RESEARCH ARTICLE

Epidemiological Profile of Acute Respiratory Infections (ARI) in Under Five Age Group of Children in Urban and Rural Communities of Ahmedabad District, Gujarat

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ABSTRACT

Background: Acute respiratory tract infection is a major cause of morbidity and mortality in developing and also developed countries. About 13 Million under 5 children dies every year in the world, 95% of them in developing countries, one third of total deaths are due to ARI.

Objective: To study the epidemiological profile of ARI and find out associated risk factors of ARI in under 5 children living in urban and rural areas of Ahmedabad district.

Materials and Methods: A cross sectional study was covering 500 under 5 children living in urban (five zone) and rural (five PHC of Sanand taluka) area of Ahmedabad district from September 2008 to March 2009.

Results: Occurrence of ARI was found to be 22%, it was lower in urban area (17.2%) as compare to rural area (26.8%) higher in. A significant association was found between ARI and low social class, overcrowded houses low birth weight, delay start initiation of breast feeding, prelactal feeding, timely given complementary feeding and immunization status.

Conclusion: The study strongly towards the importance of basic health promotional measures like proper infant feeding practices, proper nutrition of the child and socio-economic improvement in prevention and control of ARI.

Key Words: Pneumonia; Under Five Children; Breast Feeding; Nutrition; Immunization

INTRODUCTION

Acute respiratory tract infection is a major cause of morbidity and mortality in developing and also developed countries. ARI is an infection of any part of respiratory tract or any related structures including para nasal sinuses, middle ear and pleural cavity. It includes, a new episode means occurring in an individual who has been free of symptoms for at least 48 hours and also all infections of less than 30 days duration except those of the middle ear where the duration of acute episode is less than 14 days.[1] In the developing countries out of ten, seven deaths in under 5 children are due to ARI. National family health survey (NFHS - 3) revealed that two weeks before the survey 6% of under 5 children had symptoms of an ARI (cough, short and rapid breathing), out of these children 69% were taken to a health facility or health provider for treatment. Average adult has 2-4 episodes per year and a child has 6-8 episodes of ARI per year. In rural area, lack of basic health services, lack of awareness, and other associated factors like overcrowding, environmental factors, defects in immune system, overuse and misuse of antibiotics, poverty, absence of ventilation, indoor air pollution are responsible factors. In developing

countries like Kenya, Philippines, Thailand, Colombia, Nigeria, Uruguay etc, prevalence was reported in the range of 21.7 to 40%. It is estimated that at least 300 million episodes of ARI occur in India every year, out of these about 30 to 60 millions are moderate to severe ARI episode. While every 6th child in the world is Indian, every 4th child who dies, comes from India. ARI is responsible for about 30-50 % visits to health facilities and for about 20-40 % admissions to hospital.[2] The DALYs lost due to ARI in South East Asia Region are about 3, 30, 26,000. ARI is the leading cause of mortality and morbidity in India especially in under fives.

Objective: To study the epidemiological profile of ARI and find out associated risk factors of ARI in under 5 children living in urban and rural areas of Ahmedabad district.

METHODS

A cross sectional study was carried out in 500 under children in urban area (five zone) and rural area (five PHC of sanand taluka) of Ahmedabad district during September 2008 to March 2009. Out of 500 children, 250 children were studied in Urban and Rural areas of Ahmedabad District. For urban area, Ahmedabad city has 6 zones. 5 zones were chosen by simple Random Technique. Each zone has 7-9 wards; one area of each ward of each 5 zones was selected. For rural area, Ahmedabad has 10 Talukas, out of these; Sanand Taluka was selected by simple random technique. Through this technique one area of selected five villages of each 5 PHC were selected. Data collections start from no 1 house till 50 children were found for both urban and rural area. Predesigned, pretested questionnaire was used for data collection. The questionnaire included information regarding socio demographic profile details of their parents, housing condition, type of using cooking fuel, anthropometric and clinical examination also done. House to house survey was done for data collection. History of episodes of ARI during last one month was enquired for calculating the occurrence of ARI among under five children. Social classification is done on the basis of Modified Prasad's classification revised according to inflation rate in year 2007- 2008. Gradation of **ARI**[3], according to severity**:**

- **Mild ARI:** Presence of cough or cold (No pneumonia)
- **Moderate ARI:** Fast breathing without chest indrawing
- **Severe ARI:** Presence of chest indrawing (severe pneumonia) and signs of very severe disease like convulsions, abnormal sleep, severe malnutrition, wheezing, grunting, nasal flaring etc.

