Original Research Article

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20173692

Study of risk factors of acute respiratory infections in children admitted in a tertiary care hospital of Southern Maharashtra

Alka C. Kaware¹*, Nitin H. Kamble², S. K. Mangulikar³

Department of Community Medicine, ¹Government Medical College, Gondia, Maharashtra, ²Government Medical College, Rajnandgaon, Chhatisgarh, ³Dr. V. M., Government Medical College, Solapur, Maharashtra, India

Received: 21 July 2017 Accepted: 08 August 2017

*Correspondence: Dr. Alka C. Kaware,

E-mail: alkakwr1@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Acute respiratory infections (ARI) is an important cause of mortality and morbidity in children. In India, it constitutes 15% of under five deaths. Various risk factors are responsible for ARI in children. Study of risk factors will help to reduce the high morbidity and mortality due to ARI. The objectives were to study risk factors responsible for acute respiratory infections in children and to find out case fatality rate &/ outcome of acute respiratory infections ARI in children.

Methods: A hospital based cross sectional study was done in 2013-14 in a tertiary care centre to study the risk factors associated with ARI in children. All the pediatric patients between 0-12 years admitted in a tertiary care centre at Solapur were enrolled in the study.

Results: Acute respiratory tract infections (ARI) were more common in 1-4 years age group i.e. 57.31% (196). It was more common in males i.e. 64.33% (220) than females i.e. 35.67% (122). ARI was more common in lower socioeconomic classes i.e. class V (50.58%), class IV (22.52%); in patients whose mothers were illiterate 43.28% and who had history of parental smoking 84.21%. Maximum patients of ARI were having history of overcrowding 75.73%, inadequate cross-ventilation 81.87% and use of smoky chullah 78.65% in their home. Statistically significant association found between ARI cases and these socio-demographic factors. 46.78% (160) were incompletely immunized and 16.37% (56) were not immunized at all. Only 36.84% (126) were completely immunized for their age. Maximum cases of ARI (50.88%) occurred in winter season followed by rainy season (26.90%). Outcome showed that 91.52% (313) were cured, while 1.75% (6) patients died due to ARI.

Conclusions: The present study has identified various socio-demographic, nutritional and environmental risk factors for ARI which can be prevented by effective health education and an appropriate initiative taken by the government.

Keywords: Acute respiratory infections, Risk factors

INTRODUCTION

In India, an estimated 26 millions of children are born every year. As per Census 2011, the share of children (0-6 years) accounts 13% of the total population in the Country. An estimated 12.7 lakh children die every year before completing 5 years of age. Acute respiratory infection (ARI) is a leading cause of mortality and morbidity in under five children in developing countries.

Worldwide 3.9 million deaths of young children occur due to ARI every year. It is estimated that Bangladesh, India, Indonesia and Nepal together account for 40% of global ARI mortality. As per WHO 2012 estimates, the causes of Child Mortality in the age group 0-5 years in India due to ARI (pneumonia) is 15%. Although most of the attacks of ARI are mild and self-limiting but it is responsible for about 30-50% visits to health facilities and for about 20-40% admissions to hospital. According

to NFHS 4, prevalence of ARI in the last 2 weeks preceding the survey was 2.7% in India and 2.4% in Maharashtra; while children with ARI in the last 2 weeks preceding the survey taken to health facility were 73.2% in India and 84.7% in Maharashtra.4 Acute respiratory infection (ARI) is an acute infection of any part of the respiratory tract and related structures including Para nasal sinuses, middle ear and plural cavity. It includes all infections of less than 30 days duration except those of middle ear where the duration of an acute episode is less than 14 days.⁵ Childhood morbidity consumes a substantial portion of health care resources in a hospital. The overload in hospital ward remains a major source of concern in many countries, including India, for policy makers. A country needs sound epidemiological information to prioritize, plan and implement the public health care system effectively. Morbidity data from hospitalized patients reflect the causes of major illnesses and care seeking behaviour of the community. Understanding of hospital burden due to ARI morbidity could contribute to a more effective approach in designing appropriate service. This information also provides the basis for patient care in a hospital.⁶

The present study will provide essential data to find out some risk factors of ARI in paediatric patients admitted in a tertiary care centre. It will help to detect case fatality rate or outcome of ARI. It will help to formulate the health promotional policies in future that will ultimately help to reduce mortality and morbidity due to ARI.

Objectives

- 1. To study risk factors responsible for Acute respiratory infections (ARI) in children,
- 2. To find out case fatality rate &/ outcome of Acute respiratory infections (ARI) in children.

