Prevalence of acute respiratory infection among under-five children in urban and rural areas of Puducherry, India

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Abstract

Introduction: The incidence of Acute respiratory infections (ARI) is high among under-five children, especially in developing countries. However, the data on ARI from rural and urban areas in India are scarce. Objective: To estimate the prevalence of ARI and selected associated factors among under-five children. Materials and Methods: A community-based cross-sectional study was conducted in urban and rural areas of Puducherry, India. Data were collected from 509 parents of under-five children regarding ARI incidence along with socio-demographic and selected associated factors. Results: Overall prevalence of ARI was observed to be 59.1%, with prevalence in urban and rural areas being 63.7% and 53.7%, respectively. Bivariate analysis indicated that overcrowding, place of residence, and mother’s education were significantly associated with ARI. Multiple logistic regression analysis suggested that presence of overcrowding (adjusted odds ratio [AOR] = 1.492), urban residence (AOR = 2.329), and second birth order (AOR = 0.371) were significant predictors of ARI. Conclusion: The prevalence of ARI is high, particularly in urban areas. Improvement of living conditions may help in reduction of burden of ARI in the community.

Key words: ARI, under-5 years old children, rural, urban, respiratory disease

INTRODUCTION

Acute respiratory infection (ARI) is the major cause of mortality among children aged less than 5 years, especially in developing countries like India. Lower respiratory tract infections (LRTIs) are the leading cause of under-five morbidity globally.

ARI poses a major challenge to the health system in developing countries because of high morbidity and mortality. Interestingly infants living in overcrowded surroundings and suboptimally breast-fed are more likely to suffer ARI-related illnesses.

In India, ARI accounts for 30-50% of visits to health facilities and 20-40% of hospital admissions. In urban slum areas, ARI constitutes over two-thirds of all childhood illnesses. Despite these statistics, majority of the reported evidences underestimate the actual burden of ARI in the community. Hence, continued understanding of ARI prevalence and associated risk factors is essential. However, estimating the morbidity burden has inherent challenges due to lack of uniformity in study definitions, spectral nature of illness and misclassification errors. Hence, this study was conducted to estimate the prevalence of ARI among under-five children residing in urban and rural communities of Puducherry, India and to identify the association between ARI and selected socio-demographic and environmental factors.
MATERIALS AND METHODS

A community-based cross-sectional study was conducted during October 2013 to February 2014 in the field practice areas of Urban Health Centre (UHC; population of 9000) and Rural Health Centre (RHC; population of 8507) attached to a medical college in Puducherry, India.

Sample size estimation and sampling technique

Considering a prevalence of 42.3%\(^{10}\) and absolute precision of 7%, the sample size was calculated to be 199. Considering a refusal rate of 10%, final minimum sample size required from each urban and rural area was estimated to be 219. To achieve this, two out of four urban areas and three out of four villages from rural areas were selected randomly by lottery method. Purposive sampling was adopted to select the sample of children from the respective areas. Children aged less than 5 years with parents living in the field practice area for at least 6 months were included in the study.

Method of data collection

The study was conducted by house-to-house survey by the investigators and medical interns. The medical interns were trained and supervised in data collection process. Informed consent was obtained from the informants before the initiation of data collection. Data was collected by interview technique from the mother of the child. If mother was not present at the time of house visit, the father was interviewed. If within the same household, more than one child were present, one of them were selected randomly in the study. Information on ARI episode and certain associated factors were obtained using a pretested semi-structured questionnaire.

In the present study, the operational definition of an ARI episode used was based on a child having at least one of the following recognizable symptoms of ARI (cough, runny nose, ear discharge, and sore throat, which might be associated with fever, chest retractions, and fast breathing) within the last 2 weeks of the visit. With the help of the pretested interview schedule, information regarding socio-demographic characteristics of the mother and child and associated factors such as overcrowding, birth order, birth weight, number of siblings, duration of exclusive breast feeding, and duration of total breast feeding were documented. Overcrowding was assessed based on the number of persons and living rooms.