Immunization: The children were divided into 3 categories:

a. Fully Immunized: A child who had received all vaccines according to National Immunization Schedule as per his/her age at the time of interview.
b. Partially Immunized
c. Not Fully Immunized: A child who had not received any or all vaccines according to National Immunization Schedule as per his/her age at the time of interview.

Data analyzed by Epi-info 2002 package. Chi square test applied for statistical significance.

RESULTS

Out of 500 children, about 55.0% were in between 1-4 yrs, 33.2% were below age of 1 yr, and 12% were in between 4-5 yrs of age **(Table-1)**.

Table-1: Distribution of ARI Children according to Age and Sex Wise

Age Group (yrs)	Male	Female	Total
0-1	26 (41.3)	18 (37.5)	44 (40.0)
1-4	28 (45.3)	24 (50.0)	52 (47.3)
4-5	8 (13.0)	6 (12.5)	14 (12.7)
Total	62 (56.3)	48 (43.7)	110 (100.0)

Values in parenthesis are percentages

No major difference was found in between rural and urban area. The sex wise distribution was almost equal (48% boys, 52% girls). Boys were more in urban area (54%), girls were more in rural area (58%). Majority were Hindus (80 %).About one third,30% of children belonged to

upper social class(I,II) and remaining were in low social class(III,IV, V).Social class IV and V, which is more in rural area (40.8% and 38.8%) .38% of children living in pukka houses, it was more in urban (59%) as compare to rural area(17%).Overcrowding was present in more than half of the houses (53.2%),it was more in rural area (73.6%).Cross ventilation was present in 44.6% of houses, it was more in urban(62.8%) as compare to rural area(26.4%). 37.2% children were from households using smokeless fuel which is more in urban area (56.8%) as compare to rural area (37.2%). 33% father and 50.8% mother of children were illiterate (more in rural area 42.4%, 70% respectively). According to occupational status of parents, 44.6% fathers were labourers, 70.4% mothers were housewives and 18.4% were labourers. About 31.8% were malnourished children (14.6% had grade-I, 9.8% had grade-II and remaining had grade-III and IV), it was more in rural area (44%). History of parental smoking was present in 63.8% of houses, it was more in rural area (75.6%). According to symptoms, about 92.0% of children having cough, 81% nasal discharge, 38% fever, 20% fast breathing and 4% stopped feeding. According to diagnosis, severe ARI cases were more noted in rural area (4.2%) as compare to urban area (2.4%).

110 ARI cases were found during study, according to sex wise- 56.3% were males and 43.7% were females. More ARI cases were seen in 4-5 years of age group (47.3%) and in this age group 45.3% were males and 50.0% were females Overall occurrence of ARI was found to be 22.0%. According to area, occurrence of ARI was lower in urban area (17.2%) as compare to rural area (26.8%).

According to social class, occurrence of ARI was higher in low social class (in class III - 31.4%, class IV -22.1%, and class- 26.2% respectively). **(Table-2).**This difference was statistically significant ((x^2 = 13.68, p<0.001). In social class IV and class V, occurrence of ARI was more in rural area (35.3%, 41.5%) as compare to urban area (26.6%, 31.1%). This difference was statistically significant ((x^2 =15.5, p<0.05) **(Table-3).** The present study found a significant association between ARI and social class (p <0.001).

Occurrence of ARI was highest in children of illiterate (24.4%) and primary (23.9%) mothers. This difference was not statistically significant (x^2 =4.49, p>0.05).

Occurrence of ARI was highest in children of illiterate (21.0%) and primary (18.2%) fathers, but difference was not statistically significant (x^2= 2.92, p>0.05). According to occupation, occurrence of ARI was lower in children of fathers who were engage in service (17.6%) or in business (18.9%) but difference was not statistically significant (x^2= 8.59, p>0.05). Among children of mothers who were labourers (21.7%) or engaged in agriculture work (26.6%) and housewife (22.4% respectively) had higher occurrence of ARI but difference was not statistically significant (x^2=2.08, p>0.05).

Occurrence of ARI was more in those children having history of parental smoking (24.4%) as compare history of non-parental smoking(17.6%) but difference was not statistically significant (x^2 = 3.09, p >0.05). The present study found no significant association between ARI and history of parental smoking. No difference was observe in between type of house and prevalence of ARI. Overcrowding has a direct relationship with occurrence of ARI, it was higher (28.57%) in children who were living in overcrowded houses as compare to no overcrowding (14.52%). This difference was statistically highly significant (x^2 = 14.30, p<0.001). The present study found a significant association between ARI and overcrowding (p <0.001).

