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Incidence Of Acute Respiratory Tract Infection And Its Associated Risk Factors Among Birth Cohorts In An Urban Area Of Chidambaram, Cuddalore District, Tamilnadu.

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Abstract

Introduction: Among the list of health problems in Under-five children, Acute respiratory tract infection (ARI) tops the list in India. It is estimated that, in India nearly 230 million attacks of ARI occur among under-5 children in a year. In recent years, new evidence has emerged which suggests that indoor air pollution (IAP) in developing countries may also increase the risk of other important child and adult health problems. In view of this background, this study was planned with the aim to estimate the incidence of Acute respiratory tract infections among birth cohorts in an urban area of Chidamabaram, Cuddalore district, TN.

Methodology: This cohort study was conducted among infants in urban area of Chidambaram. House to house survey was done and data was collected among 150 infants, who were identified as a period sample based on inclusion criteria during 15* visit and were followed at the age of 6" month, 9*“ month and 12*‘ month of age. Various information on episodes of ARI , anthropometric measures were all collected and data was analysed using SPSS version 22 and Epi info software.

Results:

The study findings shows that 45.3% mother were in the age group of 25-29 years and 95.3% of them were home makers . It was estimated that majority of infants (68%) had RTI during their 2nd visit, followed by 66% during their 1st visit. Incidence of Episodes of RTI was found to be 1.72 episodes / 100 person days and on an average 4.71.

Conclusion: Programs for community education should focus on addressing specific issues, such as recognising respiratory infections, providing simple case management, carrying out efficient immunisation processes, breastfeeding infants and children, and reducing indoor air pollution. As a result, it's important to spread awareness among parents and the general public through suitable health education/IEC programmes.

Keywords: Birth cohorts, ARI, Risk factors

Introduction

Acute Respiratory Infection (ARI) in under-five is one of the main public health problems in India. It is the major cause of morbidity and mortality in infants and young children below the age of five. On an average, children below 5years of age suffer about 5 episodes of ARI per year, thus accounting for about 238 million attacks. It is responsible for an estimated 3.9 million deaths among young chillren worldwide. [1]In India, about 27.4 million cases of ARI were reported in 2008, which gives an incidence rate of

about 2394 cases per lakh population. It contributes to 15-30% of all under-five deaths and most of these are preventable. [2] The proportion of deaths due to ARI in paediatric wards as well as in community is much higher as many children die at home.

Many risk factors for respiratory tract infections have been identified which include not only the climatic conditions but also the poverty, poor nutrition, poor housing conditions, indoor air pollution such as parental smoking, absence of ventilation, overcrowding, industrialization, social cultural values, overuse, overuse and misuse of antibiotics, lack of basic health services and lack of awareness. There are multiple social and environmental factors associated with ARI morbidity and mortality in childhood. These include co morbid illnesses especially HIV, malnutrition, prematurely or measles, environmental determinants particularly passive smoke exposure, poor living conditions and social factors principally poverty and poor access to both preventative (including immunization) and curative health services.

There is general agreement that breastfeeding is good for the growth and health of infants. In less developed countries it may be the only way to provide complete nutrition for sustaining neonates' growth during the first 4+6 months of life, while at the same time reducing the incidence of infectious diseases such as diarrhoea and respiratory tract infections during the first year (1+4). [3] More than two billion of the world's poorest people still relay on biomass (wood, charcoal, animal dung, crop wastes) and coal-burning for household energy needs. Use of these fuels in indoors leads to levels of indoor air pollution many times higher than international ambient air quality standards allow for, exposing poor women and children on a daily basis to a major public health hazard. This exposure increases the risk of important diseases including pneumonia, chronic respiratory diseases including pneumonia, chronic respiratory disease and lung cancer (coal only), and is estimated to account for a substantial proportion of the global burden of disease in developing countries. [4]

Evidence is also emerging that exposure may increase the risk of number of other important conditions, including TB, low birth weight, and cataract, Initial studies suggest that indoor air pollution interventions perform favourably in terms of cost-effectiveness, with, for example, an improved stove Programme costing U$$ 50-100 per DALY saved. Although additional evidence on health risk is required, concerted global action is needed now to implement cost-effective interventions which can deliver substantial health benefits to the poor, and contribute to sustainable development. [5]

