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RESEARCH ARTICLE

Prevalence of acute respiratory infection in children less than 2 years in rural and urban population in and around Chennai, Tamil Nadu

Divya Krishnan[1], Abirami Omprakash[2], Padmavathi Ramaswamy[2], Thangavel G[3], Sankar S[3], Kalpana Balakrishnan[3]

[1]Department of Physiology, Tiruvannamalai Medical College, Tiruvannamalai, Tamil Nadu, India, [2]Department of Physiology, Sri Ramachandra Medical College and Research Institute, Chennai, Tamil Nadu, India, [3]Department of Environmental Health Engineering, Sri Ramachandra Institute of Higher Education and Research, Chennai, Tamil Nadu, India

Correspondence to: Abirami Omprakash, E-mail: abiramiomprakash@gmail.com

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ABSTRACT

Background: Acute respiratory infection (ARI) is the chief cause of mortality and morbidity among under-fives in Indian children and more common in below 2 years of age. Globally, the mortality percentage for ARI is higher in less developed countries like India than in developed countries. **Aims and Objectives:** The aim of this study was to estimate the prevalence of ARI in children <2 years in areas in and around Chennai. **Materials and Methods:** A population-based, epidemiological study was conducted among 310 households in urban and rural areas in and around Chennai, Tamil Nadu. A detailed health questionnaire was employed among children in 310 households to assess the prevalence of ARI. Descriptive statistics were used to calculate the percentage of ARI. **Results:** Overall prevalence of ARI is 59%. The prevalence of acute upper respiratory infection in the study population – 51.6% and acute lower respiratory infections is 7.4%. The prevalence of ARI was associated with risk factors such as rural locality (60%), age (7–12 months – 73%), male gender (62%), low socioeconomic status (64%), poor environmental sanitation (61%), and having family members infected (66%). **Conclusion:** This study had highlighted the burden of ARI in areas around Chennai and the need for control programs for the prevention of ARI in the community.

KEY WORDS: Acute Respiratory Infection; Children Under 2 Years; Prevalence; Risk Factors

INTRODUCTION

Acute respiratory infections (ARIs) are the second most important cause of morbidity and mortality in children globally. In developing countries like India, ARI is the major public health problem, leading to higher mortality among under-fives, especially below 2 years.[1] ARIs are the major contributor of under-five morbidity in children. It is a major area of concern in the health sector as on an average, child below 5 years of age suffers about 4–5 episodes of ARI per year, thus accounting for about 238 million attacks.[2] A high infant mortality rate of up to 13% has been reported by hospital-based studies and an equal proportion of death occurs in the community as many children die at home in India.[3]

The important risk factors contributing to the occurrence of ARI in rural areas are lack of basic health services, lack of awareness, and overcrowding. Apart from above-mentioned definite risk factors, the environmental factors are significant and modifiable which contributes to proportionate morbidity and mortality among under-five children. One of

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the important modifiable risk factors in rural India for ARIs, especially pneumonia, is the use of solid fuel. The biomass fuel produces a lot of toxic products that damage the local defenses of the respiratory tract which predisposes children to respiratory infections.[4] Not only in rural but also ARI is equally prevalent in urban areas; furthermore, the risk factors such as male gender, low birth weight, higher birth order, weaning at inappropriate age, poor nutritional status, mother's illiteracy, and low socioeconomic status make the children under 5 years to be prone to ARI.[5]

Most of the time, the occurrence of ARI has been under-reported due to various reasons. This leads to an underestimation of the actual burden of ARI in the community due to insufficient evidence. Hence, it is mandatory to determine the ARI prevalence and associated risk factors periodically to update and take necessary measures to reduce the burden through control programs. Moreover, the data on the prevalence of ARI in children under 2 years are limited and this is the period children become more vulnerable to various infections, especially of the respiratory system. Hence, this study was proposed to estimate the prevalence of ARI among under-two children and associated risk factors, leading to ARI in communities residing in urban and rural areas of Chennai, India.

MATERIALS AND METHODS

This present study was conducted among children in selected urban and rural areas in and around Chennai. The study was conducted after obtaining approval from the Institutional Ethics Committee of Sri Ramachandra Institute of Higher Education and Research, Porur, Chennai. An informed consent statement was obtained after explaining the aims, benefits, and implications of the study to mothers or the primary caregiver.

