on health services, especially in developing countries. Pneumonia is the leading cause of morbidity and mortality in children younger than 5 years, 1.4–1.6 million young children die every year from this infection and up to 13% of roughly 155 million episodes are severe enough to warrant hospital admission.[4,5] The mortality burden is 1.9 million per year globally out of which India accounts for around 400,000 deaths per year. Etiology of Acute LRTI in developing countries is predominantly bacterial to non-bacterial in developed countries.

Moreover, there is also a variation in the incidence of acute LRTI in rural and urban areas among the developing countries. Certain risk factors like Socio demographic, Environmental, Perinatal, and Nutritional have been implicated in the causation of LRTI in children[6,7]. The present study is an attempt to understand the various risk factors associated with acute LRTI and its magnitude. Using these observations strategies can be implemented to reduce the burden of the disease and subsequent hospitalizations by improving the nutritional and immunization status of the community.

Aims And Objectives: To study association of various Socio-demographic, Environmental, Natal and Nutritional factors with Acute Lower respiratory tract infection (LRTI). To categorize the studied factors as Definite, Probable and Possible risk factors.

Material & Methods: Study Site: Tertiary care hospital. Study Type: Observational Cross-sectional study. Study Period: 2 years (Sep-2016 to Sep-2018).Inclusion Criteria: Children in the age group of 6 months to 60 months admitted in pediatric ward with acute Lower Respiratory Tract Infection (LRTI).

Exclusion Criteria: 1. Children < 6month and > 60 months. 2. Children with any underlying chronic illness.

Acute Lower respiratory tract Infection(LRTI) is defined as an acute onset of respiratory symptoms including cough, rhinorrhea, fast breathing, chest wall indrawing &wheeze of <14days duration1.

Informed consent was obtained from parents or legally accepted guardian. Patients were selected as per inclusion criteria and data was recorded on a pre- designed questionaries' based proforma and managed on excel spreadsheet. For statistical analysis, 'Graph pad' software was used, 'Chi square Test' and 'P- Value' were derived where applicable. Variables showing statistically significant association up to $p<0.05$ were considered as potential risk factors. All percentages were rounded to nearest 1st decimal place and so some values might not total to 100%.

Possible Ethical Issues Involved In Study: None.

Funding: Nil

Limitations: We used a questionnaire method to assess the risk factors. Hence some misclassification of the exposure may have occurred.

Results: We enrolled 241 children and 20 risk factors were observed. Socio-demographic factors included gender, age group, residential area, overcrowding, SES and seasonal occurrence.

Table 1: Socio-Demographical Factors

	Category	Number Of Patients	%
Gender	Boys	136	56.4%
	Girls	105	43.6%
Age	6-12 Months	74	30.7%
	13-36 Months	104	43.2%
	37-60 Months	63	23.1%
Residence	Urban	86	35.7%
	Rural	155	64.3%
Overcrowding	<3 Persons	117	48.5%
	3-5 Persons	118	48.9%
	>5 Persons	6	2.4%
SES	I Upper Middle	8	3.3%
	II Lower Middle	53	22%
	III Upper Lower	76	31.5%
	IV Lower	104	43.1%
Seasonal	Winter	146	60.6%
	Monsoon	90	36.9%
	Summer	5	2.5%

We found the toddler age group with maximum prevalence of acute LRTI as during this time period the children are gradually weaned from breast-milk and started on family food. It is this period where faulty feeding habits can be introduced by the parents which can hamper the health of the child and lead to subsequent development of acute LRTI. Ramani et al observed same result in their study.[8]

Residence has its own effect on acute lower respiratory tract infection. Children living in urban/urban slum area are more prone to suffer from adverse effect of overcrowding and improper air sanitation due to air pollution.

Higher prevalence of acute LRTI in rural area is mainly because of lack of availability of basic health services, lack of awareness, and other associated factors like low socio-economic status, absence of cross-ventilation, indoor air pollution like smoke of chullah etc. Ganesh Kumar et al in their study in urban and rural areas of Puducherry, India showed that Children from urban areas (63.7%) had higher prevalence of ARI compared with children living in rural areas (53.7%).[9]

Overcrowding: In our study, we observed relation of overcrowding with LRTI was not significant (P value 0.65). Odd ratio of patient living in >=3

person/room to <3 persons/room is 1.10. Ramani et al in their study found that odd ratio of 1.84 for relation of overcrowding with acute LRTI[8].

