

## Original Research Article

# A cross sectional study on risk factors associated with acute lower respiratory tract infection among children aged 6 to 60 months

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## ABSTRACT

**Background:** Acute lower respiratory tract infection (ALRI) is leading cause of hospitalization and mortality among children under 5 years age in developing societies. Risk factors such as socioeconomic status, overcrowding, parental education, passive smoking, exposure to biomass fuels, kerosene lamps etc should also be considered in possible etiology of ALRI. Knowledge of risk factors would help prevention through proper health education efforts and other interventional community development initiatives. The objective of the study was to study various socio-demographic and nutritional risk factors associated with acute lower respiratory tract infection among 6 to 60 months aged children

**Methods:** This cross-sectional study was conducted in a tertiary care institute Gujarat state of India. All the children in the age group of 6 months to 60 months admitted in paediatrics ward with ALRI were included in study. Data collection was done using a pretested questionnaire including socio-demographic factors. Data was analyzed using Statistical package for social sciences (SPSS) and excel and  $p < 0.05$  was considered as statistically significant.

**Results:** Higher percentage (32%) of malnutrition was observed in age group of 13 months to 36 months ( $p < 0.05$ ). Lack of maternal education is significantly associated with malnutrition in patients of acute lower respiratory tract infection (LRTI) ( $p < 0.05$ ). Passive smoking was found among 38.1% of ALRI patients in urban area while it was among 25.6% of patients in rural patients ( $p < 0.05$ ). Difference in exposure to biomass fuel among rural and urban patients is statistically significant ( $p < 0.05$ ). Giving pre-lacteal feeding (63.9%), incomplete immunization (56.8%), no birth spacing (50.2%), no predominant breast feeding (47.7%) are some of the leading causes of acute LRTI.

**Conclusion:** Socio-demographic factors and malnutrition impact ALRI among 6 to 60 months age group of children according to place of residence.

**Keywords:** Acute lower respiratory tract infection, Socio-demographic factors, Malnutrition

## INTRODUCTION

Acute lower respiratory tract infection (ALRI) is leading cause of hospitalization and mortality among children under 5 year age in developing societies.<sup>1</sup> Lower respiratory infections caused 652, 572 deaths in children younger than 5 years worldwide in 2016.<sup>2</sup> Particularly, acute tract respiratory infection (ALRI) in the form of pneumonia is recognized as the single largest cause of childhood death globally accounting for 16% of the overall

deaths in 2015.<sup>3</sup> The incidence of ALRI is high in developed world as well but more severe forms of disease and mortality is disproportionately high among developing countries.<sup>4</sup> Variety of factors as, low birth weight, time of initiation of breast feeding, weaning with complementary food, immunization status etc are shown to impact the ALRI risk in children under 5 year age. Apart from these various socio-demographic risk factors such as socioeconomic status, overcrowding, parental education, passive smoking, exposure to biomass fuels, kerosene

lamps etc. should also be considered in possible etiology of ALRI. Knowledge of risk factors would help prevention through proper health education efforts and other interventional community development initiatives. Generation of local evidence base should guide steps to keep check on risk determinants to empower management by avoiding severe form of disease and improve outcome in victims. The present study is an attempt to understand the various risk factors associated with acute LRTI and its magnitude in the community. Using these information strategies can be implemented to reduce the burden of the disease and subsequent hospitalizations.

**METHODS**

**Study area and duration**

This cross-sectional study was conducted between April to December 2018 at NHL Medical College and VS Hospital, a tertiary care institute of Ahmedabad city of Gujarat state of India.

**Inclusion criteria**

The inclusion criteria for the study was- children in the age group of 6 months to 60 months admitted in pediatrics ward with acute lower respiratory tract infection (LRTI).

**Exclusion criteria**

The exclusion criteria for the study was as follows: children <6 months and >60 months and children with any underlying chronic illness.

**Sample size**

All the children meeting inclusion criteria with parents giving valid consent were included in the study.

**Study tool**

Data collection was done using a pretested, semi structured questionnaire, designed for the study purpose. The questionnaire elicited information about socio-demographic profile, housing conditions, cooking fuel used, parental smoking, immunization status, breast feeding, and nutritional status. Socioeconomic classification is done on the basis of modified BG Prasad's classification revised according to All india consumer price index for the year 2017-18.

