ORIGINAL ARTICLE ASIAN JOURNAL OF MEDICAL SCIENCES

Incidence of respiratory infections and its correlation with smoke exposure among infants from an urban field practice area in Tamil Nadu

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Submission: 09-02-2023 Revision: 09-03-2023 Publication: 01-06-2023

ABSTRACT

Background: Children's acute lower respiratory infections are most prevalent among new-born. Clinical evaluation and symptoms help to establish the connection between smoke exposure and acute respiratory tract infection (ARTI). Furthermore, there is proof that exposing children to coal smoke considerably increases their risk of developing ARTI. **Aims and Objectives:** This study was designed to estimate the incidence of respiratory tract infection (RTI) among selected cohort of infants in urban field practice area of Tamil Nadu and to correlate the incidence of RTIs with smoke practices. **Materials and Methods:** In Tamil Nadu's urban field practice area, a cohort study of infants was done. A house-to-house survey was conducted and information was gathered among 150 newborns who were tracked after being selected as a period sample based on inclusion criteria at a 15* visit. Numerous data on ARI episodes, housing circumstances, and smoke exposure were gathered and correlated. Software such as Epi info and SPSS version 22 were used to analye data. **Results:** The incidence of TI was calculated to be 1.7 episodes per 100 person days and 4.7 on average among the 150 newborns chosen. Nearly 48% of people lived in huts, 84% had indoor kitchens, and 75% cooked with gas. Infants who appeared to regularly be exposed to passive smoking have a little increase in the incidence of mean RTI bouts. **Conclusion:** The additional hospital admissions, which are entirely preventable, place a heavy load on the public health system. It is evident that new initiatives are required to stop infants from being exposed to passive smoke during and after pregnancy. Improving international Electrotechnical commission activities play an active role is reducing incidence of RTIs among infants. Intensified educational interventions on ill effects of indoor and outdoor smoke, passive smoking helps in addressing the issue.

Key words: Infant mortality; Passive smoking; Respiratory tract infection

Access this article online

Website: http://nepjol.info/index.php/AJMS

DOI: 10.3126/ajms.v14i6.52302

E-ISSN: 2091-0576

P-ISSN: 2467-9100

INTRODUCTION

There is strong evidence that exposing people to biomass smoke increases their chance of developing a number of serious and common diseases.[1] Acute lower respiratory infections in children, particularly pneumonia, are the most common of these. The link between exposure and chronic bronchitis, which is determined by symptoms, and chronic obstructive pulmonary disease, which is determined by spirometry and clinical assessment, is also pretty well established, especially in women.[2] In addition, there is evidence that shows coal smoke exposure in the house significantly raises the incidence of lung cancer, especially in women (mostly from China).[3,4]

Although this information is more questionable because it is based on fewer research, there is new evidence that suggests indoor air pollution (IAP) in developing nations may also increase the risk of several significant child and adult health problems. Low birth weight, perinatal mortality (stillbirths and deaths within the 1st week of life), asthma and middle ear infection in children, TB, nasopharyngeal and laryngeal cancer, and cataract in adults are a few of the disorders that fall within this category.[5] Children who are exposed to second

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hand smoke are more likely to get ear infections, severe asthma attacks, respiratory symptoms (such as coughing, sneezing, and shortness of breath), respiratory infections (such as bronchitis and pneumonia), and other conditions. Similarly in children aged 18 months or younger, second hand smoke exposure is responsible for an estimated 150,000–300,000 new cases of bronchitis and pneumonia annually and 7500–15,000 hospitalizations in the United States.[6]

Pneumonia caused roughly 70–75% of newborn mortality overall. A risk factor for pneumonia was also being exposed to cooling. Children of smokers were more prone to pneumonia than those who were not exposed to cigarette smoke in both developing and wealthy nations. A major factor in ARI among child deaths was also strongly suggested to be IAP (World Bank, 1993).[7] Adult non-smokers who were exposed to passive smoking developed lung cancer and ischemic heart disease, while children who were exposed to passive smoking developed respiratory illnesses, cot deaths, middle ear infections, and asthma episodes.[8]

In the UK, 42% of youngsters reside in a household where at least one smoker is present. Young children had a 72% higher risk of respiratory diseases in homes with two smokers. In the UK, the consequences of passive smoking result in the hospitalization of more than 17,000 kids under the age of five every year.[9] Children who were exposed to passive smoking were more likely to have cardiovascular and neurological impairment, bronchitis, pneumonia, coughing and wheezing, asthma attacks, middle ear infections, and cot death.[10]

This study was planned to estimate the incidence of respiratory tract infection (RTI) among selected cohort of infants in urban field practice area of Tamil Nadu and to correlate the incidence of RTIs with smoke practices.