This study was conducted in 310 households selected from rural and urban areas in Chennai, Tamil Nadu, India. All children who are <2 years of age were included in the study. Children born with congenital anomalies, multiple pregnancy, and children born to those mothers working at dusty occupations were excluded from the study. Detailed history was collected using a health questionnaire. Information about demographics, socioeconomic and nutritional, immunization, and exposure details were collected. The height, weight, and mid-upper arm circumference of children <2 years were measured using Seca stadiometer/Seca infant measure mat, Tanita electronic weighing machine, and Gulick II measuring tape, respectively. Anthropometry was done. Body mass index was calculated.

The prevalence of ARI among <2 years was determined by administering a child health calendar with 2 weeks recall of details regarding symptoms of ARI. For acute lower respiratory infection (ALRI), clinical case definition specified by the WHO was used.[6] For ALRI, the signs and symptoms included were constant cough, difficulty in breathing with a raised respiratory rate, and for severe ALRI, stridor, lower chest wall in drawing, vomiting, and refusal to feed. The cases were recorded and considered based on multiple field trials.

Statistical Analysis

Data analysis was done using standard statistical packages including R and STATA statistical software. The prevalence of ARI was calculated as a percentage using summary statistics among urban and rural households as well as in several subcategories. Test of comparison used was a binomial test for proportions.

RESULTS

A total of 310 households in rural and urban areas in and around Chennai were monitored for respiratory health assessments in children below the age of 2. Table 1 describes the sociodemographic characteristics of the study population. Figure 1 depicts the overall prevalence of ARI to be 51.6% and ALRI to be 7.4% under the age of 2 years in rural and urban areas in and around Chennai. Table 2 shows the prevalence of ARI and ALRI among the rural and urban study population. The prevalence of ARI was found to be almost equal in both urban (58%) and rural communities (60%) in the study population. More susceptibility for ALRI has been observed in rural communities than in urban areas. According to their area of residence, the majority of the risk factors identified in the study were found to be more in the rural areas than in urban areas. The prevalence of ARI being a maximum of 73.0% in 7–12 months of age and higher among male children

Table 1: The sociodemographic characteristics of the study population

Descriptive variable	Number of children, n (%)
Age (months)	
Birth–6	84 (27.1)
7–12	90 (29)
13–24	136 (43.9)
Gender	
Male	168 (54.2)
Female	142 (45.8)
Locality	
Rural	202 (65.2)
Urban	108 (34.8)
Socioeconomic status	
Upper	13 (4.6)
Middle	177 (62.5)
Lower	93 (32.9)

(62%) compared to female children (56%). Furthermore, the prevalence of ARI was highest among kerosene (75%) and biomass users (70%) and lowest (56%) was observed in liquefied petroleum gas users. The highest prevalence was observed in the middle socioeconomic class, the percentage is 64. The percentage being higher in communities lacking toilet facility (63%) and with family members affected with infection (66%) [Table 3].

Table 2: Prevalence of ARI and ALRI among the rural and urban study population

Category	Prevalence (%)	
	ARI	ALRI*
Rural	60	10
Urban	58	2.8
P value	0.82	0.02

**P*<0.05. ARI: Acute respiratory infection, ALRI: Acute lower respiratory infection

Table 3: Prevalence of ARI among the subcategories in the study population

Risk factor	Prevalence of ARI (%)
Age (months)	
Birth–6	50
7–12	73
13–24	56
Locality	
Urban	58
Rural	60
Gender	
Male	62
Female	56
Type of fuel	
LPG	56
Kerosene	75
Biomass	70
Socioeconomic status	
Upper	54
Middle	64
Lower	53
Cleanliness of the surrounding	
Clean	61
Moderate	57
Poor	61
Toilet facility	
Yes	58
No	63
Family member infected	
No	57
Yes	66

ARI: Acute respiratory infection, LPG: Liquefied petroleum gas

DISCUSSION

This cross-sectional study was conducted to examine the prevalence of ARIs in children under 2 years among rural and urban communities in and around Chennai. This study shows overall prevalence of ARI to be 59.4% under the age of 2 years in rural and urban areas in and around Chennai. To categorize, the overall prevalence of acute upper respiratory infection being 51.6% and ALRI was 7.4%. There are various risk factors predispose children to ARIs in rural and urban areas. For ARI, the risk factors identified were age (7–12 months) –73%, male gender – 62%, middle socioeconomic class – 64%, lack of toilet facility – 63%, and having family members infected – 66% at home.

