



Original Research Article

A Longitudinal Study Among Under-Five Slum Children Of Bankura District, West Bengal On Spells Of Acute Respiratory Tract Infection And Its Correlates.

Name of Author:

Dr. Rama Pramanik^{1*}, Dr. Gautam Narayan Sarkar²

Affiliation:

¹Assistant Professor, Department of Community Medicine, Netaji Subhas Medical College, Patna, Bihar, India.

²Professor & Head, Department of community medicine, Shantiniketan medical college and Hospital Bholpur, Shantiniketan West Bengal, India.

Corresponding Author: Dr. Rama Pramanik

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Abstract: Background: ARI is the perhaps most common human ailment that resolves without any consequences. But in under five especially in vulnerable children have increased morbidity and mortality. The current study was carried out among under-five children of Bankura town, West Bengal. Total 98 children were included in this study and followed up for 09 month from August 2017-April 2018 with total duration of study was 12 months i.e. June 2017- July 2018. The samples were taken from 02 slums of Bankura town by complete enumeration. The purpose of the study was to estimate the magnitude of ARI and its correlates. The overall incidence of spell was 1.19 episodes per child per year and estimated annual incidence of spell was 1.59 episodes per child per year. In bivariate analysis significant association ($p < 0.05$) was found between spells of ARI and feeding during illness, regularity of ICDS meal intake, type of housing, period of gestation during delivery. A logistic regression was performed to ascertain the effects of type of house, ICDS meal, breast feeding, and period of gestation and feeding during illness on the likelihood that participants have ARI. The model was statistically significant $X^2(6) = 23.98$, $p < 0.0001$. The model explained 35.6% (Nagelkerke R^2) variation in the ARI episodes and correctly classified 80% of cases. Not taking meal from ICDS regularly increases probability of having ARI is 7.63times more, where other variables kept constant. Non term delivery increases probability of having ARI is 4 times more, where other variables kept constant. Exclusive breast feeding was associated with reduction of probability of having ARI.

Keywords: Spells of ARI, Under-five children, Slums, incidence of ARI, Longitudinal study

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INTRODUCTION

Infection of the respiratory tract is perhaps the most common human ailment.¹ Lots of areas of the respiratory tract may be affected by infection resulting in large variety of signs and symptoms. These are cough, difficult breathing, sore throat, runny nose, ear problems.² Fever is also common in acute respiratory infections. Most children with these respiratory symptoms have only a mild infection, such as a cold or bronchitis. There may be cough due to nasal discharge from a cold drips go down the back of the throat, or may be have a viral infection of the bronchi (bronchitis). These children are not seriously ill and can be treated at home.

But in vulnerable children, infections that begin with

mild symptoms may sometimes lead to more severe illnesses, such as pneumonia – especially when they coincide with other illnesses like diarrhoea or malaria.³

In majority of persons the disease resolves without any treatment or complication. ARI can affect all the age groups and gender. But in young infants and small children it increases the morbidity and mortality. The vulnerability of children to develop ARI and related complications like pneumonia have many reasons. Healthy children and infants having normal immune system are protected but with compromised immune system have weakened defence.

Undernourished children, particularly those not

exclusively breastfed or with inadequate zinc intake, are at higher risk of developing pneumonia.

Similarly, children and infants suffering from other illnesses, such as AIDS or measles, are more likely to develop pneumonia. Environmental factors, such as living in crowded homes and exposure to parental smoking or indoor air pollution, may also have a role to play in increasing children's susceptibility to pneumonia and its severe consequences.³

India's Reproductive and Child Health programme has components for the prevention and control of ARI since 1992.⁴ ARIs, however, still continue to be the single largest contributor of childhood morbidity and mortality with estimated 3–5 episodes every year, 4 million pneumonias, and 1 million deaths.^{3,5-6} Estimates also indicate that 30–50% of OPD attendance and 20–40% of hospital admissions may be attributed to ARI and pneumonia.⁷

According to census 2011 – A slum has been defined as residential areas where dwellings are un-fit for human habitation by reasons of dilapidation, overcrowding, faulty arrangements and design of such buildings, narrowness or faulty arrangement of street, lack of

ventilation, light, or sanitation facilities or any combination of these factors which are detrimental to the safety and health.⁸

In India 63% towns were reporting having slum and 17.4% households comprised as urban slum. In West Bengal proportion of slum households to urban households was 21.9%.⁸ It is evident that vulnerable age group in vulnerable environment will definitely cause increased disease causation.

