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Original Research Article

Prevalence of acute respiratory infections among under five children in a rural area of Kozhikode district, Kerala

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ABSTRACT

Background: Although childhood acute respiratory infections (ARI) is a significant public health problem in India, robust epidemiological data on its prevalence is not available. This study was done to estimate the prevalence of ARI in under five children and study the factors responsible for the same in a rural area of Kozhikode District.
Methods: This cross sectional study was conducted in 386 under-5 children in Kunnamangalam panchayat of Kozhikode district from June 2015 to June 2016. Employing cluster sampling technique, data regarding socio demographic factors, prevalence of ARI and selected factors were collected using a pre tested semi structured questionnaire.
Results: The overall prevalence of ARI in children was 31.9 %. Prevalence was slightly higher in boys (32.7%) than in girls (31.1%). The prevalence of ARI was more in lower social class children (36.1%), compared to those from upper social class (26.3%). ARI was higher in children living in overcrowded houses (40.2%), poorly ventilated houses (37.8%), houses in which there were no smoke outlets (43.1%), houses having pets (58.6%). Underweight children were also found to have higher rates of ARI (46.5%). Binary logistic regression revealed that after adjusting for all other factors, age less than 1 year (OR 0.48, p=0.02) and nuclear family (OR 0.10, p=0.01) are significant independent protective factors for ARI.
Conclusions: Among under-5 children, younger age and membership in a nuclear family are significant protective factors for ARI.

Keywords: Acute respiratory infections, Risk factors, Nutrition, Overcrowding

INTRODUCTION

The world has made substantial gains in child survival over the past two decades. However, progress has been uneven both across and within countries. Today, fewer children less than 5 years of age are dying – 16,000 in 2015 every day compared with 35,000 in 1990. Most child deaths are caused by diseases that are readily preventable or treatable with proven, cost-effective and quality-delivered interventions. Infectious diseases and neonatal complications are responsible for the vast majority of under-five deaths globally. Despite this advancement, major preventable diseases continue to kill young children.[1]

Acute respiratory infections (ARI) in young children are responsible for an estimated 3.9 million deaths worldwide every year. About 90 percent of the ARI deaths are due to pneumonia which is usually bacterial in origin. While the incidence of pneumonia in developed countries may be as low as 3-4 per cent, its incidence in developing countries range between 20 to 30 percent. This difference is due to high prevalence of malnutrition, low birth weight and indoor air pollution in developing countries.[2]

It is estimated that at least 300 million episodes of ARI occur in India every year, out of which about 30 to 60 million are moderate to severe ARI. While every 6th child in the world is Indian, every 4th child who dies, comes from India.[3] Hospital records from states with high infant mortality rate show that up to 13% of inpatient deaths in pediatric wards are due to ARI. The proportion of death due to ARI in the community is much higher as many children die at home.[4]

Childhood ARI is thus an important public health problem in India and a multiple of social and environmental factors are linked with ARI morbidity and mortality. Studies in developing countries have identified poverty, overcrowding, low birth weight, poor housing conditions, passive smoking and lack of access to preventive (including immunization) and curative services as risk factors.[5]

ARIs are a major public health problem among children in Kerala. Even though Kerala accounts for only 2.7% of India's population, 17.5% of total cases of ARI reported in India during 2014 were from Kerala.[6] However, community based surveys for finding out the prevalence and various factors associated with ARI are very few.[5] Knowledge about factors related to ARI in children can contribute to interventions that can reduce the burden of disease. In view of the above, this study was conducted to estimate the prevalence of ARI and study selected factors among the under five children in a rural area of Kozhikode.