**Data analysis**

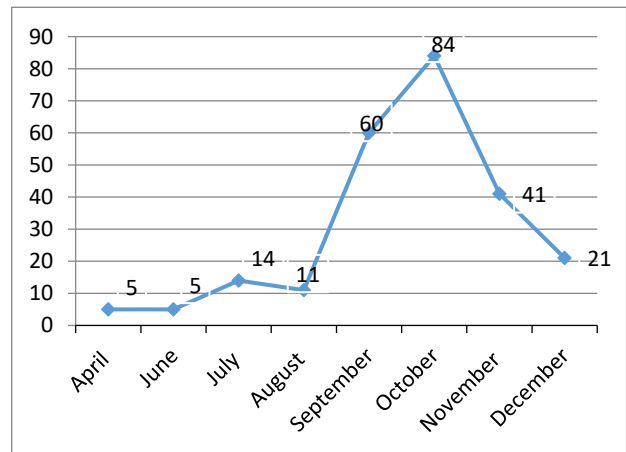
The data was analyzed using Statistical package for social sciences (SPSS) trial version and Microsoft excel 2013. Descriptive statistics were performed for various variables. The chi-square test for association was used and  $p < 0.05$  was considered as statistically significant.

**RESULTS**

Most common age group (43.2%) of patients in our study is 13 months to 36 months i.e. toddler age group. Gender wise distribution shows that 56.5% patients are male while 43.6% patients are female. Majority of patients i.e. 57.7% were residing in rural area (Table 1).

**Table 1: Demographic characteristics of participants (n=241).**

Demographic characteristics	No. of patients	%	
Age groups (in months)	6 to ≤12	74	30.7
	13 to ≤36	104	43.2
	37 to ≤60	63	26.1
Gender	Male	136	56.4
	Female	105	43.6
Place of residence	Urban	102	42.3
	Rural	139	57.7



**Figure 1: Month wise distribution of cases.**

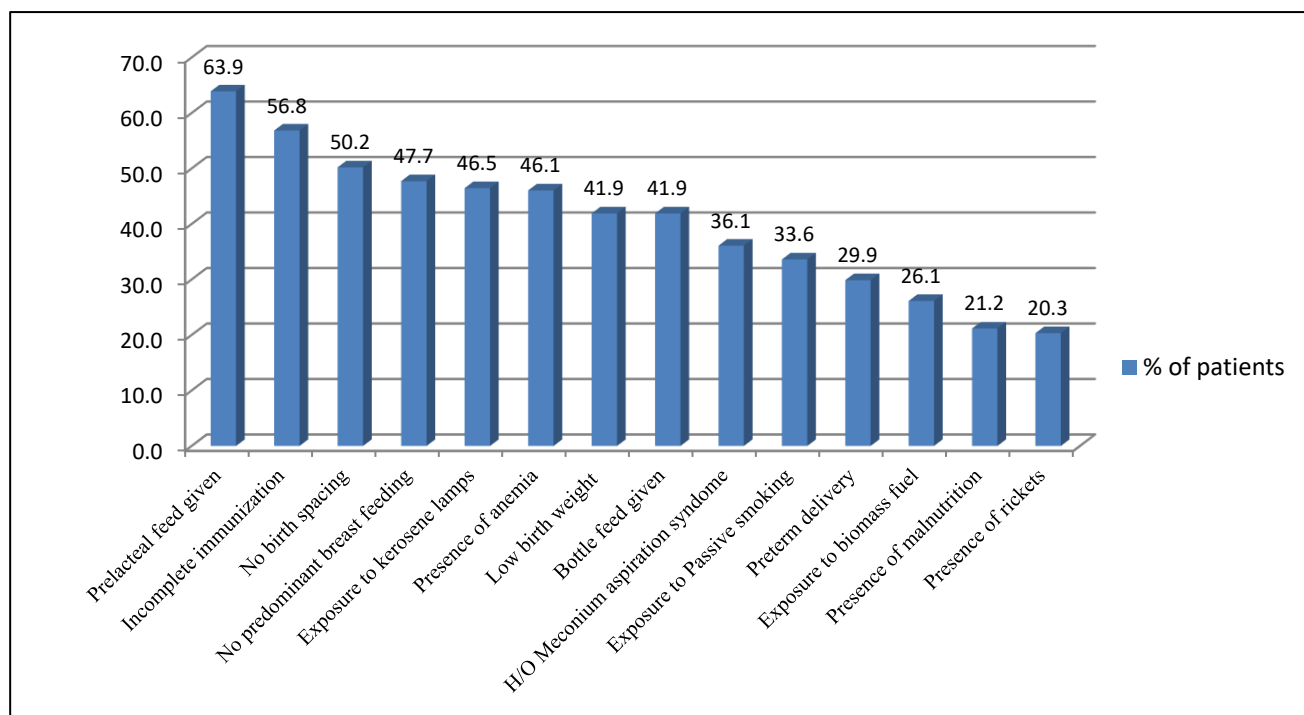
Relation of malnutrition with lower respiratory tract infection among different age group was found statistically significant ( $p < 0.05$ ). Higher percentage (32%) of malnutrition was observed in age group of 13 months to 36 months. While sex wise analysis shows that there is 23.53% prevalence of malnutrition among males and 18.09% prevalence of malnutrition among female in patients of ALRI. However, this difference is not statistically significant which suggests that there is no correlation of the sex and malnutrition in patients of acute LRTI. Analysis also shows that 13.5% of acute LRTI patients whose mothers were uneducated and 27.2% of patients whose mothers had education up to basic school have malnutrition. Both of them account for 40.7% cases of malnutrition. And this difference was statistically significant ( $p < 0.05$ ). It is also evident that 27 out of 51 (52.9%) acute LRTI patients had their father's education up to basic level or uneducated. This shows that lack of maternal education is significantly associated with malnutrition in patients of acute LRTI (Table 2).