There is consistent evidence that exposure to biomass smoke increases the risk of a range of common and serious diseases of both children and adults. Chief amongst these are acute lower respiratory infections (ALRI) in childhood, particularly pneumonia Association of exposure with chronic bronchitis [assessed by symptoms] and chronic Obstructive pulmonary [COPD- progressive and incompletely reversible airways obstruction] (assessed by spirometry and clinical assessment) is also quite well established, particularly among women. [6] In addition there is evidence (mainly from China), that exposure to coal smoke in the home markedly increases the risk of lung cancer, particularly in women [7]

In recent years, new evidence has emerged which suggests that indoor air pollution (IAP) in developing countries may also increase the risk of other important child and adult health problems, although this evidence is more tentative, being, based on fewer studies. [8] It includes conditions such as low birth weight, perinatal mortality (still births and deaths in the week of life) asthma and middle ear infection for children, tuberculosis nasopharyngeal and laryngeal cancer, and cataract in adults [9] In view of this background, this study was planned to estimate the incidence of respiratory infections and its associated risk factors among infants from an urban field practice area of Chidambaram, Cuddalore district, Tamilnadu.

Methodology

Study Design : Cohort Study

Study Population : Infants under 1 year

Study area : Urban area of Chidambaram, Cuddalore District, Tamilnadu

Study Period : 1.11.2020 - 30.04.2022 (1 and half years)

Study Tool : Interview Schedule, infant weighing scale , Inch Tape

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Data collection method: A house to house survey was made in urban field practice area of a medical college in Chidambaram District, Tamilnadu to identify the infant under 1 year of age to find out the‘ incidence of episodes of respiratory tract infection and to correlate the selected variables and risk factors. 150 infants were identified as a period sample based on inclusion criteria during 15* visit and were followed at the age of 6"‘ month, 9*“ month and 12*‘ month of age.

The environmental history like type of house, cooking pattern and location of kitchen whether it is inside or outside, Type of fuel used like wood, gas, or kerosene stove were noted, weight and height were measured according to the standard criteria, the incidence of respiratory tract infection was assessed with symptoms reported by the mother like cough, fever, wheezing, stridor, running nose. A detailed history of episodes of respiratory tract infection occurred previous to the present visit and the clinical examination was done by the investigator at the time of visit.

Statistical Analysis

Incidence of RTI was assessed by 100 person days. The average number of episodes was assessed using arithmetical mean.The average number of episodes of RTI of different categories of the selected variables were analysed by ANOVA.

Statistical analysis was done using Microsoft excel, SPSS version 22 and Epi info software

Operational Definitions

a) **Respiratory tract infection:** Children with any one or combinations of symptoms and signs like cough and cold, running or blocked nose, sore throat, rapid breathing, noisy breathing, stops feeding and drinking, chest in drawing etc, A new episode was taken as one occurring in an individual who had been free of symptoms for at least three consecutive days or more as per WHO (1997) definition of ARI.

b) **Stridor:** Stridor is a harsh, vibratory sound of varying pitch caused by turbulent airflow through an obstructed airway.

c) **Wheeze:**A wheeze is a continuous, coarse, whistling sound produced in the respiratory airways during breathing.

Inclusion Criteria

Mothers willing to participate in the study were included. Babies who were reportedly normal at the time of delivery, with normal / appropriate weight for age and Infants under one year of age were included in the study.

Exclusion Criteria

Babies with congenital anomalies diagnosed at or immediately after birth. Babies with chronic respiratory tract infection such as progressive primary complex and Low birth weight and preterm babies were excluded from the study

Informed Consent: Informed consent was obtained from the mothers prior to the investigation

Ethical Committee approval: Institutional ethical committee approval was obtained

Results

Data collected and analysed are represented in form of tables and graphs. Table 1 shows the sociodemographic characteristics and housing conditions of the study respondents. From table 1 it shows that 45.3% mother were in the age group of 25-29 years. The table shows that (21.3% were illiterate and those who had beyond primary level education was 78.3%.It is also noticed that 95.3% of the mothers were home makers and only 4.6% of mothers were employed. Maximum number of Mothers (48%) i.e 72 out of 150 lived in huts, followed by 31.3% of mothers who lived in kutcha house. Majority of the mothers 84.6%, had kitchen inside their houses. Mong the study respondents most of the mothers (75.5%) used gas for cooking and 17.3% of mothers used fire wood for cooking. It can also be seen that that the sex of the study subjects were almost equal in number.