Aims and objectives

This study is planned to estimate the incidence of RTI among selected cohort of infants in urban field practice area of Tamilnadu and to correlate the incidence of respiratory tract infections with smoke practices.

MATERIALS AND METHODS

This cohort study was planned among infants residing in an urban field practice area of Tamil Nadu for a period of 1 ½ years from February 01, 2021, to August 30, 2022. Method used for data collection was interviewing. To determine the prevalence of episodes of respiratory tract illness and to connect them with smoke exposure, a house-to-house survey was conducted in the urban field practice area of a medical college in Tamil Nadu to identify infants younger than 1 year of age.

The mother's reports of her child's cough, fever, wheezing, stridor, and running nose were used to determine the likelihood of a RTI. Other environmental factors considered included the type of house, cooking habits, and whether the kitchen was located inside or outside. Weight and height were also recorded using the standard criteria. Before the current visit, a thorough history of RTI episodes was provided and the clinical examination was done by the investigator at the time of visit.

RTI incidence was calculated using 100 person days. The mathematical mean was used to determine the average number of episodes. Analysis of variance was used to analyze the average number of RTI episodes for the various categories of the chosen factors. Software such as Microsoft Excel, SPSS version 22, and Epi Info were used for the statistical analysis.

Operational definitions

RTI

Children who exhibit any one or many symptoms and signs, such as a cold and cough, a runny or stuffy nose, a sore throat, quick or noisy breathing, cessation of eating or drinking, chest compression, etc. According to the World Health Organization (WHO's) definition of ARI from 1997, a new episode was defined as one that started after the person in question had gone at least 3 days without experiencing any symptoms.

Stridor

The loud and vibrating sound known as stridor is produced when turbulent airflow passes through a blocked airway.

Wheeze

A wheeze is a breathing-related continuous and coarse whistling sound made in the respiratory airways.

Inclusion criteria

Mothers who agreed to take part in the research were included in the study. Infants under 1 year of age who were reportedly normal at the time of delivery, had normal or age-appropriate weights, and were included in the study.

Exclusion criteria

Babies with congenital abnormalities identified at birth or right away were excluded in the study. The study excluded infants with persistent respiratory infections such as progressive primary complicated, low birth weight, and preterm birth. Informed consent was obtained from the mothers before the investigation. Institutional ethical committee approval was obtained.

RESULTS

This cohort study was done among infants under the age of one in field practice area in Tamil Nadu, to estimate the

incidence of RTIs and to assess their association with various smoke exposures has come out with interesting results, which are presented here in the form of tables and graphs.

A total of 150 infants from urban filed practice area were chosen and their mothers were interviewed. Sociodemographic determinants, behavioral risk factors, comorbid conditions, family history of smoking, various smoke exposures, and association were analyzed in this study. The results of the study are given below and explained in the form of tables and figures.

Among the 150 infants, approximately 45% of the infants, mothers belonged to age group 25–29, while the remaining 45% belonged to 21–24 and minimum of 10% belonged to age group <34. When interviewed regarding mothers educational status and occupation, nearly 23% had completed up to high school and 95% of them were homemakers.

Figure 1 represents the age distribution among our study participants. It can be seen that majority 28.8% of the babies were between 90 and 120 days. Furthermore, sex distribution was equal among the infants.

The housing conditions are illustrated in Table 1, from which we can see that maximum lived in hut (48%), and nearly 84% had their kitchens located inside their house and also the type of fuel used were gas by majority of the respondents, followed by wood and kerosene.

