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Prevalence of acute respiratory tract infections and its risk factors in under-five children

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This study was undertaken to determine the prevalence and risk factors of Acute Respiratory Infections (ARI) among under-five children in a peri-urban community. A cross-sectional community-based study was conducted in North Okkalapa Township during July 2003. Thirty out of the total of 669 children had ARI episodes during the study period. The prevalence of ARI in the community was 5.2 %. Risk factor analyses were carried out using a univariate analysis and the association between exposures and outcomes was expressed as an odds ratio (OR) with its 95% confidence interval (CI). Risk factors for Acute Respiratory Infections included the practice of driving out mosquitoes by smoke (OR= 5.41, 95% CI= 1.08-27.07). Children aged between 6 months to 2 years had the greatest risk compared to less than 6 months although the result did not reach the statistical significance (OR= 3.60, 95% CI= 0.81-15.92). Immunisation was found to have a protective effect as indicated by lower odds of BCG vaccination (OR=0.26, 95% CI= 0.09-0.72), complete DPT vaccination (OR=0.13, 95% CI= 0.04-0.44) and completion of all immunisation (OR=0.16, 95% CI= 0.01-0.29).

INTRODUCTION

Acute Respiratory Infections (ARI) are a worldwide problem from which millions of children die annually, and literally billions suffer acute and chronic morbidity arising from their effect [1]. They are responsible every year for the deaths of 4.3 million children under five years of age that represents 21.3% of all deaths in this age group [2].

Studies in various parts of the world also show that on average, young children under five years of age suffer 4 to 6 episodes of Acute Respiratory Infections per year and that one-third to a half of the outpatient paediatric consultations in developing countries are due to ARI [3, 4, 5].

The incidence of ARI has been reported to be as much as fifty times higher in developing countries than in developed countries. One possible explanation for this discrepancy is that it is due to socio-economic status [1, 2].

In spite of the high incidence of Acute Respiratory Infections, there is very little information on the risk factors for these infections. The main objective of this study was to determine the prevalence and associated risk factors of Acute Respiratory Infections in under five years of age in North Okkalapa Township. Knowledge of the factors related to acquisition of ARI will help in its prevention and control.

MATERIALS AND METHODS

Study area and population

A community-based cross-sectional survey was carried out in North Okkalapa Township, a peri-urban township of Yangon during July 2002. Two wards from this township with same socio-economic status were selected. The study population consisted of every household with at least one under five children and a total of 669 households (669 children) were recruited for the study.

Methodology

Before the field survey, series of training were given to interviewers for field data collection. After having informed consent data was collected by face to face interview using standard pre-tested structured questionnaire to obtain socio-demographic characteristics and risk factors for ARI. Prevalence of ARI was accessed by asking the mothers or guardians if they had been ill with cough accompanied by short, rapid breathing among other signs of ARI in the last 2 weeks. Upper Respiratory Infection (URI) was defined to include any combination of the following symptoms: cough with or without fever, blocked or running nose, sore throat, and/or ear discharge. Acute Lower Respiratory Infection (ALRI) included any of the above symptoms of URI with the addition of rapid breathing and/or chest indrawing and/or strider [6].

Statistical methods

Each risk factor was analysed separately in a univariate model. The association between exposures and outcomes was expressed as an odds ratio (OR) with its 95% confidence interval (CI). P<0.05 was used as the definition of statistical significance.

Ethical Consideration

This study was approved by the Medical Ethics Committee of the Department of Medical Research.

RESULTS

Table 1. Socio-demographic characteristics as risk factors for ARI

Risk factors	ARI prevalence	Odds ratio	95% CI	p-value
Age				
0-5 months	2.35%	1		
6-23 months	8.00%	3.61	0.82-15.93	0.06
24-60 months	3.89%	1.68	0.37-7.61	0.49
Sex				
- Male	5.4%	1		
- Female	5.1%	0.95	0.48-1.87	0.88
Mother's education				
- Illiterate	0.0%	Infinite		
- Literate but less than high school	5.58%	1		
- High school and above	5.19%	0.92	0.46-1.85	0.83
Father's occupation				
- Retired	5.8%	1.98		
- Non-government employed	6.38%	2.18	0.59-6.64	0.27
- Government employed	2.7%	1	0.42-11.24	0.35
Mother's occupation				
- Dependent	4.9%	1.84	0.24-13.97	0.55
- Non-government employed	8.1%	3.18	0.38-25.96	0.28
- Government employed	3.03%	1		
Family income (Kyats per month)				
- ≤10,000	7.04%	1.73	0.68-4.36	0.23
- 11000-20000	4.59%	1.10	0.42-2.81	0.84
- ≥21000	4.19%	1		

