ORIGINAL ARTICLE

Effect of community based intervention on childhood pneumonia and its risk factors in slums of Dibrugarh, Assam

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ABSTRACT

Background: Pneumonia, one leading cause of mortality in children. Preventing pneumonia related deaths is an urgent priority to meet sustainable development goals. Settings and Design: Community based cross sectional study in two registered slums Chandmarighat and Graham bazar in Dibrugarh, Assam. **Methods and Material**: 2 out of 10 registered slums were chosen and a baseline cross sectional study was done to list out the risk factors. Based on the risk factors, community based intervention was done by capacity building of frontline workers and monitoring and suportive supervision in one while only monitoring was done in non intervention slum. Taking 95% confidence interval for two tail distribution, the sample size in each of the slums was 300. **Statistical analysis**: done by using SPSS 20, rates, ratios, proportions, univariate and multivariate analysis. **Results**: Prevalence of pneumonia was significantly low (9.33% vs 16.33%) in intervention and non-intervention area ($p<0.001$). Univariate analysis reported that initiation of complementary feeding before 6 months and indoor air pollution were associated with pneumonia in intervened area($p<0.001$). Multivariate analysis was done and type of family, complementary feeding before 6 months and indoor air pollution were associated with pneumonia in intervened area. **Conclusions**: Community based interventions targeting the established risk factors found effective in reducing the childhood pneumonia.

KEYWORDS
Air Pollution, Childhood, Community, Intervention, Pneumonia

INTRODUCTION

Pneumonia is the single largest cause of death, and accounts for 14% of all deaths in under five children (1). It has been estimated that there are about 150 million episodes of childhood pneumonia per year and 11– 20 million hospital admissions(2). In South east Asia, it has been documented that there are 0.36 episodes per child year, with an interquartile range of 0.32–0.40 (3). Intervention targeting the different determinants were found effective (4). Studies from India revealed; one third of families does not seek care for their children who suffers from pneumonia (5). Community case identification and management raises the care seeking behaviour by 13% (6) in areas where access to health facility is poor, training and retraining of

frontline workers is considered a strategy to lower the mortality risk from pneumonia in children 0–4 years by 24% and pneumonia-specific mortality in children 0–4 years by 36% (7).

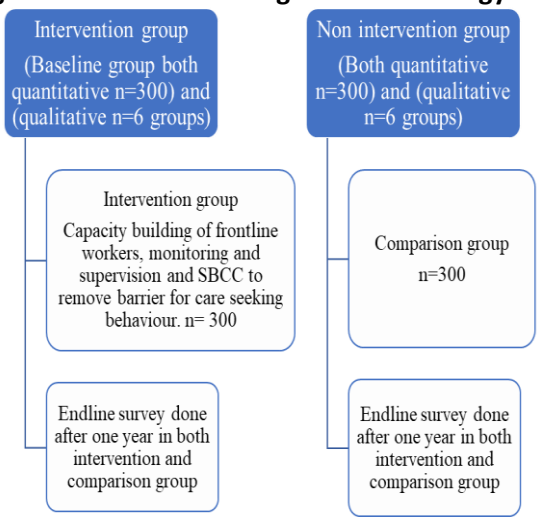
With India's population growth there is also an increase in the slum population and compromised facilities leads to diseases like pneumonia(8) in children. Hence forth , the present study is expected to assist the policy makers in setting strategies to decrease pneumonia-related morbidity and mortality.

Aim & Objective

To evaluate the effect of community based interventions on childhood pneumonia and its risk factors in slums of Dibrugarh, Assam.