Occurrence of ARI was more in children living in houses with inadequate ventilation (24.4%) as compare to houses with adequate ventilation (19.2%). This difference was statistically significant (x^2 =11.89, p <0.001). Severity of disease depicts mild, moderate and severe cases (20.6%, 3.0%, and 0.7%) more in inadequate ventilation than adequate ventilation (17.5%, 1.2% and 0.4%) respectively.

Table-2: Distribution of Children according to Social Class

Social Class	Severity of ARI				Children with No ARI	Total
	Mild	Moderate	Severe	Total		
I	11 (9.6)	1 (0.8)	0 (0.0)	12 (10.5)	102 (89.4)	114 (100.0)
II	9 (23.6)	2 (5.2)	0 (0.0)	11 (28.9)	27 (71.0)	38 (100.0)
III	9 (25.7)	1 (2.8)	1 (2.8)	11 (31.4)	23 (68.5)	35 (100.0)
IV	31 (19.6)	4 (2.5)	0 (0.0)	35 (22.1)	123 (77.8)	158 (100.0)
V	36 (23.0)	3 (1.9)	2 (1.2)	41 (26.2)	115 (73.7)	156 (100.0)
Total	96 (19.2)	11 (2.2)	3 (0.6)	110 (22.0)	390 (78.0)	500 (100.0)

Values in parenthesis are percentages ($\chi^2 = 13.68$, $p<0.001$)

Table-3: Distribution of Children according to Social Class and Urban-Rural Comparison

Social Class	ARI cases		
	Urban	Rural	Total
I	10 (22.2)	2 (3.0)	12 (10.9)
II	7 (15.5)	4 (6.1)	11 (10.0)
III	2 (4.4)	9 (13.8)	11 (10.0)
IV	12 (26.6)	23 (35.3)	35 (31.8)
V	14 (31.1)	27(41.5)	41 (37.2)
Total	45 (100.0)	65 (100.0)	110 (100.0)

Values in parenthesis are percentages ($\chi^2 = 15.5$, $p<0.05$)

Occurrence of ARI was higher in children of mothers who were using smoky chullhas (24.8%) as compared to using smokeless chullhas (17.2%). This difference was statistically significant ($x^2 = 3.97$, $p < 0.001$). According to exposure to type of fuel and types of ARI, ARI cases were more seen in rural area(72.3%) as compare to urban area (68.8%) where smoky fuel was used but difference was not statistically significant ($p > 0.05$).

Nutritional status of child has direct bearing on children's susceptibility to ARI. Occurrence of ARI amongst children who had no malnutrition was lowest (14.0%), while it was more in Grade-I to IV malnutrition. This difference was statistically significant ($x^2 = 39.86$, $p<0.001$) **.** The present study found a significant association between ARI and nutritional status ($p < 0.001$).

25.0% of mothers were not knowing about birth weight of their children, 39.8% of children having low birth weight (<2.5 kg). Low birth weight baby (<2.5 kg) was more in rural area (42.4%) as compare to urban area (37.2%). Birth weight and occurrence of ARI has been found to be correlated. severity of ARI was very high in low birth weight baby (36.1%) as compare to normal birth weight baby (17.3%).This difference was statistically significant ($x^2 = 21.32$, $p < 0.001$).

According to birth order of children ,about more than one third (39.8%) were 2nd birth order, 28.6% were 1st birth order and 31.6% were in 3rd or above birth order. Positive correlation found between birth order and occurrence of ARI, it was lowest among children who were in 1st birth order (14.6%), while it was highest in 5th birth order (78.5%).

Table-4: Distribution of Children according to Initiation of Breast Feeding and Urban-Rural Comparison

Initiation of Breast Feeding	Urban	Rural	Total
Immediate	171 (68.4)	75 (30.0)	243 (49.2)
1st day	43 (17.2)	50 (20.0)	93 (18.6)
2nd day	25 (10.0)	40 (16.0)	65 (13.0)
3rd day	4 (1.6)	56 (22.4)	60 (12.0)
After 3rd day	7 (2.8)	29 (11.6)	36 (7.2)
Total	250 (100)	250 (100)	500 (100)