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Table 1: Sociodemographic and housing characteristics of study participants (N=150)

Sno	Characteristic	Frequency	Percentage (%)
1.	**Age of mother**		
	21-24	66	44
	25-29-	68	45.3
	30-34	16	10.7
2.	**Mother's education status**		
	Literate	32	21.3
	Primary School	17	11.3
	Middle School	22	14.3
	High School	34	22.7
	Intermediate	30	20
	Graduation	15	10
3.	**Mothers Occupation**		
	Home Maker	143	95.3
	Employed	7	4.6
4.	**Age distribution of baby**		
	<7	4	2.6
	8-15	13	8.6
	16-30	33	22
	31-60	26	17.3
	61-90	31	20.6
	91-120	43	28.8
5.	**Sex distribution of infants**		
	Male	76	50.6
	Female	74	49.3
6.	**Type of housing**		
	Kutcha	47	31.3
	Pucca	31	20.6
	Hut	72	48
7.	**Location of Kitchen**		
	Inside	127	84.6
	Outside	3	15.3

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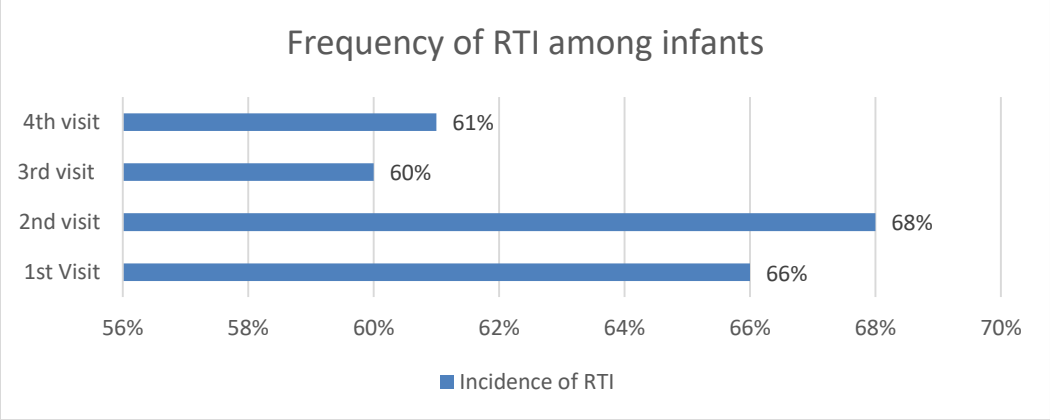
8.	**Type of fuel used in kitchen**		
	Gas	113	75.5
	Wood	26	17.3
	Kerosene	11	7.3

From table 2 we can notice the weight and length distribution of our study participants. The table shows the height at length of infants at theor1st visit.

Table 2: Distribution according to the Weight and length of the Baby at first Visit (N=150)

S No	Age of the Baby in days	No of Cases	Minimum	Maximum	Mean	SD
1	**Weight of infant**					
	<7	4	2.8	2.9	2.82	0.050
	8-15	13	2.3	3.4	2.915	0.341
	16-30	33	2.3	3.7	3.124	0.313
	31-60	26	3	4.6	3.665	0.36
	61-90	31	3.8	4.9	4.40	0.234
	91-120	43	4.4	6.8	5.91	0.585
2	**Length of Infant**					
	<7	4	36	45	38	4
	8-15	13	37	52	42	4
	16-30	33	37	51	43	3
	61-90	26	38	60	48	4
	91-120	43	52	64	60	2

Figure 1: Frequency of RTI among infants during their 1st, 2nd ,3rd and 4th visits



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The frequency of respiratory tract infection among infants is illustrated in Figure 1. It is noticed that majority of infants (68%) had RTI during their 2nd visit, followed by 66% during their 1st visit. Most of the infants had RTI in their 1st and 2nd visit. In subsequent 3rd and 4th visits there is decrease in frequency of RTI as 60% and 61% respectively. The Frequency of episodes on RTI on follow up visits is depicted in Figure 2. During the 2nd visit, 41.1% of the infants had atleast 2 episodes of RTI followed by 29.6% had 3 episodes and 26.4% had one episode. On subsequent 3rd visit, the 38% of the study population had 1 episode and same had 2 episodes in 3rd visit. During the 4th visit, majority 41.7% had 2 episodes of RTI.