METHODS

Study area

The present study has been carried out in a tertiary care centre at Solapur over a period of one year from 1st January 2013 to 31st December 2013.

Study design

It is a hospital based cross sectional study of patients between 0-12 years admitted in paediatric ward of a tertiary care centre.

Study population

All the cases of acute respiratory infections admitted in paediatric ward.

Period of study

The study period was of 1 year from 1st January 2013 to 31st December 2013.

Data collection

The purpose of the study was explained to the parent or guardian of the child and informed consent was taken before enrolling them in the study. The sociodemographic and epidemiological information of the cases were collected by interviewing the parents or guardians of the child using a pre-tested proforma. A detailed clinical review, including history and clinical examination was done. In every case, health education was given to the parent or guardian of the child for prevention of similar attacks of disease in future. The cases were followed and the outcome in relation to mortality was recorded.

Inclusion criteria

Inclusion criteria were paediatric patients of acute respiratory infections from 1 January 2013 to 31st December 2013; parents or guardians of patients admitted in paediatric ward up to the age of 12 years who had given consent to take part in the study.

Exclusion criteria

An exclusion criteria was parents or guardians of patients not giving consent.

Statistical analysis

The detailed data was entered into the Microsoft Excel 2010 spreadsheets, presented in the form of tables and figures and subsequently analyzed statistically using percentages, Chi-square test. For all the statistical tests, a 'p value' of less than 0.05 was considered as statistically significant and 'p value' of less than 0.01 was considered as statistically highly significant.

Terminologies used in the study

1) Education

- Literate: In census, any one above age 7 who can read and write in any language with an ability to understand was considered as literate.⁷
- *Illiterate*: A person who could not read or write in any language.
- Socioeconomic status: Modified B. G. Prasad classification was used.
- 3) Exclusive breast feeding: It means only breast milk nothing other than breast milk except vitamin drops, if indicated given to baby and continued through first six months after birth.
- 4) Indian national immunization schedule²
 - Complete immunization: Received vaccines as per national immunization schedule
 - *Incomplete immunization*: Not taken any one of the vaccine recommended under National Immunization schedule.

 Not done at all: Not taken any vaccine recommended under National Immunization schedule.

5) Malnutrition

- *Underweight*: Weight-for-age below -2 standard deviations (SD) of the WHO standards. ^{9, 10}
- Severe acute malnutrition (SAM): Weight-forheight of below -3 standard deviations (SD) of the WHO standards is used to identify infants and children as having SAM.¹¹
- Moderate acute malnutrition (MAM): Weightfor-height between -2 and -3 standard deviations (SD) of the WHO standards is used to identify infants and children as having MAM.
- 6) Pollution from biomass fuels: Pollution from biomass fuels was considered to be present in the house if the fuel used for cooking were smoke-producing fuels (e.g. wood, crop residues, coal, animal dung).
- 7) History of tobacco smoking in the family: It was elicited by asking if any of the family members were smoking tobacco in the household.
- 8) Case fatality rate: The proportion of cases of a specified condition, which are fatal within a specified time.²

 $Case \ fatality \ rate = \frac{\text{Within a specified period}}{\frac{\text{Diagnosed cases of that disease}}{\text{in the same period}}} \times 100$

RESULTS

Table 1 shows distribution of acute respiratory infection (ARI) patients according to age and sex. Maximum number of patients were from age group 1-4 years i.e. 57.31% (196). ARI was more common in males i.e. 64.33% (220) than females i.e. 35.67% (122). The difference was not statistically significant (p>0.05).

Table 2 shows that, acute respiratory infections were more in lower socio-economic classes i.e. 50.58% in class V and 22.52% in class IV. It was more in patients whose mothers were illiterate 43.28% and who had history of parental smoking 84.21%. Maximum patients of ARI were having history of overcrowding 75.73%, inadequate cross-ventilation 81.87% and use of smoky chullah 78.65% in their home. Statistically significant association found between ARI cases and socio-economic class, mother's education, history of parental smoking, overcrowding, cross ventilation, use of domestic fuel and nutritional status.

Table 1: Distribution of acute respiratory infections (ARI) patients according to age and sex.

Age group in years	Male (%)	Female (%)	Total (%)	
<1	53 (15.50)	33 (9.65)	86 (25.15)	
1-4	130 (38.01)	66 (19.30)	196 (57.31)	
5-12	37 (10.82)	23 (6.72)	60 (17.54)	
Total	220 (64.33)	122 (35.67)	342 (100)	

Table 2: Social demographic factors and Acute Respiratory Infections in paediatric patients.