Indian studies showed that incidence density rate varies from 7.9 episodes/ 100 child-weeks of exposure to 19.57 /100 person – months at risk to 27.25% incidence 9-11 in slum, rural area and peri-urban area respectively.

So, despite the all negative influences for disease causation, incidence is never been 100% or extremely high. At this point it can be said that there are also some positive influences are also present which has been fighting with those negative influences so that life goes on. Keeping with this view in mind an attempt was made by this study to estimate the spells of ARI and different influencing factors among under five children of slum dwellers of Bankura district.

MATERIALS AND METHODS

The study was descriptive, community based with longitudinal design. All the under-five children residing in the urban slums of Bankura town, West Bengal were the study population. As the data collection, was continued for 09 months, the under-five children from neonatal period up to the age of 48 completed months were included in the study. Sample size (SS) for this study was estimated based on the formula used for calculating sample size for 'study to estimate an incidence rate with specified relative precision'. Here, the precision was assumed to be 20% of the incidence at 95% confidence interval (CI).

The formula is $n = (z/e)^2$ where the $Z=1.96$ at 95% CI and the e =relative precision at a level of 20% of the incidence in the reference population.

As per this formula the SS was,
 $n = (1.96/0.2)^2 = 97$.

Assuming 5% attrition the revised SS will be,
 $97 + 5\% \text{ of } 97 = 101.85 \approx 102$.

Then these 102 under-five children were included in the study from the selected two slums on basis of complete enumeration.

Multistage random sampling technique was adopted for this study. First, 02 wards of Bankura Municipality having slum(s) was selected by simple random sampling (SRS). Then out of all slums in the selected two wards, 01 from each was selected by SRS. Then the study subjects was included by complete enumeration from 02 slums. The data was collected from August 2017 to April 2018. Those who are permanent residents were included

in the study and parents/care giver not willing to participate in the study, having kyphoscoliosis, congenital heart diseases, immunocompromised states were excluded from the study. Data were collected using pre-designed and pre-tested schedule which include base line characteristics and schedule for monthly visits. Stethoscope, non-stretchable measuring tape, clinical mercury thermometer was used for clinical data and for record review MCPC (Maternal and Child Protection) Card, Birth certificate, Prescriptions were thoroughly checked and included.

After obtaining permission of WBUHS and ethical approval from Institutional Ethics Committee Bankura Sammilani Medical College, Bankura, data collection for this study was started.

After explaining purpose of the study, informed consent of parents or care givers was obtained verbally. Baseline data collection was done by interviewing the caregiver, conducting clinical examination including anthropometry and review of relevant records using predesigned questionnaire and equipment for clinical examinations and anthropometry. Then monthly follow up visit was made for each and every child. Prescribing medicine for the episode was done on request.

The selected slums house-holds having under-five were identified and enrolled. Baseline information were collected by house to house visit. Monthly follow-up were done in each selected houses using above mentioned study tools. Outcome variable was episodes of ARI present or absent. Operational definitions used as follows:

ARI episode –Defined as runny nose or cough either with or without fever lasting at least 72 hours¹⁹Classification of ARI – Severe - A respiratory illness including lethargy, seizures or loss of consciousness. Moderate - A respiratory illness including chest in-drawing and failure to feed adequately.

Mild - Any ARI episode where the child feeding adequately and where severe pneumonia had not already been diagnosed. Principal Care giver –The person

primarily responsible for the care and upbringing of a child.

