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Risk factors associated with acute respiratory tract infection in children among one month to 5 years

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Abstract
Background: Acute respiratory tract infections are among the major cause of morbidity and mortality among children developing countries accounting for 40% of mortality in children fewer than 5 years of age.
Objectives: To find out the risk factors associated with acute respiratory tract infection in children between 1 month to 5 years.
Methodology: An observational study was conducted was conducted in G.G. Hospital , Jamnagar over a period of 12 months. Institutional ethical clearance taken. After written consent taken from parents, total 150 patients taken in the age group 1 month to 5 years of acute respiratory tract infections as per inclusion and exclusion criteria. Detailed history, anthropometry and physical examination carried out. Assessment of various risk factors done.
Results: Most of the parents of patients of ARI were having lower education. Presence of anemia, absence of predominant breast feeding, Exposure to biomass fuel, preterm delivery, low birth weight are predominant risk factors as its association with ARI is found statistically significant. Bottle feeding, prelacteal feeds, no birth spacing and exposure to kerosene lamps are amongst the probable risk factors
Conclusion: Lack of predominant breast feeding, anemia, malnutrition, passive smoking, exposure to biomass fuel, preterm delivery, low birth weight and meconium aspiration syndrome definite risk factors of ARI, with incomplete immunization and faulty feeding practices also plays a major role in causation of ARI in children.

Keywords: acute respiratory tract infection, breast feeding, children, malnutrition

Introduction

Acute respiratory infection (ARI) is manifested by cough accompanied by short rapid breathing which may be associated with death especially when there are other comorbidities [1], even though a significant decline has been achieved over the past two decades [2]. Acute respiratory tract infection are among the major cause of morbidity and mortality among children in developing countries, accounting for about 40% of mortality in children under 5 years of age. Hospitalization for acute respiratory infection in young children poses a substantial burden on health services, especially in developing countries. Mortality due to ARI is significantly varied across regions [3]. In 2010, global burden disease reported that more than 12 million children with severe ARI were admitted to hospitals every year worldwide [4]. ARI accounts for up to 50% of visits of children to health facilities globally [5]. According to WHO, Acute RTI is leading cause of under 5 childhood morbidity in the world with nearly 160 million episodes each year of which India accounts for a bulk of 45 million. The mortality burden is 2.1 million per year globally out of which India account for around 400,000 deaths per year. Acute respiratory tract infection is defined as an acute onset of respiratory symptoms including cough, rhinorrhea, fast breathing, chest wallin drawing & wheeze of <14 days duration [6, 7].

Etiology of acute RTI in developing countries is predominantly bacterial to non-bacterial in developed countries. Moreover, there is also a variation in the incidence of acute RTI in rural and urban areas among the developing countries. Various risk factors like socioeconomic, natal, environmental etc. play major role in incidence of acute respiratory tract infections. Early detection and treatment help in better prognosis. Proper Education of society and well directed health programs helps in prevention of many respiratory tract infections [8, 9, 10].

Several factors predispose children under five years of age for ARIs. These factors may be attributed to child factors such as age and female sex, maternal factors such as lower age],

unemployment and lower educational status environmental-related factors such as urban residence, rural residence, wet season and co-morbid diseases [11-17].

At present commonest cause of childhood mortality is acute respiratory tract infection like pneumonia and others. In resource limited countries like India, the databases for acute respiratory infection are poor and epidemiological information regarding their magnitude in community is limited. The present study is an attempt to understand the various risk factors associated with acute RTI and its magnitude in the community. Using these information strategies can be implemented to reduce the burden of the disease and subsequent hospitalization by improving the natal, sociodemographic, nutritional and immunization status of the community. Most of the factors causing RTI are preventable and treatable for childhood survival.

Present study was done with an aim to find out the risk factors associated with acute respiratory tract infection (RTI) in children (1 month – 5 years).

Following are study Objectives

- To study various socio-demographic, environmental, natal and nutritional risk factors, their association with acute respiratory tract infection RTI.
- To categorize the studied risk factors as definite, probable, and possible according to their association with acute RTI.
- To find out the association of risk factors with outcome of disease.

Material and Methods

An observational study was conducted in the Department of Paediatrics, Medical College and G.G. Hospital, Jamnagar over a period of 12 months. Institutional Ethical Clearance taken. After consent as format attached, total number of 150 patients in the age group,1 month to 5 years of respiratory tract infection are included in this study who will present with various upper and lower respiratory tract symptoms. Detailed history of the illness and examination was conducted according to a questionnaire prepared for the purpose of study. The children who met criteria are included in the study. Assessment of the risk factors was done in paediatric wards.