Figure 2: Frequency distribution of episodes in visits

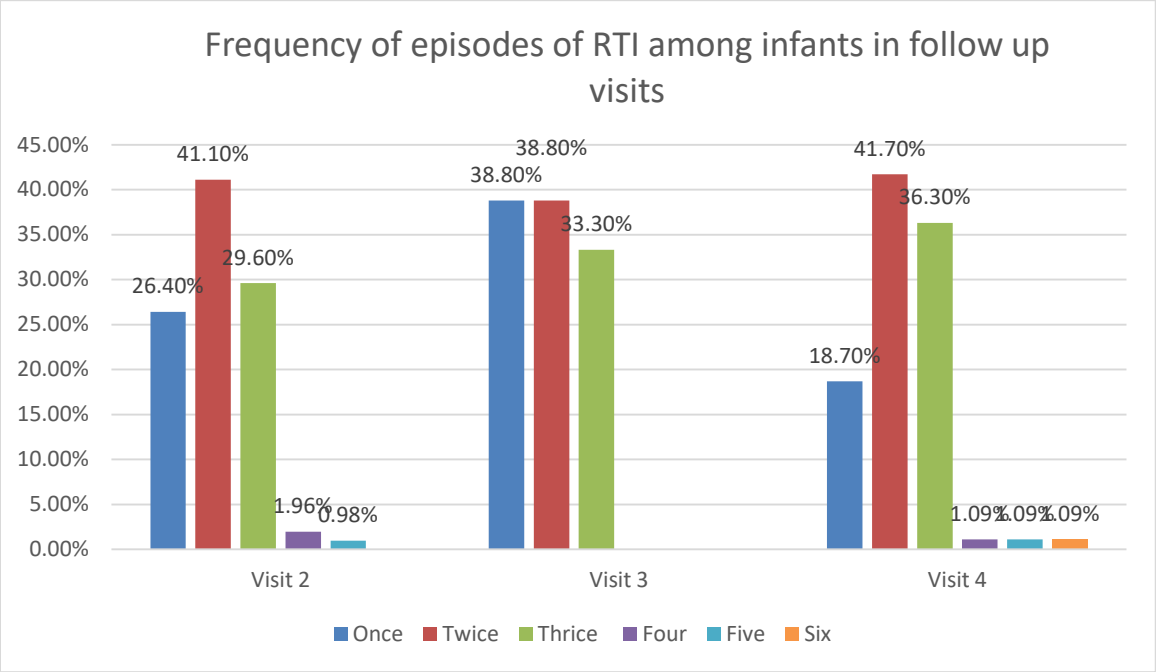

Table 3: Presence of symptoms in follow up visits among infants (N=150)

Sno	Characteristic	Frequency	Percentage (%)
1.	**At 1st visit**		
	Present	100	66.6
	Absent	50	33.3
2.	**At 2nd visit**		
	Present	102	68
	Absent	48	32
3.	**At 3rd visit**		
	Present	90	60
	Absent	60	40
4.	**At 4th visit**		
	Present	91	60.7