Values in parenthesis are percentages

About half (49.2%) of mothers started breast feeding immediate or within 1st hour. Mothers who started delay breast feeding by 1st day, 2nd day, and 3rd day or later was 18.6%, 13% and 19.2% respectively **(Table-4).** 68.4% of urban mothers as compare to 30% in rural mothers started breast feeding immediately. Delayed breast feeding was highest in rural area (34% on 3rd day or later). Significant correlation found between timely initiation of breast feeding and decreased occurrence of ARI. Occurrence of ARI was lowest in mothers who initiated breast feeding immediately (15.4%) or within one hour (21.5%) as compare to initiated breast feeding on 3rd day or beyond it (33.3%). This difference was statistically significant ($x^2 = 16.27$, $p < 0.001$)**.** Occurrence of ARI was more in those

children who started prelactal feeding (29.3%) as compare to (16.3%) did not start prelactal feeding. This difference was highly statistically significant ($x^2 = 12.19$, $p < 0.001$).

According to duration of breast feeding, out of total mothers, 71% mothers continued breast feeding for more than 6 months after delivery. No more difference was observed in urban (35.6%) and rural area (34.4%). 28.1% of mothers continue breast feeding up to 6 months. Only 1.4% of mothers discontinued breast feeding before 3 months after delivery. 33.2% of children excluded below less than one year of age. Occurrence of ARI was higher in children of mothers who continued breast feeding up to 3 months (40.0%) as compare to breast feeding up to 6 months, 9 months and 12 months i.e 29.7%, 27.2% and 30.4% respectively. This difference was not statistically significant ($p > 0.05$).

40.8% of children started complementary feeding at 6 months of age, 28.6% of children started after 6 months. 13.0% of children didn't start complementary feeding. Starting of complementary feeding around 6 months or after it was slightly more in urban area (75.2%) as compare to rural area (63.6%). Observations reveal that timely initiation of complementary feeding protect against the ARI. It was least in children who were initiated complementary feeding at age of 4 months (21.3%) and 6 months (13.7%), as compare to delayed start complementary feeding 6 months or after it (30.7%). This difference was statistically highly significant ($x^2 = 14.78$, $p < 0.001$). Occurrence of ARI was more in urban area (46.1%) as compare to rural area (19.6%) when complementary feeding started at age of 6 months or after. This difference was also statistically highly significant ($x^2 = 8.1$, $p < 0.05$). The child when fully immunized is protected against various respiratory infections like diphtheria, pertussis and also complications of measles. As these children are not fully immunized they are at risk of development of these infections. 43.8% were fully immunized, 33.8% were not immunized and 22.4% were partially immunized children. Fully immunized children were higher in urban area (77.1%) as compare to rural area (22.8%).Direct correlation between immunization status of children and occurrence of ARI. It was least in children who were fully immunized (9.1%) as compare to unimmunized children (33.7%). This difference was statistically significant ($x^2 = 33.87$, $p < 0.001$). 63.6% children had taken vitamin A. Vitamin A coverage was more in urban (84.0%) area as compare to rural (43.2%) area. Occurrence of ARI was more in those children who are not taking vitamin A prophylaxis (24.1%) as compare to taking vitamin A prophylaxis (20.7%) . This difference was not statistically significant ($p > 0.05$).

DISCUSSION

110 ARI cases of ARI were found during study, according to sex wise- 56.3% were males and 43.7% were females. More ARI cases were seen in 4-5 years of age group (47.3%) and in this age group 45.3% were males and 50.0% were females Overall occurrence of ARI was found to be 22.0%. Our findings are compare with the study done by Sikolia D N[4], Ram kishore Gupta[5] and Rahman MM[6]. According to area, occurrence of ARI was lower in urban area (17.2%) as compare to rural area (26.8%). Similar observations were seen in study done by Deb SK[7]. According to diagnosis, severe ARI cases more seen in rural area (4.2%) as compare to urban area (2.4%).

According to social class, occurrence of ARI was higher in low social class (in class III - 31.4%, class IV -22.1%, and class- 26.2% respectively).This difference was statistically significant (($x^2 = 13.68$, $p < 0.001$). In social class IV and class V, occurrence of ARI was more in rural area (35.3%, 41.5%) as compare to urban area (26.6%, 31.1%). This difference was statistically significant (($x^2 = 15.5$, $p < 0.05$). The present study found a significant association between ARI and social class ($p < 0.001$).Various studies like by Deb SK[7], Ram kishore Gupta[5], Nilanjan kumar Mitra[8], M.R.Savitha[9] and Biswas A[10] found similar association.