	Urban	Rural	Total (%)	Chi square test	P value
Distribution of ARI cases					
according to social class					
Social class I	6	1	07 (2.05)		0.02*
Social class II	11	6	17 (4.97)	11.81	
Social class III	39	29	68 (19.88)		
Social class IV	45	32	77 (22.52)		
Social class V	130	43	173 (50.58)		
Mother's education					
Illiterate	69	79	148 (43.28)		<0.01*
Primary	47	16	63 (18.42)		
Middle school	44	7	51 (14.91)	55.85	
Secondary	35	4	39 (11.40)	33.83	
Higher secondary	24	3	27 (07.90)		
Graduation	10	2	12 (03.51)		
Post-graduation	2	0	2 (00.58)		
History of parental smoking					
Yes	201	87	288 (84.21)	4.20	0.04*
No	30	24	54 (15.79)		
Overcrowding					
Yes	187	72	259 (75.73)	10.56	0.001*
No	44	39	83 (24.27)		

Cross ventilation							
Inadequate ventilation	197	83	280 (81.87)	5.576	0.01*		
Adequate ventilation	34	28	62 (18.13)				
Use of domestic fuel							
Smoky chullah	174	95	269 (78.65)	4.702	0.03*		
Smokeless chullah	57	16	73 (21.35)				
Distribution of ARI cases	Distribution of ARI cases						
according to nutritional status							
Normal	76	53	129 (37.72)				
MAM	137	47	184 (53.80)	8.78	0.01*		
SAM	18	11	29 (8.48)				

Table 3: Association between immunization status and occurrence of ARI.

Communicable	Immunization status	Total (0/)	Drolno		
disease	Complete for age (%)	Incomplete for age (%)	Not done at all (%)	Total (%)	r value
Acute respiratory infections	126 (36.84)	160 (46.78)	56 (16.37)	342 (100)	0.01

Table 4: Season-wise distribution of patients.

Communicable disease	Season				Chi ganana	
	Summer (February-May)	Rainy (June- September)	Winter (October - January)	Total	Chi-square test	P value
Acute respiratory infections	76 (22.22)	92 (26.90)	174 (50.88)	342	48.49	p<0.01*

Table 5: Distribution of patients according to outcome.

Communicable	Number of	Outcome of patients			
disease	patients (%)	Cured (%)	AMA and Abscond (%)	Death (CFR%)	
Acute respiratory infections	342 (100)	313 (91.52)	23 (06.73)	6 (1.75)	

Out of 342 patients, maximum numbers of patients i.e. 46.78% (160) were incompletely immunized and 16.37% (56) were not immunized at all. Only 36.84% (126) were completely immunized for their age. There was highly significant association between immunization status and occurrence of ARI (p<0.01) (Table 3).

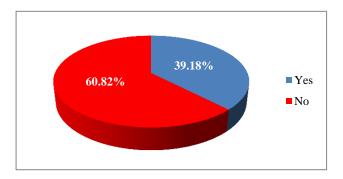


Figure 1: Distribution of ARI patients according to exclusive breast feeding.

Out of 342 patients, maximum numbers of patients i.e. 60.82% (208) were not exclusively breast feed and only 39.18% (134) were exclusively breast feed (Figure 1).

Maximum cases of ARI (50.88%) occurred in winter season followed by rainy season (26.90%). There was significant association between season and occurrence of disease (p<0.01) (Table 4).

Distribution of patients according to outcome shows that maximum numbers of patients i.e. 91.52% (313) were cured, 6.73% (23) went against medical advice and absconded, while 1.75% (6) patients died due to ARI (Table 5).

DISCUSSION

The present hospital based cross sectional study was carried out on patients admitted in paediatric ward of a tertiary care centre over a period of one year from 1st January 2013 to 31st December 2013. All the cases of ARI admitted in paediatric ward were studied.