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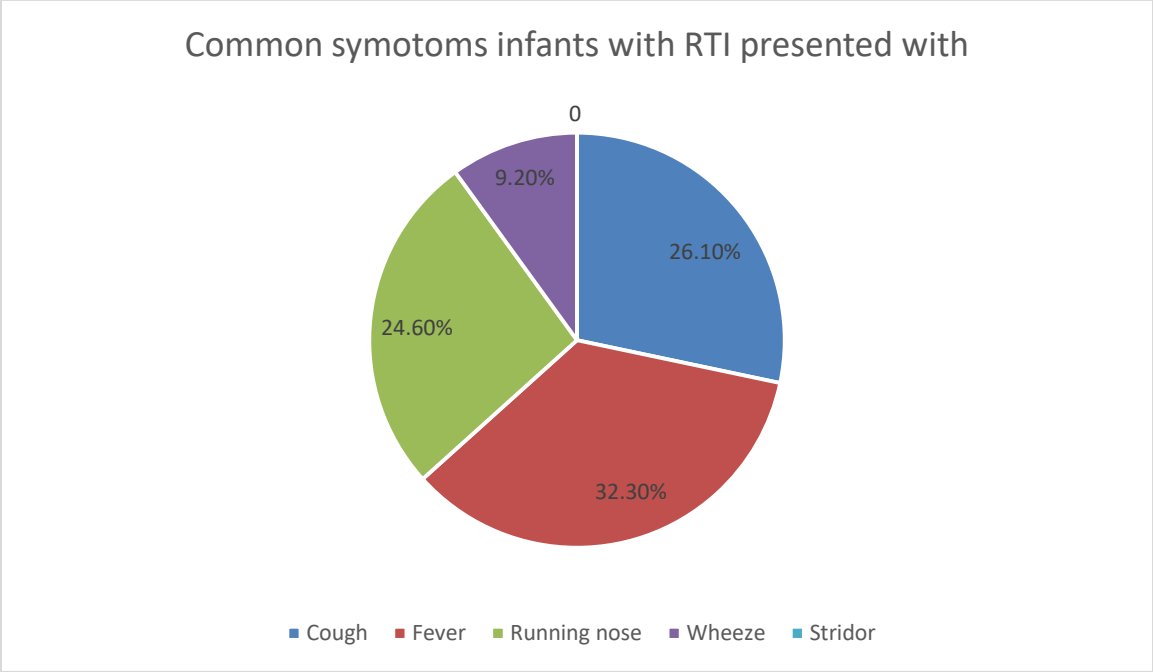
	Absent	59	39.3
5.	**Whole year**		
	1-3	46	32.6
	4-6	47	33.3
	7-9	40	28.3
	10-12	8	5.67

Figure 3: Symptoms of Respiratory tract infection among infants



Nearly, 66.6% of children had history of RTI at first visit as shown in table 3. Over a period ranging from less than 7 days to 120 days. The above table shows that 68% had history of episode of RTI at 2nd visit since first visit. Nearly 41.1% of babies had 2 episodes of RTI during 2nd visit followed by 3 episodes for 29.4% and one episode for 26.4% of babies. Majority (32.3%) of infants reported with fever, followed by cough and running nose (26.1% and 24.6%). The above table shows that 60% of the babies had RTI during 3 months interval between second and third visit.In one third of the babies, the number of episodes were 3 during the period between 2nd and 3rd visit. During 3rd visit maximum (36.3%) reported to have fever followed by cough and running nose (20% and 20.9%). At the time of 4th follow up (12 months) 60.6% of babies reportedly had RTI. Majority (41.7%) had 2 episodes of RTI and 3% had more than 3 episode.

Incidence of Episodes of RTI

$$= \frac{\text{Total No. of Episodes Occurred for the entire follow-up}}{\text{Total No. of Person Time in Days}}$$

$$= \frac{707}{41000} = 0.0172$$

= 1.72 episodes / 100 person days

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Average = 707

150 = 4.71

Table 4: Analytical statistics on Association between various socio demographic and housing characteristics with Incidence of Respiratory tract infection among infants.

SNo	Characteristic	Number	Total No. of Person Time (in Days)	No. of Episodes Occurred	Incidence of Episodes and RTI @	Mean*	SD	ANOVA F value	P value
1.	**Gender**								
	Male	76	20758	352	0.016	4.632	3.085	0.108	0.743
	Female	74	20242	355	0.017	4.797	3.097		
2.	**Type of House**								
	Hut	72	18971	369	0.019	5.12	3.09	2.148	0.120
	Kutcha	47	13915	186	0.013	3.957	2.87		
	Pucca	31	8114	152	0.018	4.90	3.22		
3.	**Location of Kitchen**								
	Inside	127	34684	581	0.016	4.57	2.9	2.148	0.120
	Outside	23	6316	126	0.019	5.47	3.47		
4.	**Type of fuel used**								
	Gas	113	31108	515	0.016	4.55	2.98	0.636	0.531
	Wood	29	7887	153	0.019	5.27	3.46		
	Kerosene	8	2005	39	0.019	4.87	3.18		
5.	**Education of mother**								
	Illiterate	32	9180	124	0.013	3.87	2.95	0.669	0.647
	Primary School	17	4313	82	0.019	4.82	2.72		
	Middle School	22	5976	108	0.018	4.90	3.32		
	Higher Secondary School	34	9621	177	0.018	5.20	3.01		
	Intermedial	30	7769	144	0.018	4.80	3.17		
	Graduating	15	4142	72	0.017	4.80	3.46		

*-Average number of episodes per individual., @-Incidence rate per 100 person days.