Study population

A total of 669 children were enrolled. Their mean age was 24± 15.24 months. Sex distribution was almost equal (Male 50.2% and female 49.8%). The median household was a family of seven persons (interquartile range, 5-9). Median number of rooms per household was two (interquartile range, 2-3). Majority (65.3%) of children lived in the house built with timber, while 20.6% lived in bamboo and 12.3% in brick house.

Table 2. Housing and crowding parameters as risk factors for ARI

Risk factors	ARI prevalence	Odds ratio	95% CI	p-value
Type of house				
- Bamboo	8.00%	1		
- Timber/brick	4.50%	0.55	0.26-1.15	0.11
Cooking place				
- In the living room	6.4%	1.33	0.52-3.41	0.61
- Kitchen	5.2%	1.07	0.51-2.3	0.83
- Outside the house	4.8%	1		
Frequency of cooking				
- 1-2	7.8%	1		
- >2	12.5%	1.69	0.19-14.67	0.06
Pets at home				
- No	5.1%	1		
- Yes	5.6%	1.11	0.51-2.41	0.79
Work place at home				
- No	5.1%	1		
- Yes	5.3%	1.04	0.36-3.03	0.94
Number of room				
Single	6.57%	2.13	0.77-5.89	0.13
- Two	5.04%	1.61	0.55-4.68	0.37
- Three or more	3.18%	1		
Total household member				
- 1-3	5.45%	1		
- 4-5	4.39%	0.79	0.20-3.12	0.74
- 6-9	3.89%	0.70	0.18-2.60	0.59
- ≥10	8.72%	1.66	0.45-6.08	0.44
Persons sharing a bed				
- 1-2	2.22%	1		
- 3-4	5.51%	2.56	0.60-10.97	0.18
- ≥5	8.57%	4.12	0.64-26.54	0.10

Nearly 44% of households cooked inside their houses and 16.4% cooked outside. Only 40.4% had a kitchen. Majority of household (83 %) used wooden coal as a cooking fuel and 68% used to cook two times a day.

There were smokers in 64.13% of the households with median number of two smokers in each household. Most (80%) of the children were taken care at their home. Only 20% attended day care centres. Nearly 90% of children completed all relevant immunisation. Regarding the feeding practices, 95% of children were exclusively or partially breast fed.

Table 3. Factors enhancing indoor air pollution as risk factors for ARI

Risk factors	ARI prevalence	Odds ratio	95% CI	p-value
Passive smoking				
- No smoker				
- One or more smoker	4.2%	1		
	5.8%	1.42	0.67-3.02	0.36
*Type of material for setting fire**				
- Less	4.4%	1		
- Moderate	5.6%	1.28	0.53-3.09	0.72
- Heavy smoke-forming	5.9%	1.34	0.17-10.63	0.83
*Type of fuel***				
- No smoke forming	4.88%	1		
- Smoke forming	4.80%	1.02	0.25-4.12	0.97
Use of scent stick				
- No	4.70%	1		
- Yes	6.40%	1.37	0.68-2.79	0.38
Use of mosquito coil				
- No	4.50%	1		
- Yes	5.50%	1.21	0.52-2.83	0.44
Practice of driving out mosquitoes by smoke				
- No	4.10%	1		
- Yes	22.2%	5.41	1.08-27.07	0.04

* Less= Turpentine, Moderate= Pieces of wood/ paper , Heavy= Pieces of scent sticks/ rubber/ wax / Coconut skin /Garbage/ disposal/Diesel/ kerosene

** No smoke forming = Electric/ gas, Smoke forming = Wood/ coal/ Kerosene/ Animal excreta

Prevalence of ARI

All of these children had cough, runny nose and fever. Chest indrawing and difficulty in breathing were not seen. Among the enrolled children, 35 had signs and symptoms of Upper Respiratory Tract Infections, yielding an ARI prevalence of 5.2% in this study.