Seasonal: We found higher numbers of patients during winter season. We observed exposure to biomass fuel, passive smoking and kerosene lamp

Use of biomass fuels (woods, crop residues, animal dung), coal and other media (kerosene)are pre dominant contributors to indoor pollution. Environmental tobacco smoke is another air pollutant that reduces local defense mechanisms and predisposes children to invasive infection.[10]

Table 2: Environmental Factors

Indoor Air Pollution	Residence	Yes	P-Value
Biomass Fuel	Rural	35(34.3%)	0.01 (Significant)
	Urban	28(20.1%)	
Passive Smoking	Rural	22 (25.6%)	0.04 (Significant)
	Urban	59(38.1%)	
Kerosene Lamp	Rural	42(48.8%)	0.58 (Insignificant)
	Urban	70(45.2%)	

In Relation of residence with biomass fuel in patients of Acute LRTI we found that 63 out of 241 patients of acute LRTI had history of exposure of biomass fuel. Difference in exposure to biomass fuel among rural and urban patients was statistically significant ($p<0.05$). It means higher percentage of patients (55.5%) in rural area developed acute LRTI who were exposed to biomass fuel as compared to urban area.

Odd ratio of exposure to non-exposure of bio mass fuel is 7.58. In urban area 44.4% patients were exposed to biomass fuel and in rural area 55.6% patients were exposed to biomass fuel.

Ramani et al showed that there is significant association between ARI and usage of firewood as fuel odd ratio of 3.29. An article published in National Family Health Survey Bulletin by Mishra V et al stated that a large national household survey in India found a statistically significant relationship (OR 1.3) between reported use of household biomass fuel and reported incidence of respiratory infection in the previous week among children under five years.[11]

Higher prevalence of passive smoking in urban area clearly demonstrates effect of urbanization. Pembe et al in their study, observed that the rates of passive smoking were 76.7% and 50.7%,

respectively ($p = 0.000$ which is statistically significant).[12]

Analysis of exposure to kerosene lamps, another variable as indicator of indoor air pollution showed that in urban area 62.5% patients were exposed to kerosene lamps, while in rural area 37.5% patients were exposed to kerosene lamps. The difference was not statistically significant. Ramani et al in their study showed that incidence of ARI has equivocal association with exposure to kerosene lamp. Perinatal factors like birth spacing, preterm birth, low birth weight, meconium aspiration syndrome (MAS) were observed for association with LRTI.

Table 3: Natal Risk Factor Assessment Among Patients Of LRTI (N=241)

Risk Factors	YES	%	NO	%
Preterm	72	29.9	169	70.1
Low Birth Weight	101	41.9	140	58.1
Meconium Aspiration Syndrome	87	36.1	154	63.9
Birth Spacing Not Followed	121	50.2	120	49.7

Table 3 above shows observed natal risk factors for acute lower respiratory tract infection. We noted 72 babies were preterm, 101 babies were LBW and 87 were having MAS. It is evident from above table that low birth weight (41.9%) is one of the major risk factors for development of acute lower respiratory tract infection. This finding is also statistically significant ($p<0.05$).

Table 4: Nutritional Factors Among Patients Of Acute LRTI (N=241)

Nutritional Factor	No.	%
Prelacteal Feeds	154	63.9
Lack Of Exclusive Breastfeeding	115	47.7
Bottle Feeding	101	41.9
Anemia	111	46.1
Rickets	49	20.3
Malnutrition	60	25

Nutritional Factors: We have studied factors like prelacteal feeds, lack of exclusive breastfeeding, bottle feeding, anemia, malnutrition, rickets have been implicated in the causation of LRTI.

Out of 241 patients, total 60 patients (25%) were suffering from various grade of malnutrition and from our study the relation of malnutrition with acute LRTI is found to be statistically Significant ($p<0.05$). Higher percentage (32%) of malnutrition was observed in age group of 13 months to 36 months. In Ramani et al in their study 53.85 % patients were having grade IV malnutrition and 26.67% were having grade V malnutrition. Ramesh Bhat Yellanthoor et al in their study they found that severe malnutrition in 54.9% patients of acute LRTI patients however in our study 25% patients of acute LRTI presented with malnutrition[13].

In this study relation of malnutrition with different sex in patients of Acute LRTI shows 23.53% malnutrition among males and 18.09% malnutrition among female in patients of acute lower respiratory tract infection. However, this difference is not statistically significant which suggests that there is no correlation of the sex and malnutrition in patients of acute LRTI.