METHODS

This community based cross sectional study was conducted from June 2015 to June 2016 in Kunnamangalam panchayat of Kozhikode district, which has a population of 38,208. Considering a prevalence of 26.22, relative precision of 20% and design effect of 1.39, the final minimum sample size was calculated to be 375.[7,8]

Children from zero to 60 months age residing in the study area for the preceding 6 months in the study area were eligible for inclusion in this study. Those whose caregivers gave written informed consent were included. Eligible children who were unavailable on multiple occasions were excluded. Cluster sampling method was employed, with clusters being at the level of electoral wards. Of the 23 wards in the panchayat, 10 were selected by draw of lots. Cluster size was 40. Within each cluster, systematic random sampling was performed to identify study subjects. Where there were two or more eligible children in a single household, one was selected by draw of lots.

Information regarding ARI episode and certain associated factors like socio demographic factors, family details, birth details, immunization details, environmental factors, morbidity and treatment details were obtained using a pretested semi-structured questionnaire.

For the purpose of this study, ARI was defined as the presence of one or more of the following, with or without fever, in the two weeks preceding the study: cough, cold, running or blocked nose, sore throat, rapid breathing, noisy breathing, ear ache, ear discharge (in all children), stops feeding and or drinking for at least two hours (in children less than 2 months).[3] Overcrowding was assessed based on the per capita floor space area of the living room.[7]

The study protocol was approved by the Institutional Research Committee and Institutional Ethics Committee of Government Medical College, Kozhikode. Data were analyzed using SPSS statistical software version 18. The prevalence of under nutrition of children was assessed using z-scores with the help of WHO Anthro software[9] version 3.2.2, by calculating the weight/age (underweight) and height/ age (stunting) and weight/height (wasting).[9] ARI in the study population was measured in terms of prevalence. Bivariate analysis was performed to assess the factors associated with ARI.[10] Logistic regression analysis was used to determine the association of ARI with suspected risk factors.

RESULTS

A total of 386 subjects participated in the study, of which 196 (50.8%) were boys and 190 (49.2%) were girls. The mean age of study subjects was 31.9±15.7 months. The 3–4 years age group accounted for the largest proportion (23.8%) of study subjects (Table 1). Hindus constituted the majority 221 (57%), followed by Muslims 159(41%) and Christians 6(2%). According to modified Kuppuswamy socio economic scale, 163 (42.2%) families belonged to lower middle socio economic class, 142 (36.8%) to the upper middle class, 56(14.5%) to the upper lower class and 25 (6.5%) to the upper class families.[11]

Table 1: Age and gender distribution of the study population.

Age (in completed months)	Gender		Total (n=386)
	Male (n=196)	Female (n=190)	
	N (%)	N (%)	N (%)
0–11	29 (14.8)	29 (15.3)	58 (15.0)
12–23	36 (18.4)	37 (19.5)	73 (18.9)
24–35	41 (20.9)	38 (20.0)	79 (20.5)
36–47	49 (25.0)	43 (22.6)	92 (23.8)
48–60	41 (20.9)	43 (22.6)	84 (21.8)

Table 2: Factors associated with ARI among under-five children.