Figure 2 shows how common RTIs are in babies. The majority of infants with RTI (68%) were diagnosed on their second appointment, followed by 66% during their first visit. In their first and second visits, the majority of the infants had RTI. There is a 60% and 61% drop in RTI frequency in the third and fourth visits that follow, respectively. Figure 2 shows the frequency of RTI episodes during follow-up visits. A total of 41.1% of the infants had at least two episodes of RTI on the second visit, followed by 29.6% who had three episodes and 26.4% who had just one. 38% of the study population had one episode on the subsequent third appointment, and the same group had two episodes on the third visit. During the fourth visit, majority 41.7% had two episodes of RTI.

As shown in the Table 2, 4–6, episodes were reported in 33.3% babies followed by 7–9 episodes in 28.3% of babies. 10–12 episodes were reported in 5.67% of babies.

$$\text{Incidence of Episodes of RTI} = \frac{\text{Total No. of episodes occurred for the entire follow-up}}{\text{Total No. of person time in days}}$$

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

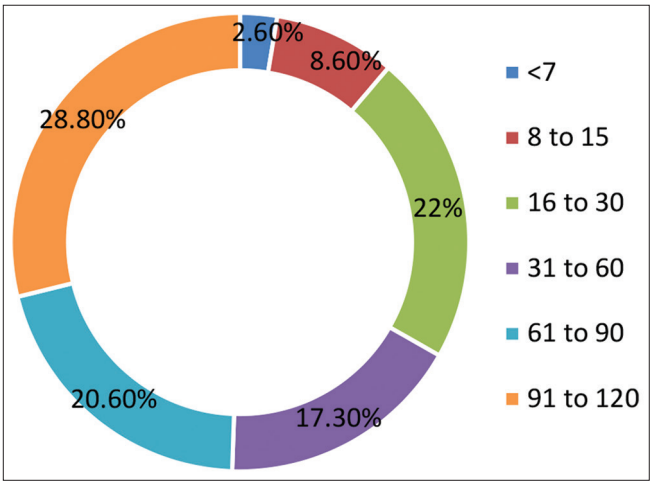

Figure 1: Age distribution of baby

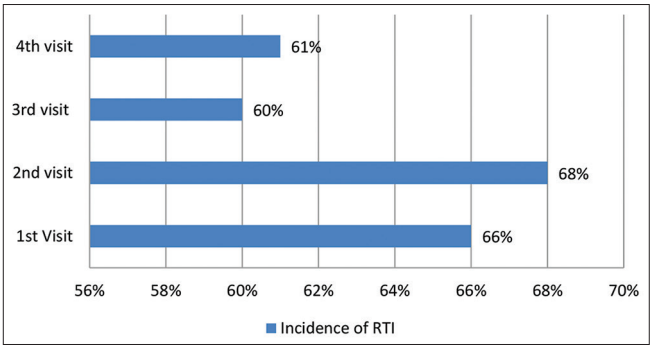

Figure 2: Frequency of respiratory tract infection among infants

Table 1: Housing conditions among study respondents

S. No.	Determinant	Frequency	Percentage
1	Type of housing		
	Kutcha	47	31.3
	Pucca	31	20.6
	Hut	72	48
2	Location of Kitchen		
	Inside	127	84.6
	Outside	3	15.3
3	Type of fuel used in kitchen		
	Gas	113	75.5
	Wood	26	17.3
	Kerosene	11	7.3

Table 2: Frequency distribution of episodes of RTI for the whole year

Number of episodes	Number of infants	Percentage
1–3	46	32.6
4–6	47	33.3
7–9	40	28.3
10–12	8	5.67
Total	141	100

Table 3: Association table

Type of Fule	Number	Total No. of person time (in days)	No. of episodes occurred	Incidence of episodes and RTI@	Mean*	SD	ANOVA F value	P-value
Analysis of variance of type of fuel used and the episodes of RTI								
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		
Analysis of variance on data of exposure to passive smoking and episodes of RTI								
Nil	103	28788	478	0.016	4.64	3.07	0.924	0.431
Regular	34	9045	178	0.019	5.23	3.09		
Intermediate	7	1769	25	0.014	3.571	3.20		
Rare	6	1398	26	0.018	4.33	3.2		
Analytical variance among the smokers in the family and the episodes of RTI								
Smokers	47	212212	229	0.018	4.87	3.12	0.181	0.671
Non smoking	103	28788	478	0.016	4.64	3.07		

*Average number of episodes per individual. @Incidence rate per 100 person days. ANOVA: Analysis of variance

$$= 1.72 \text{ episodes } / \text{ 100 person days}$$

$$\text{Average} = \frac{707}{150} = 4.71$$

The average number of RTI episodes for the household who uses gas as their primary fuel was (4.55), with 515 episodes total. Kerosene as their fuel had a mean of (4.87) and 39 episodes happened, with P=0.531, while the mean for wood as their fuel was (5.27) and there were 153 episodes. Therefore, no statistically significant association between fuel type and RTI episodes was discovered.