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From Table 4 it is observed that the mean episode of RTI in male babies was 4.632 and the number of episodes occurred was 352/1000 person and the number of episodes in female babies was 353 and the mean episodes was 4.797. Hence the episode occurrence was similar for both with p value - 0.743. There was no significant association between sex of the babies and episodes of RTI. Also the mean episodes in Kutcha type of house whereas the mean episode in hut was 5.12. However the different was not statistically significant.

It can be noticed that the mean episodes of RTI in families who have their kitchen inside the house was (4.57) and the number of episodes was (581) and the mean episodes of RTI in families who have kitchen outside was (5.47) with number of episodes (126) with p value 0.120. There was no significant association between location of kitchen and incidence of RTI. The mean episodes of RTI of the family using gas as their fuel was (4.55) with number of episodes 515. wood as their fuel was (5.27) with number of episodes 153 and kerosene as their fuel the mean was (4.87) and number of episodes occurred was 39 with p value 0.531. Hence there was no statistically significant difference was found between type of fuel used and episodes of RTI. There was no statistically significant association between episodes of RTI and educational status of mothers

Discussion

The present study was carried out to find out the incidence of episodes of respiratory tract infection among children less than one year of age. The study was made on 150 infants in and urban area of Chidambaram district, Tamilnadu. The 150 infants were followed for 4 visits. 1st visit with in 4 months, second visit at 6 months, third visit at 9th month and fourth visit at 12th month. 49.4% of the study subjects were in the age group of 2-4 months of age. The literacy status of mothers was 78.3%. [12]

The prevalence of RTI at first visit was 66.6%. Among the children less than 4 months of age, it was almost close to 72% a study conducted by Rahman et al among slum infants in dacha but it was higher than 41.8% by a study conducted by Rapit Goel among infants.[13] Infant 41.1% and 29.4% of the infants had 2 and 3 episodes of RTI respectively in second visit at 6 months. The incidence RTI was in 60% of the babies during second visit and one third of babies had 3 episodes of RTI between 2nd and third visits. At fourth visit 60.6% of the babies had RTI and 41.7% had more than 3 episodes, it shows that more number of infants were getting RTI regularly. This present study had found that the incidence of episodes of RTI was 4.7 in a year among infants and these findings was similar to 4.7 episodes per 100 days in a study conducted by Anders Koch et al., in greenland and another study by J. Mukhopadhye also found out that the incidence of episodes as 3.5 in infants. [14],[15]

A study conducted at Delhi rural area by P. Chhabra shows that the incidence of episodes of RTI among O-1 month infant was 3. In another study by Elite in Turkey has found out little higher episodes of 6.5 episodes per child per year. This study has found but that there was no association between episodes of RTI and educational status of mothers and this factor was supported by Bipin Prajapah who has reported that there was no association between episodes of ARI and educational status of mothers as in this study. [12]The present study had not found out any association between sex of the babies and episodes of RTI and similar finding was also reported out by P. Chhahra in her study.[16] The present study had identified that there was 1.4 times higher risk of RTI among babies living in hut compared to babies living kutcha and pucca houses and these finding was supported by a study conducted by Rahman in which he has reported that RTI was 2.39% times higher in infants living in low housing standard. From a study conducted by Ganesh kumar, et al in Pondicherry , the estimated Overall prevalence of ARI was observed to be 59.1%, with prevalence in urban and rural areas being 63.7% and 53.7%, respectively. [17]

Conclusion

Programs for community education should concentrate on addressing specific issues, such as identifying respiratory illnesses, straightforward case treatment, effective immunisation procedures, breastfeeding new-borns and children, and lowering indoor air pollution. Mothers should be informed that eating bananas is not a correct taboo and that cold weather is more of a supporting causal factor for ARI than a predisposing factor. They should be told about ways to promote health, such blowing the child's nose, keeping them warm in cold weather, and adding moisture to the air (like hanging damp clothes in the room) to help a sick child's upper respiratory

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passages feel better. Therefore, it is necessary to raise awareness among parents and the community at large through appropriate health education/IEC programmes.

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