**Table 2: Relation of malnutrition with demographic variables among ALRI patients (n=241).**

Risk factor	Category	Malnutrition in LRTI patients			Test statistics
		Yes (%)	No (%)	Total	
Age group (months)	6 ≤12	15 (20)	59 (80)	74	$\chi^2=6.09$ , df=2, p=0.04
	13 to ≤36	34 (32)	70 (68)	104	
	37 ≤60	11 (17)	52 (83)	63	
Gender	Male	32 (23.53)	104 (76.5)	136	$\chi^2=1.049$ , df=1, p=0.3
	Female	19 (18.09)	86 (81.9)	105	
Mother's education	High school	03 (25)	09 (75)	12	$\chi^2=6.53$ , df=2, p=0.03
	Basic school	34 (27.2)	91 (72.8)	125	
	Uneducated	14 (13.5)	90 (86.5)	104	
Father's education	Graduate	01 (25)	03 (75)	04	$\chi^2=1.75$ , df=2, p=0.62
	High school	23 (24.7)	70 (75.3)	93	
	Basic school	16 (21.1)	60 (78.9)	76	
	Uneducated	11 (16.2)	57 (83.8)	68	

**Table 3: Relation of risk factors with place of residence among ALRI patients (N=241).**

Risk factor	Category	Place of residence			Test statistics
		Urban (%)	Rural (%)	Total	
Overcrowding (persons/room)	<3	78 (66.7)	39 (33.3)	117	$\chi^2=0.84$ , df=2, p=0.65
	3 to 5	73 (63.5)	42(36.5)	115	
	>5	03 (50)	03 (50)	6	
Exposure to passive smoking	Yes	59 (72.8)	22 (27.2)	81	$\chi^2=3.86$ , df=1, p=0.04
	No	96 (60)	64 (40)	160	
Exposure to biomass fuel	Yes	28 (44.4)	35 (55.6)	63	$\chi^2=3.86$ , df=1, p=0.04
	No	111 (64.4)	67 (37.6)	178	
Exposure to kerosene lamps	Yes	70 (62.5)	42 (37.5)	112	$\chi^2=0.3$ , df=1, p=0.58
	No	85 (65.9)	44 (34.1)	129	



**Figure 2: Association of risk factors with acute LRTI (n=241).**

Passive smoking was found among 38.1% acute LRTI patients of urban area while it was 25.6% in rural patients. This difference is also statistically significant ( $p < 0.05$ ). Higher prevalence of passive smoking in urban area clearly demonstrates the effect of urbanization. Further, 63 out of 241 patients of acute LRTI had history of exposure to biomass fuel. Difference in exposure to biomass fuel among rural and urban patients is 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 biomass fuel is 7.58. Analysis also shows that 112 out of 241 i.e. 46.47% patients with LRTI had history of exposure to kerosene lamps. However, difference in exposure among urban and rural patients was not statistically significant ( $p = 0.58$ ). (Table 3) Number of cases of acute LRTI rises after August; reaches peak between October and November and decrease thereafter. (Figure 1) Giving Pre-lacteal feeding (63.9%), incomplete immunization (56.8%), no birth spacing (50.2%), no predominant breast feeding (47.7%) are some of the leading causes of acute LRTI (Figure 2).

## DISCUSSION

Our study has examined various risk factors related to ALRI in target age group of children. In the age group of 1 to 3 years, the prevalence of acute LRTI is maximum 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 in their similar study carried out in Karnataka found presence of acute respiratory tract infection in 37.84% children among age group of 2 to 3 years.<sup>5</sup> In a similar study carried out by Munagala et al in a tertiary care hospital of Andhra Pradesh, authors found presence of acute lower respiratory tract infection in 46.67% children among age group of 1 to 4 years which is near to our study results.<sup>6</sup> Greenbaum et al in their study of Hospitalizations for severe lower respiratory tract infections in Atlanta, Georgia found 50.7% hospitalization due to lower respiratory tract infections among age group of 1 to 4 years.<sup>7</sup>