MATERIAL & METHODS

Figure: Flowchart showing the methodology



The district Dibrugarh has 10 number of registered slums and out of those, 2 slums Chandmari ghat and Graham Bazar were chosen as the study sites. Ethical clearance was obtained from the institutional Ethics Committee and written informed consent was taken from all the participants. A community based cross sectional baseline study was done in both the slums initially. The annual cumulative incidence of pneumonia was taken as 38.3 per 1000 in 12-23 months age group and 10% relative precision and 95% confidence interval the sample size was 627 which was rounded of to 630 in the initial prevalence study. Based on probability proportionate to size technique, the required sample size was calculated. In the initial baseline study, prevalence of pneumonia and its risk factors in 1 -4 year age group was calculated. Based on the risk factors, intervention was planned in Graham Bazar area while no intervention was kept for Chandmari ghat and was taken for comparison. Taking 95% confidence interval for two tail distribution, the sample size for intervention study came out 249 which was rounded of to 300(9). All frontline workers of the intervention area were trained to assess pneumonia based on the criteria of fast breathing and chest indrawing according to IMNCI and home-based newborn care modules. Interventions also included health education and promotional activities in the Graham Bazar area (intervention slum) by the frontline workers as well as the supervisors who monitored the assessments and supervised the activities who were also trained IMNCI facilitators. Efforts to address the myths associated with child caring practices and to enhance care seeking practices were discussed. After one year of intervention study the endline survey was done using the same formats.

RESULTS

Table 1 Using modified Kuppuswamy 2014, socio economic classification, 42.3% belonged to upper lower class, 32.5% belonged to lower middle class and 17% belonged to upper middle class, while 7.6% belonged to lower class.

11.9% of mothers of the study participants were educated upto high school and above while 24.9% mothers were illiterate.

Table 2, showed that the prevalence of pneumonia at the baseline was 17.61% in the intervention area before intervention while it came out to 9.33% following intervention and it was significant. It was 14.09% and 16.33% at the endline and baseline respectively in nonintervention slum.

Table 2, shows that implementing intervention is significantly associated with reduction of pneumonia (p=.001).

Univariate analysis was done at the endline study and it showed significant association

with initiation of complementary feeding and indoor air pollution as shown in Table 3.

Multiple logistic regression was done in the endline survey in the intervention area and significant association was noticed with type of family, complementary feeding at less than six months and indoor air pollution as seen from Table 4. Another Multiple logistic regression was accomplished in non intervention area during endline and it revealed mother's education, age at giving complementary feeding and immunization is associated with pneumonia as shown in Table 5.

Table 1: Distribution of the study group according to different variables.

Variables	Number	Percentage (%)
Socio economic status		
Upper Middle Class and above	111	17.78
Lower Middle class	203	32.5
Upper Lower Class	264	42.3
Lower Class	46	7.3
Maternal education		
Illiterate	152	24.35
Upto primary	148	23.71
upto matric	282	45.19
High school and above	42	6.7

Table 2: The distribution of study participants according to presence of signs and symptoms of pneumonia before and after intervention

	Baseline			Endline			p-value
Pneumonia	Number	Total Population	Percentage	Number	Total Population	Percentage	
Graham bazar (Intervention before endline)11	71	403	17.61	28	300	9.33	0.001
Chandmarighat (No intervention)	32	227	14.09	49	300	16.33	0.48

Table 3: Univariate analysis of endline survey in non intervention and intervention areas.

Variables		Non Intervention	Intervention	p- value
		Endline	Endline	
Prelacteal Feed	Given	121 (40.3)	119 (39.7)	0.5
	Not given	179 (59.7)	181 (60.3)	
Feeding in first six months	Only breast milk	181 (60.3)	186(62.0)	0.5
	Breast milk + water	16 (5.3)	22(7.3)	
	Others	103 (34.3)	92(30.7)	
Complementary feeding	Less than 6 months	11 (3.7)	19(6.3)	0.001
	At 6 months	194 (64.7)	233(77.7)	
	More than 6 months	95 (31.7)	48(16.0)	
Immunization	Complete	205 (68.3)	185(61.7)	0.10
	Partial	93 (31.0)	114(38.0)	
	Not immunized	2 (0.7)	1(0.3)	
Indoor air pollution	Yes	210 (70.0)	168(56.0)	0.001
	No	90 (30.0)	132(44.0)	

Initiation of complementary feeding before 6 months and indoor air pollution were associated with pneumonia following intervention.

