

Acute respiratory tract infection among preschool children in Western Maharashtra, India

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Submitted: 13-03-2014

Revised: 08-04-2014

Published: 30-05-2014

ABSTRACT

Background: Malnutrition and infectious diseases both occur in the same unfortunate children and together they play a major role in causing the high morbidity and mortality in them. In developing countries, mortality from ARTI is 30-70 times higher than in developed countries and it has been estimated that up to 1/3rd of all deaths in children less than 5 years are attributed to ARTI. **Aims & Objectives:** This study aimed to find the attack rate of Acute Respiratory Tract infection and the socio-demographic variables of pre-school children suffering from Acute Respiratory Tract infections. **Method:** A Comparative Longitudinal study was carried out among preschool children (3-5 years) who were selected from Private pre-primary school of urban area (155) & Anganwadis (157) of urban slum area of Karad town and followed for the period of one year. Mother/guardian/teacher was interviewed by using pre-tested proforma during this period. **Results & Interpretation:** out of all 97.4% of private pre-primary school children had 1.8 episodes/child/year of ARTI compared to Anganwadi children where all of them had 2.5 episodes/child/year of ARTI. **Conclusion:** Maximum number of children from private pre-primary schools from urban area also suffered with at least one episode of Acute Respiratory Tract Infection compared to Anganwadi children from urban slum areas.

Key words: Anganwadi, ARTI, Incidence, Maternal literacy, Pre-primary school children

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INTRODUCTION

Malnutrition and infectious diseases both occur in the same unfortunate children and together they play a major role in causing the high morbidity and mortality in them.¹ The period below 5 years among the children is the most crucial period and if any infection occurs during this period, will affect the growth and development of child because maximum growth and development occur in this period. Among the infectious diseases, Acute Respiratory Tract Infections (ARTI) and acute diarrhoeal disease (ADD) are leading cause for childhood mortality and morbidity.² In developing countries, mortality from ARTI is 30-70 times higher than in developed countries and it has been estimated that up to 1/3rd of all deaths in children less than 5 years are attributed to ARTI.³ In India ARTI is one of the major cause of death and it is also one of the

major reason for which children are brought to hospitals and health facilities.⁴

ARTI is responsible for 30-50% OPD attendance, 20-40% hospital admission, and it was observed that every child below 5 years of age suffer about 5 episodes of ARTI per year, thus accounting for about 238 million attacks every year and 1-2 lack deaths annually and among that 90% deaths were below the age of 5 years.⁵ According to the Director General's published figures, these account for 15-20% mortality during this age group. The current estimates of about 600,000 annual deaths during pre-school age group are realistic. The case fatality rate is high and ranging, between 5-10%.⁵ According to NFHS II (1998-99),⁶ prevalence of ARTI in children below 3 years of age in India was 19.3%, out of which 64% of ARTI cases were taken to health facility or a health care providers.

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The incidence of ARTI in Maharashtra is 3.67 per child per year.⁷

MATERIAL AND METHODS

A Community Based Comparative Longitudinal Study was conducted in urban area among the pre-primary school children, 3-5 years at the time of selection of study subjects from two different sectors of the community i.e. Private & Government (Anganwadis) for comparison. The services provided in the setup & the socio-economic status of family is different in these two sectors so hence were selected for comparison.

Sample size was calculated by taking the incidence of Acute Respiratory Tract Infection from the past study i.e. 11% (p),⁷ and considering 5% error (E), which comes around 151. The formula applied was sample size = $(1.96)^2 \times pq/E^2$. Considering the chances of drop outs during the Course of the study, extra 10% samples were added it. So the final sample size was 166. This sample was taken from private pre-primary school and similar number of samples was also taken from anganwadi centres. Three Private pre-primary school & four Anganwadi centres from karad city were enrolled randomly to reach the desired number of children. The child who was present for all the visits was included in the study whereas those children who missed one or more visits were excluded from the study.

Children & their mother/guardian/teacher were enrolled for the study by using pre structured & pretested proforma. The proforma included the baseline data i.e. general particulars of the parents and children and also on birth and immunization history (cross checked from records), breastfeeding history and anthropometric measurements of the child; general and systemic examination of each subject was carried out. The information was collected from mother/father/guardian and class teacher/anganwadi worker. During this period, parents were told about the signs and symptoms of Acute Respiratory Tract Infections so that they can deliver proper history.