Our study shows that there is not much preponderance on the basis of gender in the development of acute LRTI. In a study of hospitalizations for severe lower respiratory tract infections in Atlanta, Georgia by Greenbaum et al, there were 56.6% males and 43.3% were females who had non severe LRTI which is very much similar to findings in our study.<sup>7</sup> Dagvadorj et al in a study of hospitalization risk factors for children's LRTI carried out in Mongolia found that 52.2% were male and 47.8% were female patients of acute LRTI. This finding is similar to our study.<sup>8</sup>

Residence has its own effect on acute LRTI. 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. However, children of rural area are also affected by lack of sanitation, indoor air pollution by smoke of "chullah". Ganeshkumar 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%).<sup>9</sup> While Prajapati et al in their study of Ahmedabad district showed that prevalence of ARI was lower in urban area (17.2%) as compare to rural area (26.8%) (Combine is 22%).<sup>10</sup> In rural area, it is more because of lack of availability of basic health services, lack of awareness, and other associated factors like overcrowding, low socio-economic status, absence of cross ventilation, indoor air pollution are responsible factors.<sup>10</sup>

Higher percentage (32%) of malnutrition was observed in age group of 1 to 3 years in our study. Yellanthoor et al in their study found that severe malnutrition was present in 54.9% patients of acute LRTI patients of under 5 age group.<sup>11</sup> This difference may be due to regional variation of prevalence of malnutrition. In the study carried out by Victora et al, a strong and consistent association has been demonstrated between malnutrition and mortality from respiratory infections; further, malnutrition is considered to be a more important risk factor for pneumonia.<sup>12</sup> We didn't find any difference in malnutrition between both sexes of children with ALRI. Similarly, Yellanthoor et al in their study found that 54.2% malnutrition among male and 55.7% malnutrition among female patients of acute LRTI.<sup>11</sup> So they also didn't observed difference in prevalence of malnutrition among both the sexes of acute LRTI patients.

Higher prevalence of passive smoking in urban area in our study clearly demonstrates the effect of urbanization. Pembe et al in their study, observed that the rates of passive smoking were 76.7% and 50.7%, respectively in urban and rural area ( $p < 0.01$ ).<sup>13</sup> Lux showed that, maternal smoking during pregnancy caused the development of LRTI in children between 18-30 months of age.<sup>14</sup>

We found that higher percentage of patients (55.5%) living 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 biomass fuel is 7.58. Ramani et al showed odd ratio of 3.29 (CI=2.08-5.19) for fire wood fuel exposure among patients of acute LRTI.<sup>1</sup> A study by Smith showed that Indoor air pollution from solid fuel use is a confirmed risk factor for ALRIs, especially in children, in developing countries.<sup>15</sup> An article published in National family health survey (NFHS) bulletin by Mishra et al stated that a large national household survey in India found a statistically significant relationship (Odds ratio (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.<sup>16</sup> We didn't find any difference in exposure to kerosene lamp among urban and rural patients of ALRI. Ramani et al in their study showed that incidence of ARI has equivocal



association with exposure to kerosene lamp.<sup>5</sup> A recent estimate of the global disease burden of HAP suggests that, household solid fuel use causes 4,55,000 ALRI deaths every year. There is loss of 3,91,00,000 Disability-adjusted life-years (DALY) due to ALRI.<sup>17</sup>

Our study demonstrated that 95.62% acute LRTI patient had incomplete immunization whose mother were either uneducated or had education level up to basic school only. Kumar et al in their study in urban and rural areas of Puducherry showed that low maternal education is significantly associated with acute LRTI.<sup>9</sup> Nath et al in their study reported that low level of mother's education was associated with poor coverage of Diphtheria, tetanus and pertussis (DPT) and measles vaccination.<sup>18</sup> Vikram et al in their study showed that immunization rates rose sharply with mother's education through upper primary education with each higher level of mother's education, children were more likely to be completely immunized.<sup>19</sup> 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.<sup>5</sup> Due to widespread immunization programs by the government and appointment of Accredited social health activist (ASHA) workers a large number of below educated or uneducated mothers have also completely vaccinated their children. In seasonal analysis carried out by Sneha et al in their study observed two peaks with the more prominent peak falling in the month of February which coincided with spring season. The lesser peak was seen in November, coinciding with autumn season.<sup>20</sup>

#### **Strengths and limitations of the study**

The strength of this study is that the sample size was 241 which can be considered as adequate. However, we didn't considered control in our study which was the limitation of our study and simultaneously it is the future scope which may derive more reliable results.

#### **CONCLUSION**

Socio-demographic factors and malnutrition impact ALRI among 6 to 60 months age group of children according to place of residence. Giving pre-lacteal feeding (63.9%), incomplete immunization (56.8%), no birth spacing (50.2%), no predominant breast feeding (47.7%) are some of the leading causes of acute LRTI.

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