Occurrence of ARI was highest in children of illiterate (24.4%) and primary (23.9%) mothers. This difference was not statistically significant

(x^2 =4.49, p>0.05). Similar findings observed in study done by Nilanjan kumar Mitra.[8]

Occurrence of ARI was more in those children having history of parental smoking (24.4%) as compare history of non-parental smoking (17.6%) but difference was not statistically significant (x^2 = 3.09, p >0.05). The present study found no significant association between ARI and history of parental smoking. Our finding are compare with the study done by Rahman MM[6] and J.K Peat[11] . Overcrowding has a direct relationship with occurrence of ARI, it was higher (28.57%) in children who were living in overcrowded houses as compare to no overcrowding (14.52%). This difference was statistically highly significant (x^2 = 14.30, p<0.001). The present study found a significant association between ARI and overcrowding (p <0.001). Various studies like by Rahman MM[6], Ram kishore Gupta[5] and Berman[12] found similar association.

Occurrence of ARI was higher in children of mothers who were using smoky chullhas (24.8%) as compared to using smokeless chullhas (17.2%). This difference was statistically significant (x^2 = 3.97, p <0.001). According to exposure to type of fuel and types of ARI, ARI cases were more seen in rural area(72.3%) as compare to urban area (68.8%) where smoky fuel was used but difference was not statistically significant (p >0.05). Our finding are compare with the study done by Rahman MM[6], Nilanjan kumar Mitra[8], Wafula EM[13], Berman[12], M.R.Savitha[9] and Biswas A[10] .

Occurrence of ARI amongst children who had no malnutrition was lowest (14.0%), while it was more in Grade-I to IV malnutrition. This difference was statistically significant (x^2 =39.86, p<0.001). The present study found a significant association between ARI and nutritional status (p <0.001). Similar observations where noted by Deb SK[7], Nilanjan kumar Mitra[8], Biswas A[10], M.R.Savitha[9], Fonseca W[14] and Pandey A[15].

Birth weight and occurrence of ARI has been found to be correlated. severity of ARI was very high in low birth weight baby (36.1%) as compare to normal birth weight baby (17.3%). This difference was statistically significant (x^2 = 21.32, p <0.001). Similar observations where noted by Nilanjan kumar Mitra[8], Sudha Yadav[16] and Fonseca W[14] in their study.

Positive correlation found between birth order and occurrence of ARI, it was lowest among children who were in 1st birth order (14.6%), while it was highest in 5th birth order (78.5%). This difference was statistically highly significant (x^2 =36.15, p <0.001). Our findings are compare with the study done by Sudha Yadav[16] and S.singhi[17].

Significant correlation found between timely initiation of breast feeding and decreased occurrence of ARI. Occurrence of ARI was lowest in mothers who initiated breast feeding immediately (15.4%) or within one hour (21.5%) as compare to initiated breast feeding on 3rd day or beyond it (33.3%). This difference was statistically significant (x^2 =16.27, p <0.001). Our finding are compare with the study done by Sudha Yadav[16] and Nafstad P[18]. Occurrence of ARI was more in those children who started prelactal feeding (29.3%) as compare to (16.3%) did not start prelactal feeding. This difference was highly statistically significant (x^2 = 12.19, p <0.001). Similar finding was observed in study carried out by Biswas A[10], Deb SK[7] and M.R. Savitha[9].

Timely initiation of complementary feeding protect against the ARI. It was least in children who were initiated complementary feeding at age of 4 months (21.3%) and 6 months (13.7%), as compare to delayed start complementary feeding 6 months or after it (30.7%). This difference was statistically highly significant (x^2 =14.78, p <0.001). Occurrence of ARI was more in urban area (46.1%) as compare to rural area (19.6%) when complementary feeding started at age of 6 months or after. This difference was also statistically highly significant (x^2 = 8.1, p <0.05). Our findings are compare with the study done by M.R. Savitha.[9]

Direct correlation between immunization status of children and occurrence of ARI. It was least in

children who were fully immunized (9.1%) as compare to unimmunized children (33.7%). This difference was statistically significant (x^2= 33.87, p<0.001). Our findings are compare with the study done by Deb SK[7], M.R. Savitha[9] and Fonseca W[14], Nilanjan kumar Mitra[8], S.singhi[17]. Occurrence of ARI was higher in those children who have history of pallor (25.1%) as compare to non pallor (18.9%) patient. This difference was not statistically significant (p >0.05). This finding compare with the study was carried out by S. Broor.[19]

CONCLUSION

The study strongly towards the importance of basic health promotional measures like proper infant feeding practices, proper nutrition of the child and socio-economic improvement in prevention and control of ARI.

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