Baseline data was collected in the month of January 2010. Subsequent three follow up visits were carried out at the

interval of every 3 months i.e. in the month of April-May, August-Sept & December-January. During the follow up visits, episodes were counted if they appeared freshly after completion of previous visit & during the visit. This procedure was repeated for all the follow ups. During these visits, history of any illnesses including episodes of ARTI till the follow up visit was collected from the mother, guardian or class teacher/anganwadi worker followed by General and systemic examination of the child.

Institutional Ethics Committee clearance and informed verbal consent from the parents/guardians/principals/Child Development Project Officer (CDPO) was obtained prior to the study. All the data collected were entered in to Excel sheet and analysed for frequency, percentage, Chi-square test, Odds ratio.

OBSERVATIONS

In this study total 312 children were followed up (155 from private pre-primary schools and 157 from anganwadis), excluding 20 dropouts. During the course of one year follow up, it was observed that, the overall episodes of ARTI were 686, with attack rate of 98.71 & incidence 2.198 episodes per child per year.

Incidence & attack rate was calculated as follows;

Incidence rate (spells)⁸ = number of spells of sickness starting in a defined period \times 1000/number of persons exposed to risk in that period.

Attack rate⁸ = number of new cases of a specified disease during specified time interval \times 100/total population at risk during same interval.

Among private pre-primary children followed for one year 151 out of 155 had attack of ARTI one or more time giving an incidence rate of 1.89 episodes/child/year (attack rate 97.4%) compared to anganwadi children who had an attack rate of 100% & Incidence rate of 2.5 episodes/child/year (Table1).

The incidence of ARTI was observed higher among the boys of private pre-primary school children whereas

Table 1: Magnitude of ARTI among pre-primary school children

Group	No.	No. of children affected	Total episodes	Episodes/child/year	Attack rate %	Incidence
Private pre primary school children	155	151	293	1.890	97.41	1890
Boys	83	81	159	1.195	97.59	1915
Girls	72	70	134	1.861	97.22	1861
Anganwadi children	157	157	393	2.503	100	2503
Boys	98	98	237	2.418	100	2418
Girls	59	59	156	2.689	100	2689

reverse finding was observed among Anganwadi children. These findings were not found statistically significant.

From the Table 2, the period prevalence of ARTI combined (PVT and anganwadi) was 58.6% during the baseline data collection period which increased in 1st and 3rd visits, with mean episodes/child of (0.631 ± 0.483 and 0.621 ± 0.485) respectively.

Significantly High proportion of ARTI affected children from private pre-primary school (46.4%) and anganwadi (70.7%) had past history of ARTI ($\chi^2 = 18.82, p = 0.000$).

Figure 1 shows the percentage of episodes of ARTI attacks among pre-primary school children, according to which maximum number of children (>50%) had nearly 2-3 episodes per year in both private as well as anganwadis

ARTI was seen more among boys & the children of age group 48-60months but it was not found statistically significant. Significantly more numbers of children affected with ARTI were staying in either joint family or three generation family among both the groups. Significantly maximum proportions of ARTI affected children were belonging to either upper or middle socio-economic class among private school children whereas among anganwadi children they belong to lower socio-economic class (Table 3).

Significantly more numbers of ARTI affected children from Anganwadi were born with more than second order and birth weight less than 2.5 kgs. Most of the mothers of these children were illiterate and were working by occupation compared to private school children & their mothers. Also significantly more numbers of Anganwadi children were not exclusively breast fed, not breast fed for >2 yrs and