Variable	Level	ARI		Chi-square value	P value	OR (95% CI)
		Present N (%)	Absent N (%)			
Gender	Male	64 (32.7)	132 (67.3)	0.11	0.73	1.07 (0.70-1.65)
	Female	59 (31.1)	131 (68.9)			
Type of family	Nuclear	57 (27.4)	151 (72.6)	4.13	0.042*	64 (0.42-0.98)
	Others	66 (37.1)	112 (62.9)			
Socio economic status	Upper	44 (26.3)	123 (73.7)	4.12	0.04*	0.63 (0.41-0.98)
	Lower	79 (36.1)	140 (63.9)			
Occupation of mother	Working	11 (18.6)	48 (81.4)	5.60	0.018*	0.44 (0.22-0.88)
	Home maker	112 (34.3)	215 (65.7)			
Underweight	Yes	46 (46.5)	53 (53.5)	13.07	<0.001*	2.37 (1.47–3.80)
	No	77 (26.8)	210 (73.2)			
Stunting	Yes	44 (49.4)	45 (50.6)	16.45	<0.001*	2.70 (1.65–4.40)
	No	79 (26.6)	218 (73.4)			
Wasting	Yes	31 (42.5)	42 (57.5)	4.66	0.031*	1.77 (1.05-2.99)
	No	92 (29.4)	221 (70.6)			
Overcrowding	Yes	37 (40.2)	55 (59.8)	3.88	0.049*	1.63 (1.00-2.65)
	No	86 (29.3)	208 (70.7)			
Smoke outlet	Present	70 (26.6)	193 (73.4)	10.47	0.001*	0.47 (0.31-0.75)
	Absent	53 (43.1)	70 (56.9)			
Pets	Present	41 (58.6)	29 (41.4)	26.08	<0.001*	4.03 (2.36-6.91)
	Absent	82 (25.9)	234 (74.1)			
Ventilation	Present	61 (27.5)	161 (72.5)	4.63	0.031*	0.62 (0.40-0.96)
	Absent	62 (37.8)	102 (62.2)			
Cross ventilation	Present	70 (27.3)	186 (72.7)	7.15	0.007*	0.55 (0.35-0.85)
	Absent	53 (40.8)	77 (59.2)			
Vitamin A Supplementation (N=363)	Yes	88 (30.2)	203 (69.8)	4.30	0.038*	0.57 (0.34-0.97)
	No	31 (43.1)	41 (56.9)			
Smoking place (N=55)	Inside the house	20 (55.6)	16 (44.4)	6.02	0.014*	4.68 (1.30-16.93)
	Outside the house	4 (21.1)	15 (78.9)			

*P value less than 0.05 was considered as significant.

A larger proportion of children 208 (53.9%) belonged to nuclear families followed by 127 (32.9%) from three generation and the rest 51 (13.2%) from joint families. Parental education status was similar, with 48.6% of fathers and 50.3% of mothers having received a high school education. A large proportion 327 (84.7%) of mothers were home makers. Majority 330 (85.5%) of children were immunized for age. While 99 (25.6%) children were underweight, 89 (23.1%) were stunted and 73 (18.9%) were wasted.

Overcrowding was present in 92 (23.8%) households. Inadequate ventilation was noted in 164 children (42.5%) households; and an absence of cross-ventilation was noticed in 130 (33.7%). Of the 55 (14.2%) instances where a family member smoked tobacco, 36 (65.4%) study subjects reported smoking inside the house. Only 70 (18.1%) children had pets in their house. Although 368 (95.3%) children had a kitchen inside the house, smoke outlet was not present in the houses of 123 (33.4%) children. LPG (295 (76.5%)) and firewood (91(23.5%)) were the primary cooking fuels. Of the 176 children eligible to attend anganwadi/preschool, only 140 (79.5%) children were enrolled in anganwadi/preschool.

The prevalence of ARI in the study population was 31.9% (Figure 1). Male children had a slightly higher prevalence of acute respiratory infection 64(32.7%) compared to females 59 (31.1%). The two commonest symptoms were cold (78%) and cough (56.1%) respectively. Most often (39.8%), children presented with two symptoms of ARI. The Mean (SD) number of episodes of ARI in the preceding 6 months was 2.01 (1.07), while the mean (SD) duration of illness was 4.31 (2.37) days.

The significant socio demographic risk factors were higher age of children, families other than nuclear

families, lower socioeconomic status, mothers who were housewives, higher family size and higher number of siblings (Table 2 and 3).

The significant nutritional risk factors were underweight, stunting, wasting and not receiving Vitamin A supplementation (Table 2). The significant environmental risk factors were smoking by a family member inside the house, overcrowding, absence of smoke outlet, presence of pets, inadequate ventilation and cross ventilation (Table 2).

On logistic regression analysis, younger age group and nuclear family were found to be significant independent protective factors for ARI (Table 4).