Type of housing –Mixed: Walls and floor are concrete but the roof is thatched or has tiles; Kuccha: Walls and floor are made up of mud and the roof is thatched/tiles;Pucca: walls and floor as well as roof are concrete or walls and floor are concrete with tinned/asbestos roof; Dampness: Presence of moisture contents inside a building through its walls, floors or roof. Ventilation²⁰.

ADEQUATE	INADEQUATE
• Cross ventilation – present • Window – 20% of floor area • Door – 20% of floor area • Combined window + door area – 40% of floor area • For adequate ventilation all the criteria was considered.	• Cross ventilation – Absent • Window – < 20% of floor area • Door – < 20% of floor area • Combined window + door area – < 40% of floor area • Absence of any criteria was considered

Indoor Air pollution: Use of incense stick/ aerosol spray/ mosquito repellent, fuel used for cooking and position of cooking place: Cooking place was in verandah or living room and/or using coal/wood/cow dung as fue. Any one of the above criteria was present, then it was considered as presence of indoor air pollution. Descriptive statistics were incidence rate, spells were

calculated. Relevant graphs and charts were incorporated. Inferential statistics were Chi-square test, Fisher Exact test and multiple logistic regression analysis were done after fulfilling all the assumptions. Data was compiled in Micro Soft Excel sheet for preparing a Grand chart. Statistical software IBM SPSS (Statistical Package for the Social Sciences) version 22.0 was used.

RESULTS

The majority of the families belonged to OBC (89%), had a joint family (74%), and fell into socio-economic status (SES) class IV (44%) or V (45%) as per the B.G. Prasad scale modified in January 2017. The mother was the principal caregiver in 98% of cases; 35% of mothers were illiterate and almost half (48%) were aged 21–25 years. Regarding housing, 53% resided in a pucca house, and 63% had inadequate ventilation. Interestingly, 64% of houses were devoid of dampness. Indoor air pollution was present in 91% of cases, but only 15% of children were exposed to passive smoking. Allopathy was the preferred treatment modality (85%). Only 66% of caregivers sought treatment within one day of an ARI episode.

Overall, the incidence of spell (total episodes of ARI / average sample size) was 1.19 episodes per child during the whole follow-up period, and the estimated annual incidence of spell was $(117/98) \times 12/9 = 1.59$ episodes per child per year. For males, the incidence of spell was 1.2 episodes per child during the whole follow-up period, and the estimated annual incidence of spell was 1.61 episodes per child per year. For females, the incidence of spell was 1.18 episodes per child during the whole follow-up period, and the estimated annual incidence of spell was 1.57 episodes per child per year.

Table 1. Distribution of participants according to number of spells of ARI during follow-up period (n=117)

No. of spells	Male [n1=48] No. (%)	Spells	Female [n2=50] No. (%)	Spells	Total No. (%)	Spells
1	19 (44.19)	19	24 (55.81)	24	43 (36.75)	43
2	10 (47.62)	20	11 (52.38)	22	21 (17.95)	42
3	3 (50.0)	9	3 (50.0)	9	6 (5.13)	18
≥4	2 (66.67)	10	1 (33.33)	5	3 (2.56)	15
Total	58 (49.57)		59 (50.43)		117 (100.0)	

Table 2. Distribution of participants according to number of spells of ARI in each month during follow-up period (n=117)

Gender	Aug No. (%)	Sep No. (%)	Oct No. (%)	Nov No. (%)	Dec No. (%)	Jan No. (%)	Feb No. (%)	Mar No. (%)	Apr No. (%)	Total No. (%)
Male	13	8	5	12	4	6	2	6	2	58

	(22.41)	(13.79)	(8.62)	(20.69)	(6.89)	(10.34)	(3.45)	(10.34)	(3.45)	(49.57)
Female	6 (10.34)	11 (18.97)	5 (8.62)	13 (22.41)	7 (12.07)	7 (12.07)	0	6 (10.34)	4 (6.89)	59 (50.43)
Total	19 (16.24)	19 (16.02)	10 (8.55)	25 (21.37)	11 (9.40)	13 (11.11)	2 (1.71)	12 (10.26)	6 (5.13)	117 (100.0)