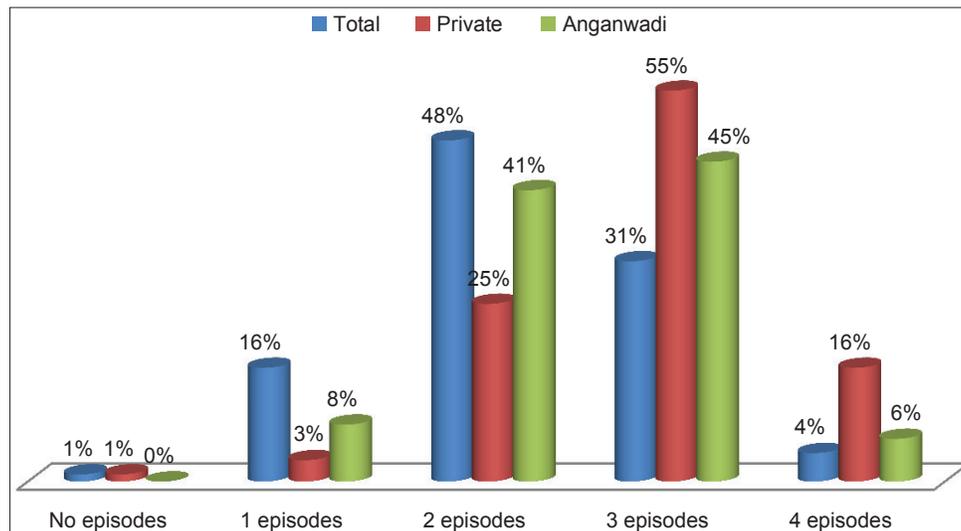


Figure 1: ARTI episodes among pre-primary school children private pre-primary school & Anganwadi children

Table 2: ARTI episodes according to visits

Particulars	1 st contact (1 st Dec 2009 to 31 st Dec 2009)	Visit I (1 st Jan 2010 to 30 th April 2010)	Visit II (1 st May 2010 to 31 st Aug 2010)	Visit III (1 st Sept 2010 to 31 st Dec 2010)
Total episodes				
Combined (Pvt&AW)	183	197	112	194
Private	98	83	33	79
Anganwadi	85	114	79	115
Mean episodes/child				
Combined (Pvt&AW)	0.586	0.631	0.359	0.621
Private	0.632	0.535	0.212	0.509
Anganwadi	0.541	0.726	0.503	0.732
Standard deviation				
Combined (Pvt&AW)	0.493	0.483	0.480	0.485
Private	0.483	0.500	0.410	0.501
Anganwadi	0.499	0.447	0.501	0.444
Period prevalence				
Combined (Pvt&AW)	58.6%	63.1%	35.8%	62.1%
Private	63.2%	53.5%	21.2%	50.9%
Anganwadi	54.1%	72.6%	50.3%	73.2%

weaning started before 6 months compared to private school children (Table 4).

On application of Odds ratio among children of private primary school children showed significant difference between children suffering & not suffering from ARTI with respect to mother's occupation & Education, Birth weight & birth order, exclusive breast feeding, total breast feeding & age at start of weaning. Chances of development of ARTI among private pre primary school children was 20.5 times more among non exclusive breast fed, 29.2 times more among not totally Breast fed children, 19.6 times more among early start of weaning & 14 times more among

children with birth order 2 or more. Whereas occurrence of ARTI could be decreased by 2.1 times if birth weight is more than or equal to 2.5 kgs, 3 times if mother is not working & 0.3 times if mother is educated. Odds ratio could not be applied to the other group i.e. Anganwadi children as all of them were suffering from ARTI.

DISCUSSION

As we know that the incidence of ARTI is very much higher in under five children, the number of factors that can make difference in occurrence of these diseases vary in various geographical areas, according to change in socioeconomic status and various environmental factors, which was studied in the current study among the pre-school age children of urban (private pre-primary school) and urban slum (anganwadi) & observed that the incidence of ARTI was very much higher among the anganwadi children (2.5 episodes/child/year) than the private pre-primary school children. Which is almost equal to the incidence reported by various community based studies from different parts of India by Kabra SK et al⁷, the incidence of ADD found by Gupta N et al⁹ was 1.69 episodes/child/year, which was more than the present study in private pre-primary school children, which may reflect the better environmental condition.

In the current study maximum ARTI affected children were boys, which is almost similar to the findings of Savitha MR et al¹⁰, Kazi Md. Abul Kalam Azad¹¹, Pore PD et al¹² in which the male affected population was almost 2/3rd of the total and reverse findings were found in the study of Prajapati Bipin et al¹³ because boys are biologically weaker than girls. Pore PD et al¹² and Meriton Stanly et al¹⁴ (41%, 52% and 47.5% respectively), of ARTI affected children were between the age group of 25-60 months, in comparison to the present study more than 60% of the ARTI affected children from both pre-primary schools were between the age group of 48-60 months.

Significantly higher proportion of illiterate mothers were observed among ARTI affected children from anganwadi, similar findings was observed by Kazi Md. Abul Kalam Azad¹¹, Savitha MR et al¹⁰ and Pore PD et al¹², it is known that the female literacy is less in urban slum and which is always associated with health ignorance, poor hygiene, which may reflect the health status of children.