Risk factor analyses

Tables 1, 2, 3 and 4 present the results of the univariate risk factor analyses.

Children aged between 6 months to 2 years had the greatest risk of ARI compared to those less than 6 months (OR = 3.60, 95% CI = 0.81- 15.92). But the result failed to reach the statistical significance (Table 1).

Practice of driving out mosquitoes by smoke had significant association with increased risk of ARI (OR = 5.41, 95% CI = 1.08-27.07) (Table 3). Immunization had protective effect as shown by the lower odds of BCG vaccination (OR = 0.26, 95% CI = 0.09-0.72), complete DPT vaccination (OR = 0.13, 95% CI = 0.04-0.44) and completion of all immunization (OR = 0.16, 95% CI = 0.01- 0.29) (Table 4).

Table 2 shows the housing and crowding parameters as risk factors. They were not found to have significant association with ARI.

As shown in the tables 1-4 other variables such as socioeconomic characteristics, smoking, childcare and breast-feeding were also tested but not found to be significant.

Table 4. Immunization, child care and breast feeding variables as risk factors for ARI

Risk factors	ARI prevalence	Odds ratio	95% CI	p-value
BCG vaccination				
- No	16.13%	1		
- Yes	4.75%	0.26	0.09- 0.73	0.005
Complete DPT vaccination				
- No	28.57%	1		
- Yes	4.91%	0.13	0.04- 0.44	0.001
Measles vaccination				
- No	11.43%	1		
- Yes	5.36%	0.44	0.14- 1.34	0.14
Complete immunization				
- Not complete	21.58%	1		
- Complete	4.12%	0.16	0.01- 0.29	0.006
Breast feeding				
- Partial or exclusive	5.0%	1		
- Never	9.10%	1.89	0.55- 6.53	0.31
Use of vitamin A				
- Yes	5.4%	1		
- No	5.1%	0.93	0.47- 1.85	0.83
Attending day-care centre				
- No	5.2%	1		
- Yes	5.2%	1.00	0.42- 2.35	0.97

DISCUSSION

This study revealed that 5.2% of the children under study had ARI. This prevalence of ARI was much lower than other studies in developing countries. Sikolia et al in 2002 [7] reported that ARI prevalence under five years of age in Kenya was 69.7%. But the study subjects in their study were recruited from outpatient clinics and hospitals while our study was community-based. It was also found that ARI prevalence in a rural community of Bangladesh was 58.7% [8]. In this study children were followed once a month for four consecutive months. These facts might account for the higher ARI prevalence in these studies.

Practice of driving out mosquitoes by smoke was a strong risk factor for ARI. Although the fact that this practice of smoke emission contributed to the prevalence of ARI has never been reported, Environmental Tobacco Smoke (ETS) was cited as a risk in some studies [9, 10, 11]. But ETS exposure was found to have no relationship with acquisition of ARI in our study.

It was also revealed that ARI was most prevalent in children aged 6 months to 2 years. Although the result failed to reach the statistical significance, this finding agrees with Anders, Zaman and Aung Thu [9, 12, 13]. The age between 6 and 18 months has indeed been termed the period of vulnerability [14, 15]. Possible mechanisms for this increased risk include degradation of maternal antibodies, immaturity of the adaptive immune system, cessation of breast-feeding and start at childcare centres.

In addition, immunisation was found to be protective against acquisition of ARI in our study. This was indicated by lower odds value of BCG vaccination, complete DPT vaccination and completion of all immunisation. This has supported Broor [16] on inappropriate immunisation for age as a risk factor to ARI prevalence. However, it was in contrast with other studies by Sikolia [7] and Zaman [12] who reported that role of immunisation status was not clear in ARI acquisition.

A study by Aung Thu et al [13] reported that

family income was closely associated with ARI. This result was not reproduced in our current study.

The International Consultation on Control of ARI in 1991 [2] reported that there were links between many environmental risk factors (such as smoke, indoor air pollution, outdoor air pollution, passive smoking, overcrowding) and risk factors in the child (that is low birth weight, malnutrition, measles, breast feeding and vitamin A deficiency) with ARI in developing countries and recommended on more research on these factors. This study revealed that none of the usual socio-economic factors was a significant risk factor but smoke emission to drive out mosquitoes and immunisation status played an important role in acquisition of childhood ARI.

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