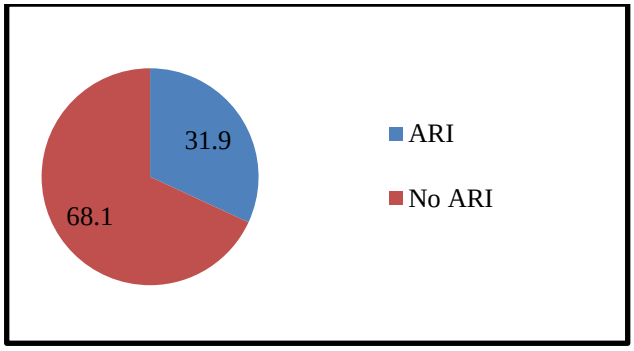

Figure 1: Prevalence of acute respiratory tract infections among under 5 children.

Table 3: ARI in relation to age in months, family size and number of siblings.

Variables	ARI		t test value	P value
	Present (Mean±SD)	Absent (Mean±SD)		
Age in months	36.22±14.19	29.93±15.99	3.72	<0.001*
Family size	5.28±1.95	4.71±1.63	3.03	0.003*
Number of siblings	0.90±0.72	0.70±0.71	2.52	0.012*

*P value less than 0.05 was considered as significant.

Table 4: Risk factors associated with ARI- multivariate analysis.

Variables	Level	Adjusted odds ratio	95 % CI	P value
Age group	<1 year ≥1 year	0.48	0.26-0.90	0.02*
Type of family	Nuclear Others	0.10	0.02-0.60	0.01*
Socioeconomic status	Upper Lower	0.70	0.11–4.53	0.71
Smoking place	Inside the house Outside the house	3.97	0.77–20.51	0.10
Underweight	Present Absent	1.59	0.33–7.62	0.56
Pets	Present Absent	1.40	0.31–6.34	0.66
Fuel	Wood LPG	1.13	0.97–1.30	0.11

*P value less than 0.05 was considered as significant.

DISCUSSION

The overall prevalence of ARI in this study was 31.9%. This is similar to the prevalence of 27% and 26.2% reported by Islam et al and Sharma et al and respectively.[7,12] However, it is considerably lower than the prevalence of 59.1% reported by Kumar et al from Puducherry.[13] These differences may be explained by differences in timing and duration of the studies. While the present study was conducted over a full calendar year, the study by Kumar was conducted over five winter months. In this study, cold (78%) and cough (56.1%) were the commonest symptoms of ARI. This is consistent with Kumar et al, who also reported the same. However,

Bipin et al reported cough as the predominant symptom, followed by nasal discharge.[3] This variation in presentation may be on account of cultural differences in the use of terminology to describe 'cold'. Unless specifically asked for as a separate symptom, people generally use the term 'cold' to describe nasal congestion and discharge. While the present study distinguished between the two terms, it is likely the same is not true of the other study. If so, the predominant symptoms would be cough and cold- the same as in other studies.

Despite a slightly higher prevalence of ARI among male children in this study, the difference was not statistically significant. This is consistent with the findings of Sharma et al and Goel et al, but in contrast to the findings of Islam et al, who reported a higher prevalence of ARI among female children.[7,12,14] Three studies all from developing region, also report an association between male sex and ARI, indicating the relationship between sex and ARI requires further investigation.[15-17]

In this study, ARI was significantly less in nuclear families compared to other types of families, which is in contrast to the findings of Islam et al, where ARI was more in nuclear families.[7] The difference is probably on account of the study setting- that study was conducted in slums of Guwahati, and likely a function of overcrowding than family type.

In the present study, mean family size of children with ARI (5.28) was found to be significantly higher compared to family size of children without ARI (4.71). This is consistent with Singh and Nayar, who report that the incidence of ARI is closely associated with higher family size.[18] Given that the mean number of siblings is a proxy for family size, it, too was significantly higher in children with ARI compared to children without ARI in our study. Lower socioeconomic status (which is associated with larger family size) was therefore significantly associated with ARI in our study. Similar results were found by Savitha et al and Cunha et al even after adjusting for other risk factors like nutritional status and overcrowding.[19,20]

CONCLUSION

The prevalence of ARI was 31.9%, with male children having a slightly higher prevalence than female children. Younger age and membership in a nuclear family had a significantly protective influence on occurrence of ARI.

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