Maximum ARTI affected children from both the groups stayed in the nuclear family (57.5% in private pre-primary school and 48% in anganwadi) and the result obtained was statistically significant, similar findings were observed in semi urban area, Gujarat by Bhandari D et al¹⁵, it is the disadvantage of the nuclear family in taking care of the sick children due to the lack of man power and support to

Table 3: Socio-demographic distribution of pre-primary school children

Particulars	PVT (%) n=151	Anganwadi (%) n=157	χ^2 value (p value)
Sex of the child			
Boys	81 (53.6)	98 (62.4)	2.089
Girls	70 (46.4)	59 (37.6)	(0.148)
Age group (mn)			
36-47	48 (31)	59 (37.6)	1.234
48-60	107 (69)	98 (62.4)	(0.266)
Type of family			
Nuclear	87 (57.6)	75 (47.8)	34.62
Joint	27 (17.9)	71 (45.2)	(0.001)*
Three generation	37 (24.5)	11 (07)	
Socio economic status			
Upper	38 (25.1)	02 (1.4)	151.3
Middle	80 (53.1)	12 (7.6)	(0.001)*
Lower	33 (21.8)	143 (91)	

*highly significant

Table 4: ARTI affected children and feeding practices, maternal variables & birth variables

Particulars	PVT (%) n=151	Anganwadi (%) n=157	χ^2 value (p value)
Maternal Education			
Illiterate	00 (00)	94 (59.5)	127.3
Literate	151 (100)	63 (40.1)	(0.001)*
Maternal Occupation			
Working Mothers	05 (3.3)	134 (85.4)	205.9
Non-working Mothers	146 (96.7)	23 (14.6)	(0.001)*
Birth Weight			
<2.5 Kgs	04 (2.6)	28 (17.8)	17.46
≥2.5 Kgs	147 (87.4)	129 (82.2)	(0.001)*
Birth order			
≤2	141 (93.4)	106 (67.5)	30.80
>2	10 (6.6)	51 (32.5)	(0.001)*
Exclusive breast feeding			
Present	144 (95.4)	47 (29.9)	137.1
Absent	07 (4.6)	110 (70.1)	(0.001)*
Total breast feedings			
Up to 2 yrs	146 (96.7)	147 (93.6)	1.554
>2 yrs	05 (3.3)	10 (6.4)	(0.296)*
Weaning			
≤6 months	131 (86.8)	97 (61.8)	23.6
>6 months	20 (13.2)	60 (38.2)	(0.001)*

*highly significant

the mother. Around 90% of ARTI affected children from anganwadi were from low socio economic class (Class IV and V), whereas study conducted in Bangladesh by Kazi Md. Abul Kalam Azad¹¹ found 48% of affected children belong to low socio economic class, this might be due to the combined effect of poor maternal education and low socio economic status.

Significantly higher proportion of ARTI affected children from anganwadi (32.5%) were of birth order >2, as compared to the affected children from private pre-primary school (6.6%), similarly in a community based study done by Mitra NK¹⁶ 43% of affected cases of ARTI were also of birth order more than 2, as it was observed that as the birth order increases the risk to various other infections.

The proportion of ARTI was seen higher in anganwadi children with birth weight less than 2.5 kgs, in comparison with the children of private pre-primary school, similar finding was observed by where as 80% of the LBW children had suffered by ARTI which was observed by Shah HK *et al*¹⁷ in her community based study in Goa, lower the birth weight lower the immunity which increase the chances of infections.

In the present study 71% of the ARTI affected children from anganwadi had positive past history of ARTI, in comparison with 46% of ARTI affected children from private pre-primary schools. Similarly Dudley *et al*¹⁸, Pritsch Silvio O.M *et al*¹⁹ also observed positive past history for >50% children who are affected by ARTI.

CONCLUSION

Maximum number of children from private pre-primary schools suffered with at least one attack of Acute Respiratory Tract Infection. Maternal illiteracy and working mothers found favourable factors in causing ARTI. Immunization coverage, EBF and proper weaning play a very important role in prevention of infections in early life as well as repeated attacks in future.

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Authors Contribution:

MBT – Design, Data Collection, Follow-up, Data entry, Data Analysis, Manuscript Preparation & Correspondence; **VVR** – Concept, Design, Data Analysis, Manuscript Editing; **SM** – Manuscript Review; **MVR** – Manuscript Review; **SBT** – Manuscript Preparation; **SVK** – Statistical analysis.

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