Table 4: Multiple logistic analysis in endline survey in intervention area.

Variables		n(%)	PR (%)	AOR	95% CI	p- value
Type of Family	Nuclear	179 (59.7)	23 (12.8)	Ref.		
	Joint	121(40.3)	5 (4.1)	0.288	0.096 – 0.869	0.027
Mother education	High school & above	80 (26.7)	6 (7.5)	Ref.		
	Upto matric	79 (26.3)	1 (1.3)	0.867	0.261 – 2.884	0.816
	Upto primary	83 (27.7)	11 (13.3)	1.057	0.328 – 3.408	0.927
	Illiterate	58 (19.3)	10 (17.2)	0.112	0.012 – 1.017	0.052
Complementary feeding	More than 6 months	48(16.0)	4 (8.3)	Ref.		
	At 6 months	233 (77.7)	18 (7.7)	0.989	0.285 – 3.437	0.986
	Less than 6 months	19 (6.3)	6 (31.6)	5.107	1.049 – 24.855	0.043
Indoor air pollution	No	132 (44.0)	2 (1.5)	Ref.		
	Yes	168 (56.0)	26 (15.5)	10.138	2.231 – 46.058	0.003

n=Total number of nuclear families, PR= Total number of participants showing signs and symptoms of pneumonia, AOR= Adjusted Odds Ratio.

Table 5: Multivariate analysis during end line survey in non intervention areas .

Variables		n(%)	PR (%)**	AOR	95% CI	p- value
Socio economic status	Upper middle class & above	37 (12.3)	9 (24.3)	Ref.		
	Lower middle class	81 (27.0)	20 (24.7)	1.507	0.505 – 4.493	0.462
	Upper lower class	157 (52.3)	17 (10.8)	0.786	0.253 – 2.443	0.677
	Lower class	25 (8.3)	3 (12.0)	0.721	0.131 – 3.959	0.706
Mother education	High school & above	36 (12.0)	17 (47.2)	Ref.		
	Upto matric	29 (9.7)	5 (17.2)	0.138	0.036 – 0.535	0.004
	Upto primary	112 (37.3)	14 (12.5)	0.131	0.045 – 0.378	0.000
	Illiterate	123 (41.0)	13 (10.6)	0.127	0.041 – 0.390	0.000
Complementary feeding	More than 6 months	95 (31.7)	25 (26.3)	Ref.		
	At 6 months	194 (64.7)	20 (10.3)	0.511	0.103 – 2.547	0.413
	Less than 6 months	11 (3.7)	4 (36.4)	0.246	0.114 – 0.534	0.000
Immunization	Complete	205 (68.3)	15 (7.3)	Ref.		
	Partial or not immune	93 (31.0)	33 (35.5)	8.754	4.005 – 19.134	0.000

DISCUSSION

Community based intervention is often designed at a geographical setting where various levels of interventions like educational , monitoring and suportive supervision etc can be employed at individual, families, social networks to change human/societal behaviour for reduction of risk of diseases. Targeted for population change, they are aggregate of individual changes and though realised poorly, community based health interventions give promising result in health promotion and disease prevention. Such interventions enhance community capacity building in reducing the risk of diseases(10). Our study found significant reduction in pneumonia prevalence following community based intervention in the form of social and behaviour change communication and skill building of frontline workers from IMNCI/ HBNC training along with supportive supervision. Specific community based interventions works effectively in improving child health and incidence of severe acute respiratory infections like pneumonia decreases with such effective interventions (11). Our study showed significant reduction in occurrence of pneumonia following initiation of community based interventions in the intervened area. Another study conducted at Pakistan reported that intensified health education, continuous surveillance and community based interventions decreased both the mortality and morbidity from pneumonia (12). At the community level, interventions can be nutritional improvements, immunization and low cost effective case management that amplifies child survival in childhood pneumonia(4). Other interventions are early breastfeeding, good nutrition, vaccination, reduced exposure to indoor air pollution and improved child care practices for prevention of childhood pneumonia in developing countries (13). Another study documented that a pooled analysis of community based interventions increases care seeking behaviour for childhood pneumonia by 13% and also decreases the treatment failure rate by 40% (14). Interventions that enhances the caregiver's awareness and knowledge on danger signs also improves child caring practices and early treatment seeking. A study from Nepal have reported that there are higher incidence of pneumonia in households that did not had a separate kitchen and used solid fuels to cook as well as to keep the interior warm in the hilly and mountainous areas (15), In our study also indoor air pollution was found to be associated with pneumonia. Children hailing from nuclear families are at higher risk of severe pneumonia as has been documented from an Indian study and it was much similar to the current study (16)