Inclusion criteria

Patients in age group 1 month to 5 years having respiratory tract symptoms.

Exclusion criteria

- Less than 1 month and more than 5 years of age.
- Parents/guardians not willing to enrol the child.
- Respiratory distress due to other proven causes like metabolic, CNS etc…

After stabilization of patients admitted to pediatric emergency, a standardized history including symptoms, past history, family and immunization history with demographic data recorded. Respiratory rate was counted by observation and auscultation method for whole 1 minute. Central cyanosis was recorded if there was bluish discoloration of tongue and buccal mucosa. In addition to recording vitals, SPo2 recording was done in all patients. Oxygen saturation (spo2) was measured at finger or toe with a pulse oximeter using an appropriately sized pediatric sensor. Routine blood counts, acute phase reactants, chest X-ray, Mantoux test were done at the time of admission. Only children with an infiltration, consistent with pneumonia were included. Blood culture was collected with proper aseptic and antiseptic precautions before starting antibiotic therapy. Pleural fluid examination was done in case of pleural effusion and empyema, necessary investigations according to the case like USG chest, CT scan were also done. Height (length for children less than 2 years of age), weight, mid arm circumference, head and chest circumference were measured on admission. Chest X – ray posterior – anterior view and ultrasonography were done.

Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results and Discussion

Table 1: Age wise distribution of patients

Age	No. of Patients	%
1 Month -12Months	68	45.3
12 Months to 3 Yrs.	58	38.6
3 Yrs. to 5 Yrs.	24	16

Table 1 show that most common age group (45.4%) of patients in our study is 1-12months i.e. infant age group. In this age group the prevalence of ARI is maximum as infants more than 6 months are gradually weaned from breast milk and started on family food. The odds of developing ARI were higher among children below 12 months of age as compared to those aged above 48 months. This was in line with a previous study.[18] Higher risk of ARI among lower age children might be due to less developed immunity [19].

Table 2: Sex Wise Distribution of Patients (N=150)

Gender	No. of patients	%
Male	87	58
Female	63	42

Table 2 shows 58% patients are male while 42% are female. It suggests possibility of less hospital visits and less helalth care attendance given by parents for females as seen due to social stigma. In a study of munagala *et al*. Andhrapradesh, they found that 65.33% were male and 34.67% were female patients among cases of acute LRTI. Degvadorj, A. *et al*. carried out in Mongolia found that 52.2% were male and 47.8% were female patient s of acute LRTI. This finding is similar to our study [20, 21].

Table 3: Relation of Parent's education with incidence of Acute RTI (N=150)

Education	Father'sNo.(%)	Mother's No.(%)	Total (%)
Higher Education	26(17)	12(8)	45(15)
Lower Education	124(83)	138(92)	255(85)

Table 3 shows that most of the parents of patients of ARI were having lower education (uneducated or educated up to basic school). Low education level of parents affects no. of factors like malnutrition, immunization, feeding practice

and sanitation. So it is associated with increased incidence of ARI. Children from rural setup were more prone to develop ARI in the current study which is in line with several earlier studies [22-24]. The probable justification for the greater ARI symptoms proportion for rural children may be due to lack of access to medical care, low socio-economic standards in rural regions and most risk factors for ARI prevail in rural setup.

Table 4: Relation of Immunization status in patients of ARI (N=150)

Gender	Immunization status in ARI Patients				
	Complete		Incomplete		Total
	NO.	%	NO.	%	
Male	50	33	37	25	87
Female	29	19	34	23	63
Total	79	53	71	47	150
X^2 =1.9, df=1, p value=0.16					

Table 4 shows out of 150, Total 79 (53%) of the patients are immunized, while 71 (47%) are incompletely immunized (Unimmunized and Partially immunized).Though this is statistically not significant but it affects the outcome of ARI.

Table 5: Relation of incidence of anemia in patients of acute RTI (N=150)

Sex	Anemia in ARI patients				
	Yes	%	No	%	Total
Male	42	48	45	52	87
Female	20	32	43	80	63
Total	62	41	88	59	150
χ^2= 4.1, df= 1 p value = 0.04					

Table 5 shows that 62 (41%) patients of ARI are having anemia, that is statistically significant (p value = 0.04). Anemia lowers immunity and decrease oxygen carrying capacity of Hemoglobin, worsening oxygen saturation and respiratory distress.