Statistical analysis

Data was analyzed using SPSS (Statistical Package for Social Sciences) software version 17.0. Bivariate analysis was performed to assess the risk factors associated with ARI. Multivariate analysis was performed using logistic regression analysis to identify association of ARI and suspected risk factors after adjusting for other confounding factors. Results of multivariate analysis were reported as adjusted odds ratios (AOR) with 95% confidence interval (CI).

RESULTS

A total of 509 subjects participated in the study. Among them, 278 (54.6%) and 231 (45.4%) were from urban and rural areas, respectively. Overall prevalence of ARI was observed to be 59.1% (301/509). Children from urban areas (63.7%) had higher prevalence of ARI compared with children living in rural areas (53.7%). Running nose and cough were the most common symptoms of ARI reported [Table 1].

The prevalence of ARI was highest in age group 0-12 months (63.2%), followed by 25-60 months (59.5%), and was comparatively lower in 13-24 months age group (52.6%). Higher proportions of boys (62.9%) were reported to have ARI as compared with girls (55.1%). Incidentally ARI prevalence was higher among children born with a birth weight of <2.5 kg, had mother's educated between 1st and 7th class, had two or more siblings, and those who lived in overcrowded settings. Bivariate analysis indicated overcrowding, place of residence and mother’s education as significant risk factors associated with ARI [Table 2].

Multiple logistic regression analysis suggested that presence of overcrowding (AOR = 1.492), urban place of residence (AOR = 2.329), and second birth order (AOR = 0.371) were significant predictors of ARI [Table 3].

DISCUSSION

In our study, the overall prevalence of ARI was higher than similar studies from Delhi,\(^{10}\) rural Ahmadabad,\(^{11}\) and Assam\(^{12}\) in India. Surprisingly, a recent National Family Health Survey (NFHS-3) data suggests a 5.8% prevalence rate.\(^{11}\) Such differences in prevalence rates may be due to the difference in cultural and socio-economic factors present in different

| Symptoms | Number of subjects (%) |
|----------|------------------------|
| Cold/running nose | 268 (52.7) |
| Cough | 231 (45.4) |
| Sore throat | 17 (3.3) |
| Ear discharge | 6 (1.2) |
| Any of the above symptom | 301 (59.1) |
| Associated with fever | 143/301 (47.5) |
| Associated with fever and fast breathing | 6/301 (2.0) |
geographical regions, difference in risk factor exposure and methodology adopted in the study. Interestingly, a study conducted in a rural community in Bangladesh reported 58.7% prevalence rate of ARI, which is comparable to this study.[13] A study using 4-5 years age group reported 47.3% prevalence rate of ARI.[11] In contrast, we observed a higher prevalence of ARI among infants. A community-based study in a coastal village of Karnataka, India reported the incidence of pneumonia to be significantly higher among infants.[14] An epidemiological study conducted in an urban area of West Tripura, India also reported higher incidence of pneumonia among infants.[15] In our study, although more boys were affected from ARI than girls, this data was not statistically significant and is consistent with other reports.[12,13,16] Our study indicated a significant association of overcrowding with ARI, which is consistent with other studies.[5,11,13] However, only a limited number of studies from India have compared the prevalence of ARI in urban and rural areas. The higher prevalence of ARI in the urban areas compared with rural areas and in overcrowded settings stresses the fact that ARI control programs in India need to consider these risk factors while treating ARI in urban primary care settings.

One of the limitations of the study was convenient sampling used in selection of urban and rural areas. Due to diversity of population in different parts of India and their living conditions, it is difficult to generalize these findings. Further, quantification of certain other related risk variables could not be included in our study due to feasibility constraints. Since our study was performed in a shorter duration, effect of seasonality could not be studied. Nevertheless further longitudinal multi-centric studies in urban and rural areas will help in identifying the time trend analysis of ARI and its association with risk factors.