Children who suffered from pneumonia had higher deficiencies of nutrients than their counterparts who did not suffer(17). Nutritional interventions prevent malnutrition and reduces occurrence of pneumonia and such interventions can be exclusive breastfeeding, initiation of complementary feeding by 6 months of age (18). WHO has recommended exclusive breast feeding for six months of age, as it lowers the risk of respiratory infections(19). A study from Maldives had reported that there is significant lower risk of acute respiratory infections following exclusive breast feeding for six months(20). A study conducted in high prevalence area of pneumonia in Indonesia have reported that among the other risk factors, non-exclusive breast feeding is a major contributor to childhood pneumonia (21). Similarly in another study conducted at rural Vietnam, hospital admissions ware raised for infants for pneumonia who were not exclusively breast fed(22). Thus, deaths from childhood pneumonia can be significantly averted amongst children exclusively fed on mother's milk and this may be applicable in resource limited settings where practice of exclusive breast feeding children reduces infant mortality(23). We have also found significant association of pneumonia with earlier initiation of complementary feeding.

Researchers have documented that along with other risk factors, indoor air pollution substantially contributes to childhood pneumonia and in India, about 41% of population do not have exposure to clean

fuels(24). Use of solid fuels either as dung, wood, agricultural crops leads to household air pollution in low middle income countries leading to multiple respiratory health outcomes and childhood pneumonia is one such outcome(25). Another meta analysis have found that the use of solid fuels is much higher in Asian countries in comparison to African region and there is significant association of solid fuel use with childhood pneumonia (26). A study from India have found that use of biomass fuel, kitchen not separate from the living room increased the risk of ARI in children by 36%(27). Household air pollution exposures is indexed by carbon mono-oxide and researchers have found that the risk of pneumonia and severe pneumonia is increased by 10% and 15% respectively per 1-part per million (ppm) increase in average prenatal CO exposure and by 6% (RR, 1.06; 95% CI, 0.99-1.13) per 1-ppm increase in average postnatal CO exposure(28). Current study had found a significant association between indoor air pollution and childhood pneumonia. However our study had limitations. Continuous moving in and out of people from the study slums and non-response was noticed in endline study. Though the burden of childhood pneumonia is declining in our country but there are 403 cases per 1000 children in 2015 in India (29), so it can be said that it was a timely study and the interventions will go a long way in reducing the burden in slums where people reside in compromised health conditions.

Conclusion

Social and behaviour change communication, empowering the community frontline workers and care seeking by care givers, strong evidence base locally adapted public health interventions can go a long way in reducing inequalities, lowering mortality and morbidity not only from pneumonia but also other childhood infections amongst children living in low income and resource limited settings and will bring the desired upliftment in child health and survival.

Recommendation

Capacilty building of frontline workers on IMNCI/HBNC along with regular monitoring and suportive supervison has potential to reduce the burden of childhood pneumonia in slum areas along with effective communication strategy implementation.

Limitation of the study

As the study was limited to slum areas, so continous moving in and out of people and also non response was noticed. As it is a community based study some imprecision may happen.

Relevance of the study

In community based settings, the frontline workers on being trained can implement the interventions to reduce morbidity and mortality from pneumonia.

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Authors Contribution

All authors have contributed equally.

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Conflict of Interest

There are no conflicts of interest.

Declaration of generative AI and AI assisted technologies in the writing process

The authors haven't used any generative AI/ AI assisted technologies in the writing process.

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