Table 3. Statistically significant (p<0.05) study variables and spells of ARI (n=98)

Variables	Categories	ARI spells: Yes	ARI spells: No	Tests of significance
Type of house	Kuccha	17 (77.3)	5 (22.7)	$\chi^2 = 6.173$ df = 2 p = 0.046
	Pucca	42 (80.8)	10 (19.2)	
	Mixed	13 (54.2)	11 (45.8)	
Gestational age	Term	55 (80.9)	13 (19.1)	$\chi^2 = 6.262$ df = 1 p = 0.012
	Non-term	17 (56.7)	13 (43.3)	
Breast feeding	EBF	35 (62.5%)	21 (37.5%)	$\chi^2 = 4.454$ df = 1 p = 0.035
	Non-EBF	23 (85.2%)	4 (14.8%)	
Feeding during illness	Same	11 (52.4)	10 (47.6)	Fisher exact test p = 0.024
	Reduced	61 (79.2)	16 (20.8)	
ICDS	Yes	50 (75.8%)	16 (24.2%)	$\chi^2 = 5.290$ df = 1 p = 0.021

**Logistic Regression
Model fit summary**

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	77.589	.251	.356

Comment: The explained variation in the dependent variable based on the present model ranges from 25% to 35.6%.

Classification table (cut value is .500)

Observed	Predicted (Dependent variable)		Percentage correct
	0	1	
Step 1: DV = 0	12	13	48.0
Step 1: DV = 1	3	55	94.8
Overall percentage			80.7

Comment: The model correctly classified 80% of cases.

Variables in the equation

Variable	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for Exp(B) Lower	95% C.I. for Exp(B) Upper
ICDS (Ref. Regular)	2.033	.767	7.020	1	.008	7.639	1.698	34.374
House (Ref. Pucca)			5.395	2	.067			
House (Mixed)	.251	.780	.103	1	.748	1.285	.278	5.929
House (Kucha)	-1.306	.807	2.620	1	.106	.271	.056	1.317
Feed (Ref. Same)	-1.254	.696	3.251	1	.071	.285	.073	1.115
Delivery (Ref. Term)	1.401	.707	3.927	1	.048	4.059	1.015	16.226
Breast Feeding (Ref. EBF)	-1.733	.729	5.655	1	.017	.177	.042	.737
Constant	.034	1.122	.001	1	.976	1.035		

Inference

$$\text{Log (p/1-p)} = B_0 + B_1 \cdot X_1 + B_2 \cdot X_2 + \dots + B_n \cdot X_n$$

The probability of having ARI can be calculated from the above equation:

$\text{Log}(p/1-p) = 0.034 + 2.033 \cdot \text{ICDS} + 0.251 \cdot \text{Mixed} - 1.306 \cdot \text{Kucha} - 1.254 \cdot \text{Feed} + 1.401 \cdot \text{Gestational age at delivery} - 1.733 \cdot \text{Breast feeding}$

From the above model, it can be said that not taking meals from ICDS regularly increases the probability of having ARI by 7.63 times, with other variables kept constant.

Non-term delivery increases the probability of having ARI by 4 times, with other variables kept constant.

Exclusive breast feeding was associated with a reduction in the probability of having ARI.

DISCUSSION

In the present study both the genders were almost equally distributed. The finding was not corroborative of National average according to census 2011 as in this report child sex ratio (0-6 years) for India was 914 and in West Bengal 956 .21

Majority of the participants were belonged to OBC (89%).The finding was not in accordance with a study done in Kolkata by Maji et. al.22 A study by Dongre et.al found 52% OBC in tribal district of Maharashtra.23

Majority of the participants were belonged to Joint family (74%). The findings were almost similar to the study by Walke et al.11

Most of the participants belonged to lower SES class (89%) according to Modified B G Prasad scale updated on January 2017. The findings were similar to the study by Maji et.al.22

In 22% cases birth weight was less than normal i.e. 2.5kg. Majority of the participants had birth order of two (47%). Most of the participants was delivered at term (79%). A study done in Hooghly district of West Bengal also found majority (57%) were having birth order of 1-2.10 Another study by Kumar et. al found in 40% cases children had birth weight < 2.5 kg .17

Majority of children belonged to < 12 months of age (32%) and among them male child were slightly higher (16%) as compared to female (15%).