There was no statistical correlation between the various types of exposure, despite the fact that there was a little increase in the incidence of mean RTI episodes among the infants who apparently experienced passive smoking on a regular basis.

Table 3 further demonstrates that the mean number of episodes of RTIs among smokers was (4.87) with a total of 229 episodes, while the mean number of episodes among non-smokers was (4.64) with a total of (478).

As a result, children who had smoking family members had a higher incidence of RTI (P=0.671). The prevalence of RTI episodes among infants whose parents smoke was determined to be statistically insignificant. Between smokers and non-smokers, the relative risk was 1.125.

DISCUSSION

In this study, it is found that as the age increase the RTI rate also increase. There is no significant association between the mother's education and RTI among infants. Similarly, there is no association between the type of fuel use for cooking by the respondents and RTIs among infants. In this study for maximum respondents had place of cooking is found to be inside the house. The association of relative risk of passive smoking and respiratory infection among infants is found to be 1.125. There is a positive association between the type of house and the rate of RTI among the infants.

The association between passive smoking and the risk of moderate-to-severe ARI was not established in this study and this conclusion was supported by a cohort study conducted in Soweto by Kristensen and Olsen, who also found inconsistent results between the presence of smokers in the home and severe acute lower respiratory infection in the studies included in the review.[11]

In this study, it was discovered that the majority of respondents cooked in their homes. Infants have a 1.125 relative risk of respiratory illness when passive smoking is present. The rate of RTI in babies is positively correlated with the kind of home.[12] IAP has been associated in studies from less developed nations to lung cancer, stillbirths, low birth weight, heart problems, and chronic respiratory illnesses like asthma. Between 100 million and 150 million individuals worldwide suffer with asthma, a condition marked by repeated spells of shortness of breath and wheezing.[13]

Worldwide rates of asthma had climbed by 50%/10 years since 1980; urbanization and an increase in time spent inside were substantially connected with this growth. The condition causes over 180,000 deaths annually, including 25,000 children. According to the WHO, the prevalence of asthma symptoms in children varies from 20% to 30% in Brazil, Costa Rica, Panama, Peru, and Uruguay; it is close to 20% in Kenya.[14]

Limitations of the study

We were unable to receive any funding as of which X-ray or other investigations were unable to be carried out.

CONCLUSION

This study thus provides further precision in the estimates of the magnitudes of those effects in relation to variations

in the source and extent of passive smoking in the home and confirms that exposure to all types of passive smoke, in particular maternal smoking, causes a statistically significant increase in the risk of infants developing lower respiratory infections in the first 2 years of life. It is notable that the study also identified clinically diagnosed bronchiolitis as a specific adverse effect of exposure, one that can result in considerable morbidity and, in some cases, mortality. Infants frequently develop lower respiratory infections; as many as 33,000 infants under the age of two are admitted to hospitals in England alone due to these infections, 10% of which are thought to be caused by passive smoking.[15] These additional hospital admissions, which are entirely preventable, place a heavy load on the public health system. It is evident that new initiatives are required to stop infants from being exposed to passive smoke during and after pregnancy.[16]

ACKNOWLEDGMENT

We thank our institution for supporting us in conducting this study. We also thank field staffs who took initiative in identifying the mothers with infant children. We are thankful to all the study participants who actively enrolled in the study. This study is a part of TN Dr. MGR Medical University, Guindy.

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Authors Contribution:
Authors' Contributions:
SKP- Definition of intellectual content, literature survey, prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation, and submission of article; **SR-** Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision; **RC-** Design of study, statistical analysis, and interpretation; **EVK-** Literature survey and preparation of figures, coordination, and manuscript revision.

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Source of Support: Nil, **Conflicts of Interest:** None declared.