### Table 2: Factors associated with ARI among under-five children (N = 509)

| Variable                | Categories | Total number of subjects | Number of subjects with ARI (%) | Pearson chi-square value | P value |
|-------------------------|------------|--------------------------|--------------------------------|--------------------------|---------|
| Age in months           | 0-12       | 133                      | 84 (63.2)                      | 2.632                    | 0.268   |
|                         | 13-24      | 97                       | 51 (52.6)                      |                          |         |
|                         | 25-60      | 279                      | 166 (59.5)                     |                          |         |
| Gender                  | Male       | 264                      | 166 (62.9)                     | 3.180                    | 0.075   |
|                         | Female     | 245                      | 135 (55.1)                     |                          |         |
| Place of residence      | Urban      | 278                      | 177 (63.7)                     | 5.210                    | 0.022*  |
|                         | Rural      | 231                      | 124 (53.7)                     |                          |         |
| Overcrowding            | Yes        | 200                      | 139 (69.5)                     | 14.645                   | 0.000*  |
|                         | No         | 309                      | 162 (52.4)                     |                          |         |
| Birth weight            | <2.5 kg    | 204                      | 123 (60.3)                     | 0.189                    | 0.664   |
|                         | ≥2.5 kg    | 305                      | 178 (58.4)                     |                          |         |
| Mother’s education      | Illiterate | 20                       | 9 (45.0)                       | 7.103                    | 0.029*  |
|                         | 1-7th class| 471                      | 286 (60.7)                     |                          |         |
|                         | ≥7th class | 18                       | 6 (33.3)                       |                          |         |
| Number of siblings      | 0          | 159                      | 99 (62.3)                      | 3.403                    | 0.182   |
|                         | 1          | 277                      | 154 (55.6)                     |                          |         |
|                         | ≥2         | 73                       | 48 (65.8)                      |                          |         |
| Birth order             | 1          | 269                      | 150 (55.8)                     | 3.055                    | 0.217   |
|                         | 2          | 204                      | 130 (63.7)                     |                          |         |
|                         | ≥3         | 36                       | 21 (58.3)                      |                          |         |
| Duration of total breast feeding in children more than 18 months of age (N=371) | <6 months | 29                       | 17 (58.6)                     | 0.245                    | 0.885   |
|                         | 6-18 months| 247                      | 145 (58.7)                     |                          |         |
|                         | >18 months | 95                       | 53 (58.8)                      |                          |         |
| Exclusive breast feeding for children aged 6 months and more (N=451) | Yes       | 392                      | 231 (58.9)                     | 0.093                    | 0.761   |
|                         | No         | 59                       | 36 (61.0)                      |                          |         |

*P value less than 0.05 was considered as significant.

### Table 3: Associated factors of ARI: Multiple logistic regression analysis

| Variable                | Category          | Adjusted odds ratio (95% CI) | P value |
|-------------------------|-------------------|------------------------------|---------|
| Age group in months     | 0-12              | 1.024 (0.632-1.657)          | 0.924   |
|                         | 13-24             | 1.276 (0.772-2.110)          | 0.342   |
|                         | 25-60             | –                            |         |
| Gender                  | Male              | 0.695 (0.478-1.011)          | 0.057   |
|                         | Female            | –                            |         |
| Overcrowding            | Yes               | 2.329 (1.541-3.518)          | 0.000*  |
|                         | No                | –                            |         |
| Area of residence       | Urban             | 1.492 (1.017-2.190)          | 0.041*  |
|                         | Rural             | –                            |         |
| Birth weight            | ≥2.5 kg           | 0.917 (0.624-1.349)          | 0.661   |
|                         | <2.5 kg           | –                            |         |
| Mothers education       | Illiterate        | 0.830 (0.193-3.570)          | 0.830   |
|                         | 1-7th class       | 0.467 (0.155-1.407)          | 0.467   |
| Number of siblings      | 0                 | 0.854 (0.358-2.037)          | 0.722   |
|                         | 1                 | 1.870 (0.879-3.971)          | 0.104   |
|                         | ≥2                | –                            |         |
| Birth order             | 1                 | 0.745 (0.275-2.016)          | 0.562   |
|                         | 2                 | 0.371 (0.138-0.996)          | 0.049*  |
|                         | ≥3                | –                            |         |

*P value less than 0.05 was considered as significant.
CONCLUSION

ARI is an important public health problem among under-five children. Improvement of living conditions in houses may help in reduction of ARI among under-five children in the community.

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