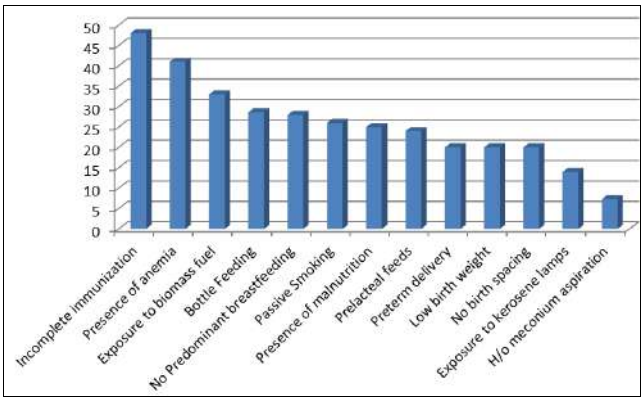
Table 6: Relation of risk factors on duration of stay in hospital among patients of ARI (N=150)

Risk Factors	Category	Distribution	Duration of stay				
			< 4 days		>5 days		P value
			No.	%	No.	%	
Sex	Male	87	52	60	35	40	0.04
	Female	63	27	43	36	57	
Residence	Rural	88	41	47	47	53	0.07
	Urban	62	38	63	24	37	
Socio- economic status	Upper Middle	19	8	42	11	58	0.6
	Lower Middle	48	24	50	24	50	
	Upper Lower	31	17	55	14	45	
	Lower	49	29	59	20	41	
Mother's education	Upper education	12	7	17	5	83	0.68
	Lower education	138	72	52	66	48	
Father's education	Upper education	26	14	54	12	46	0.002
	Lower education	124	65	52	59	48	
Passive smoking	Yes	39	24	62	15	38	0.19
	No	111	55	50	56	50	
Exposure to biomass fuel	Yes	45	27	60	18	40	0.2
	No	105	52	50	53	50	
Exposure to kerosene lamps	Yes	21	14	67	7	33	0.16
	No	129	65	50	64	50	
Birth spacing	Yes	120	64	53	56	47	0.7
	No	30	15	50	15	50	
Preterm	Yes	30	16	53	14	47	0.93
	No	120	63	53	57	47	
Low birth weight	Yes	30	17	57	13	43	0.6
	No	120	62	54	58	46	
Meconium aspiration	Yes	11	6	55	5	45	0.04
	No	139	73	53	66	47	
Pre- lacteal feeds	Given	36	19	53	17	47	0.03
	Not given	114	60	53	54	47	
Predominant breast feeding	Yes	108	65	60	43	40	0.003
	No	42	14	33	28	67	
Bottle Feeding	Yes	43	22	51	21	49	0.089
	No	107	57	53	50	47	
Malnutrition	Present	37	14	38	23	62	0.03
	Absent	113	65	58	48	42	
Immunization	Complete	79	49	62	30	51	0.01
	Incomplete	71	30	42	41	70	

Table 6 shows the outcome associated with various risk factors of ARI. From above table it is clearly seen that some common risk factors like malnutrition, incomplete immunization, lack of breast feeding, meconium aspiration syndrome are associated with longer duration of hospital stay of the patients of ARI and increase morbidity and mortality.

Presence of anemia, absence of predominant breast feeding, Exposure to biomass fuel, preterm delivery, low birth weight are predominant risk factors as its association with

ARI is found statistically significant. Bottle feeding, prelacteal feeds, no birth spacing and exposure to kerosene lamps are amongst the probable risk factors with prevalence of <40%. Selvaraj *et al*. [25] 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 feeding. Analysis of exposure to kerosene lamps , another variable as indicator of indoor air pollution showed that in urban area, total 8(13%) out of 62 patients were exposed to kerosene lamps. While in rural area, 13(25%) out of 88 patients were exposed to kerosene lamps. This difference was not statistically significant.



Graph 1: Association of risk factors with ARI in decreasing sequence. (N= 150)

Graph 1 show that percentage of patients exposed to different risk factors in decreasing order. Incomplete immunization, Presence of anemia, Exposure to biomass fuel, bottle feeding is some of the leading causes of ARI. Kabra e al in their study showed that lack of breastfeeding (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.

Conclusion

From this study, we have derived the association of acute ARI as

- Definite Risk Factors: anemia, Exposure to biomass fuel, lack of predominant breastfeeding, passive smoking,Presence of Malnutrition, preterm delivery, low birth weight and H/O meconium aspiration at birth.
- Possible Risk Factors: incomplete immunization.
- Probable Risk Factors: bottle feeding, Prelacteal feeding, no birth spacing and h/o exposure to kerosene lamps.

From this study we find that the education of parents is of utmost importance as mothers are primary health care provider in family. Since these risk factors are potentially preventable, health policies targeted at reducing their prevalence provide a basis for decreasing the burden of ARI in children.

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