In the present study, maximum number of patients were from age group 1-4 years i.e. 57.31% (196) followed by below 1 year age group, 25.15% (86); and 17.54% (60) in 5-12 years age group. ARI was more common in males i.e. 64.33% (220) than females i.e. 35.67% (122) (Table

1). In similar study conducted by Singhi et al in Chandigarh found more admission among infants (47%) followed by 5-12 year age group (29%) and 24% among 1-5 year age group. 13 Goel et al in Meerut found more ARI cases in 1-4 years of age group (46.15%) followed by 0-1 year age group (41.88%) and 11.96% in 4-5 years age group.14 They found more cases of ARI in male child (53.84%) as compared to female child (46.15%). Prajapati et al in Ahmedabad found more ARI cases in 1-4 years of age group (47.3%) followed by 0-1 year age group (40.0%) and 12.7% in 4-5 year age group. 15 They found more cases of ARI in male child (56.3%) as compared to female child (43.7%). However, Wadgave et al found more cases of ARI in female child (46.49%) as compared to male child (36.32%).³ Jha et al in Pune found more cases of ARI in females (52.3%) as compared to males (47.7%).¹⁶

In the present study, acute respiratory infections were more in lower socio-economic classes i.e. 50.58% in class V and 22.52% in class IV. It was more in patients whose mothers were illiterate 43.28% (Table.2). In a study conducted by Goel et al in Meerut, found that more burden of ARI was in low social class (in class III -20.94%, class IV-32.9% and class V-35.89% respectively). ¹⁴ More cases of ARI were seen in children of illiterate (49.14%) and upto primary educated (34.43%) mothers. Prajapati et al in Ahmedabad district of Gujarat found that ARI cases were higher in low social class (in class III - 31.4%, class IV - 22.1%, and class V-26.2% respectively). 15 They also found that ARI was highest in children of illiterate (24.4%) and primary (23.9%) mothers and illiterate (21.0%) and primary (18.2%) fathers.

In the present study, ARI was significantly more common in those patients having history of parental smoking (84.21%), history of overcrowding (75.73%), inadequate cross-ventilation (81.87%) and use of smoky chullah (78.65%) in their home (p<0.05).

History of parental smoking, overcrowding, inadequate cross-ventilation and use of smoky chullah as a domestic fuel has a direct relationship with occurrence of ARI.

In a study by Goel et al in Meerut, ARI was more in those children having history of parental smoking (78.20%), overcrowding (70.94%), in houses with inadequate ventilation (74.35%). ARI was higher in children of mothers who were using smoky chullhas (56.83%). In a study by Jha et al in Pune, history of parental smoking was present in 75.3% of houses. Overcrowding was present in more than half of the houses (83.0%). ARI was higher in children of mothers who were using smoky chullhas (42.9%). In a study by Prajapati et al in Ahmedabad, they found that ARI was more in those children having history of parental smoking (24.4%), overcrowding (28.57%), houses with inadequate ventilation (24.4%). ARI was higher in children of mothers who were using smoky chullhas (24.8%).

Out of 342 patients, maximum numbers of patients i.e. 46.78% (160) were incompletely immunized and 16.37% (56) were not immunized at all. Only 36.84% (126) were completely immunized for their age. There was highly significant association between immunization status and occurrence of ARI (p<0.01) (Table 3). Even after 29 years of initiation of the Universal immunisation programme in our country, vaccination coverage is low. A study conducted by Pore et al in Solapur found that out of 80 cases of ARI, 28.75% were fully immunized while 58.75% were partially immunized and 12.5% were not immunized at all.¹⁷

Occurrence of ARI was more in those patients whose mothers were not practicing exclusive breast feeding 60.82% (208) (Figure 1). As most of the mothers are unaware about importance of colostrum and exclusive breast feeding, they discard the colostrum and exclusive breast feeding is not given. It hampers the children's immunity and nutritional status and makes them susceptible to infections. Early weaning is started by working mothers and in case of less spacing between two children. A study conducted by Pore et al in a tertiary care centre in Solapur found significant association between breast feeding and ARI (p<0.05).¹⁷ In a study by Jha et al in Pune, found that incidence of ARI was more in children those who were not exclusively breast feed.¹⁶

Clustering of communicable disease morbidity is known to follow a seasonal trend. In the present study, maximum cases of ARI (50.88%) occurred in winter season followed by rainy season (26.90%) (Table 4). There was significant association between season and occurrence of diseases (p<0.01). Maximum admissions during winter show that season winter season encourages environmental factors for transmission of acute respiratory infections. These seasonal variations should have important implications for health care managers to take appropriate actions to prevent and to deal with these diseases.

Seasonal variations in ARI were documented by Sharma et al in a tertiary health care system in Chandigarh, which were also seen to be statistically significant as in this study. They found 38.31% cases of ARI in winter. Similar pattern was observed by Singhi et al in a tertiary care teaching and referral hospital in Chandigarh. They found maximum number of ARI cases in the months of December and January. Jha et al in Pune found seasonal variation of ARI, which was highest in winter season.