In relation of immunization among patients of LRTI with father and mother's education we found; out of 241 patients, 104 patients had completed immunization and 137 patients were having incomplete immunization whose mother were either uneducated or had education level up to basic school only. We observed that relation of mothers' education with immunization status among acute LRTI patients was not found to be statistically significant. This may be due to high coverage of immunization services due to government programs and active role of ASHA workers who ensure the administration of vaccines at door to door.

Table 5: Relation Of Mother's Education With Malnutrition In Patients Of Acute LRTI

Mother's Education	Malnutrition Among LRTI Patients				
	Yes	%	No	%	Total
High school	03	25.0	09	75.0	12
Basic school	34	27.2	91	72.8	125
Uneducated	14	13.5	90	86.5	104
Total	51	21.2	190	78.8	241
$\chi 2$ =6.53, df=2, p value=0.03(significant)					

It is evident from above table that 13.5% acute LRTI patients whose mother were uneducated and 27.2% of patients whose mothers were education up to basic school have malnutrition and this study was statistically significant ($p<0.05$). This shows that lack of maternal education is significantly associated with malnutrition in patients of acute LRTI. Among patients who had malnutrition, 40.7% mothers of them were either uneducated or educated up to basic school level only. While Ramani et al in their study at Urban Slums of Gulbarga City showed that incidence of ARI has equivocal association with mother's education. Education of woman of any country is of utmost importance as mothers are primary health care provider in family.

Table 6: Classification Of Factors In To Definite, Probable And Possible Risk Factors In Patients Of Acute LRTI (N=241)

Class Of Risk Factor	Risk Factor	No. Of Patients Observed	%
Definite ($p<0.05$)	Lack Of Exclusive Breast Feeding	115	47.7
	Exposure To Biomass Fuel	63	26.1
	Presence Of Malnutrition	60	24.9
	Passive Smoking	81	33.6
	Low Birth Weight	101	41.9
Possible (Occurrence: 40% To 70%)	Pre-Lacteal Feed Given	154	63.9
	Incomplete Immunization	137	56.8
	No Birth Spacing	121	50.2
	Exposure To Kerosene Lamps	112	46.5

	Presence Of Anaemia	111	46.1
	Bottle Feed Given	101	41.9
Probable (Occurrence <40%)	H/O Meconium Aspiration Syndrome	87	36.1
	Preterm Delivery	72	29.9
	Presence Of Rickets	49	20.3

As per our study Table 6 shows that absence of Predominant breast feeding, Exposure to biomass fuel, Presence of malnutrition and Passive smoking are Definite risk factors as its association with acute LRTI is found statistically significant ($p<0.05$). Moreover, Pre-lacteal feeds, incomplete immunization, lack of birth spacing, exposure to kerosene lamps, anaemia, and Bottle feeding are among the Possible risk factors with Prevalence of 40-70% and history of Meconium Aspiration, Preterm Delivery and Rickets are amongst the Probable risk factors with Prevalence of <40%.

S Ganeshkumar et al in their study have noted that in developing countries, children who are exclusive breast fed for 6 months had 30%-42% lower incidence of ARI compared to children who did not received the same duration of breast feeding12. Kabra e al in their study showed that lack of breastfeeding (OR: 1.64; 95% CI: 1.23–2.17); severe malnutrition (OR: 1.85; 95% CI: 1.14–3.0); cooking fuel other than liquid petroleum gas (OR: 2.5; 95% CI: 1.51–4.16); inappropriate immunization for age (OR: 2.85; 95% CI 1.59–5.0) were the significant contributors of ALRTI in children under five years.[10]

Conclusion: We studied and categorized various risk factors as: Definite, Possible and Probable. We conclude that indoor air pollution, passive smoking, nutritional factors (lack of breast feeding, malnutrition, low birth weight) are major modifiable risk factors for ALRTI. We strongly believe that the Education of woman of any country is of utmost importance as mothers are primary health care provider in family.

Moreover, we also found that despite lack of education immunization is adequate in many

areas which shows a positive impact of the government programs. Since these risk factors are potentially preventable, health policies targeted at reducing their prevalence provide a basis for decreasing the burden of acute LRTI in children. Community education should focus on specific issues such as proper birth spacing, proper antenatal care, institutional delivery, avoidance of giving prelacteals feeds, exclusive breastfeeding, identification of respiratory illness,

easy access to healthcare facility, proper immunization and nutrition of child and about reducing domestic air pollution.

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