Almost all the cases principal care giver was mother (98%). 35% mothers were illiterate. Almost half (48%) of the principal care giver were belonged to age group 21-25 years. The findings are similar to the findings from adjacent district Burdwan, where illiterate mothers were 30% and 80% mothers from urban area were by profession homemaker.24

Most of the cases (89%) occupation of principal care giver was home maker. As most of the cases principal care giver was mother and were illiterate, so by profession percentage of home maker was found to be maximum.

Majority of children lived in a pucca house (53%). Majority of children live in an ill ventilated house (63%). In majority of cases (64%) dampness was absent. Only 15% cases children exposed to passive smoking. Most of the cases (91%) indoor air pollution was present.

Only 19% children were exposed to pet animal.

35% children were not exclusively breast fed till date. Majority (79%) of cases feeding during illness were reduced. Only 63% children took ICDS meal regularly. Majority (94%) children were immunised up to date.

Majority (62%) of cases principal decision maker regarding treatment was mother. Majority of the cases (85%) allopathy was the usual preferred system of medicine. Majority of cases (66%) principal care giver seek treatment within 1 day. It can be said that for majority of the cases principal care giver was mom, so may be that reason play a role for seeking treatment within 1 day. Majority (77%) of cases pallor was absent. A study done by Bandopadhyay et al found that 70% of mothers preferred allopathic medicine as a choice of type of treatment.24

Overall, Incidence of spell was 1.19 episodes per child during the whole follow up period and estimated annual incidence of spell was calculated to be 1.59 episodes per child per year. For male, incidence of spell was 1.2 episodes per child during the whole follow up period and estimated annual incidence of spell was 1.61 episodes per child per year. For female, incidence of spell was 1.18 episodes per child during the whole follow up period and estimated annual incidence of spell was 1.57 episodes per child per year. A longitudinal study by Mitra found incidence density of ARI was 19.57/100 person months and slightly higher in female (24.6) than male (15.74), but the difference was not significant .10 Another study findings from Gulbarga city found slightly higher incidence (27.5%) of ARI .9 One study by Walke et al found overall incidence of ARI (all types) was found to be 7.9 episodes/100 child-weeks of exposure and no significant difference between gender .11 A study by Krishnan et al found slightly lower incidence of ARI (0.37).25 A study done in Kolkata found episode wise incidence of ARI was highest and it was 1939 episodes/1000 population /year.22 The finding is almost similar to the present study finding. Maximum spells were occurring in November (21.37%) and least in February (1.71%). Similar kind of result also found by the study in Kolkata, where Maximum ARI cases were occurring in winter and pre- winter.22

The present study revealed that maximum (91%) cases were mild variety. Severe cases only found in female (2.575). 34% cases were seek care in Government health facility followed by private practitioner (28%) and quack (22%). In 9% cases (all mild) no treatment was taken. In

78% of all cases no home remedy was given. In 21% mild cases home remedy was given. But no home remedy in severe cases. In moderate cases males were getting more home remedies (17%).

All the child from the present study was cured and only two children (male) were hospitalised. It may be due to majority care givers of the participants seek attention within 1 day and slums are located near to health facilities. A study by Krishnan et al. found that boys had 2.4 times higher ARI-related hospitalization rate as compared to girls.²⁵ This finding was corroborative with the resent study.

The present study on bivariate analysis revealed that significant association ($p < 0.05$) between spells of ARI and some influencing factors. Those were types of house, breast feeding practice, regularity of ICDS meal intake, period of gestation during delivery. A study by Birdar et al found that ARI was more in non- exclusively breast children.²⁶ A study by Ashwani et al found that ARI episode was less in children living in pucca house.²⁷

Conflict of interest: Nil

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