In the present study, maximum numbers of patients i.e. 91.52% (313) were cured while 6.73% (23) went against medical advice and absconded. 6 patients died due to ARI making CFR for acute respiratory infections as 1.75% (Table 5).

In a study by Reddaiah et al among under-fives admitted in a comprehensive rural health services hospital at Ballabgarh, case fatality rate (CFR) for ARI was found to be 12.8%. 19

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

REFERENCES

- NHM Components: RMNCH+A: Child Health. Available at: http://nhm.gov.in/nrhm-components/ rmnch-a/child-health-immunization/ childhealth/background.html. Accessed on 4 June 2017.
- 2. Park K. Park's Textbook of Preventive and Social Medicine. 23rd Edition. Jabalpur (INDIA): M/s Banarsidas Bhanot Publishers; 2015: 123,167,168.
- 3. Wadgave HV, Godale LB. Burden of acute respiratory tract infections (ARI) in under-fives in urban area. J Med Educat Res. 2011;1(2):39-43.
- 4. National Family Health Survey 4 (NFHS 4). Available at: http://rchiips.org/nfhs/factsheet_NFHS-4.shtml. Accessed on 4 June 2017.
- Acute Respiratory Infections in Children Case Management in Small Hospitals in Developing Countries. A Manual for Doctors and Senior Health Workers - WHO/ARI/90.5; 1990.
- Roy RN, Shrivastava P, Das DK, Saha I, Sarkar AP. Burden of Hospitalized Pediatric Morbidity and Utilization of Beds in a Tertiary Care Hospital of Kolkata, India. Indian J Community Med. 2012;37(4):252-5.
- 2011 Census of India. Available from: www.censusindia.gov.in/2011-prov-results/paper2vol2/data.../Chapter_VI. Accessed on 4 June 2017.
- 8. Reddy DS, Arlappa N. An Updated Prasad's Socio Economic Status Classification for 2013. Int J Res Develop Health. 2013;1(2):26-7.
- 9. WHO Child Growth Standards Length/height-forage, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age Methods and development. Available from: http://www.who.int/childgrowth/publications/technical_report_pub/en/index.html. Accessed on 4 June 2017.
- Training course on child growth assessment: WHO child growth standards, A-introduction: 9. Available at: http://whqlibdoc.who.int/publications/2008/9789241595070_A_eng.pdf. Accessed on 4 June 2017.

- 11. WHO child growth standards and the identification of severe acute malnutrition in infants and children. A Joint Statement by the World Health Organization and the United Nations Children's Fund: 2; Available at: http://www.unicef.org/nutrition/files/stmt child growth sam final.pdf. Accessed on 4 June 2017.
- 12. Taking action nutrition for survival, growth and development. Available at: http://www.who.int/pmnch/topics/child/acf whitepaper.pdf. Accessed on 4 June 2017.
- 13. Singhi S, Gupta G, Jain V. Comparison of pediatric emergency patients in a tertiary care hospital vs a community hospital. Indian Pediatr. 2004;41:67-72.
- 14. Goel K, Ahmad S, Agarwal G, Goel P, Kumar V. A cross sectional study on prevalence of acute respiratory infections (ARI) in under-five children of Meerut district, India. J Community Med Health Educ. 2012;2(9):1-4.
- 15. Prajapati B, Talsania N, Sonaliya KN. A study on prevalence of acute respiratory infections (ARI) in under five children in urban and rural communities of Ahmadabad district, Gujarat. National J Community Med. 2011;2(2):255-59.
- Jha AK, Bhawalkar JS, Dixit AK, Pawaiya AS, Pathak NK. A study of factors associated with presence of ARI in children 1-4 years of age in an urban slum of Pune city. National J Community Med. 2014;5(2):179-81.
- 17. Pore PD, Ghattargi CH, Rayate MV. Study of risk factors of acute respiratory infections (ARI) in underfives in Solapur. National J Community Med. 2010;1(2):64-7.
- 18. Sharma MK, Kalia M, Walia D, Goel NK, Swami HM. Surveillance of communicable diseases in tertiary health care system in Chandigarh, UT. Indian J Med Sci. 2007;61(7):407-13.
- 19. Reddaiah VP, Kapoor SK. Acute respiratory infections in under-fives: Experience at comprehensive rural health services project hospital, Ballabgarh. Indian Journal of Community Medicine. 1995;20(1-4):13-8.

Cite this article as: Kaware AC, Kamble NH, Mangulikar SK. Study of risk factors of acute respiratory infections in children admitted in a tertiary care hospital of Southern Maharashtra. Int J Community Med Public Health 2017;4:3129-34.