There was a significant difference in the prevalence of ALRI in rural and urban children. In our study, rural children showed a higher prevalence of ARLI than urban counterparts. Similar results have been reported by Sharma *et al.*,[5] Deb,[7] and Goel *et al*.[8] One of the major risk factors identified by studies in the rural area as a determinant of the occurrence of ARI is biomass fuel usage. Wadgave and Godale noted that the exposure of children to indoor smoke can cause serious respiratory health effects which may include ARI in children and chronic obstructive pulmonary disease or chronic bronchitis in women.[9] According to Cardoso *et al*., biomass is the main source of cooking fuel used by the large proportion of households in developing countries and as biomass is burnt partially in unvented cookstoves with poor household ventilation, it leads to high indoor concentration of pollutants.[10] Children with immature lung, when exposed to biomass smoke, have been shown to have inflammation of lung tissue due to particulate matter. The inflammatory process is known to affect pulmonary immune defense mechanisms which render them more susceptible to ARIs.[11]

Age and gender were also identified as the most common risk factors for the higher prevalence of ARI by other studies. Children in the age group of 7–12 months showed a higher

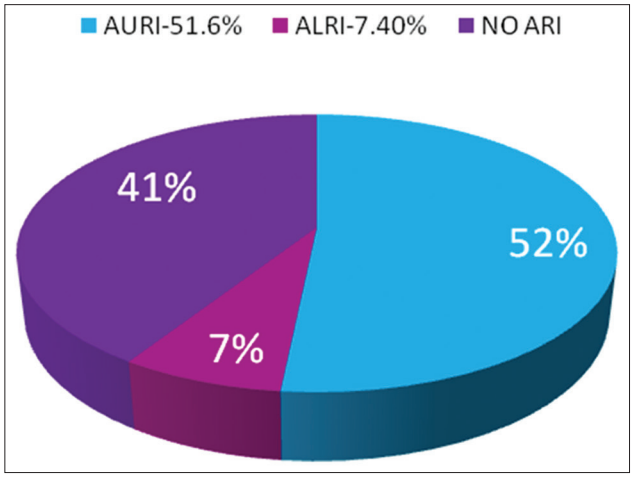

Figure 1: The overall prevalence of acute respiratory infection among the study population

prevalence than any other group in our study. Mir *et al*. have documented higher prevalence in <2 years of age due to the fact that there is a slow decline in maternal immunity during this period due to the weaning of breastfeeding and also frequent handling of children by family members. Again during the 2nd year of life, children are more prone to nutritional deficiencies due to inadequate and/or inappropriate food intake as a result of poor knowledge on weaning practices that even lead to specific nutritional deficiency resulting in an immunocompromised status of a child to make them more susceptible to respiratory infections.[12] ARI was observed to be more prevalent among male children in our study, may be correlated to the fact that male sex is biologically weaker and also more privileged for health-seeking behavior than female children which goes with the results of other studies by Siziya *et al.,*[13] Goel *et al*.,[7] and Prajapati *et al*.[14] However, a study by Islam *et al*. has reported higher prevalence in female children[15] and no significant association of predisposition with sex by Chhabra *et al*.[16]

A higher prevalence of ARI has been associated with low socioeconomic status with low income and densely populated communities. Similar findings were documented by Sharma *et al*.,[5] Prajapati *et al*.,[14] and Gupta *et al*.[17] The above factors hinder access to social, human, and material resources and also quicker transmission of agents causing infection, leading to more predisposition to respiratory infections. Having family members infected show a higher prevalence of ARI in our study. A study by Chen *et al*. reported a higher prevalence of ARI in communities having children attending childcare facilities. The possible explanation given was transmission of disease through person-to-person contact among family members, and therefore, measures should be taken to interrupt the transmission of infections within households to reduce the secondary attack rate.[18] Poor environmental sanitation and poor hygiene might also increase exposure among poorer and less educated groups, due to modified defense to fight off infection.

The strength of the study is it had highlighted the burden of ARI among children under 2 years in rural and urban areas of Chennai. The specific data on the ARI prevalence in this age group are very limited. The study has found various sociodemographic, socioeconomic, and environmental factors as significant determinants for ARI in these areas which will help policymakers and program planners to take preventive measures. The limitation of the study is that it has included only limited areas in Chennai city. The large-scale epidemiological studies are needed to identify the risk factors specific for rural and urban communities so that interventions can be planned to bring down the mortality and morbidity due to ARI.

CONCLUSION

This study has estimated the ARI prevalence in rural and urban populations in and around Chennai, Tamil Nadu. The baseline prevalence estimate for ARI generated in this study can be used for the implementation of interventions by local public health officials. Awareness and health education among parents and caregivers regarding the risk factors is necessary to prevent the occurrence of ARI among children below 2 years. The comprehensive approach toward prevention needs to be thoroughly planned and coordinated in the current ARI control programs.

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