Influence of Household Environment and Living Conditions on Incidence of Diarrhea and Acute Respiratory Infections among Slum Children of Eight Major Cities of India

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1. Introduction

The year 2007, showing the world's urban population equal to the world's rural population, has made a breakthrough first time in human history. In number as well as the share of total urban population of the world, Asia and Africa will continue to lead global urban growth through 2030. As a result growing urban population does not necessarily guarantee the improved quality of life for urban inhabitants. Moreover, poverty led rural to urban migration and growing slum population lays additional disadvantages towards this goal. At the global level, 31.2 per cent of all urban dwellers lived in slums in 2005, a proportion that not changed significantly since 1990. However, the magnitude of the problem has increased substantially: 283 million have added to the global urban population in last 15 years. Today, there are approximately 998 million slum dwellers in the world, and if current trends continue, the slum population will reach 1.4 billion by 2020 (UN-Habitat, 2006). In absolute numbers, Asia has the largest share of the world's slum population – in 2005, the region was home to more than half of the total slum population, or about 581 million people. Most of the slum dwellers in Southern Asia's slum dwellers – 63 per cent, or almost 170 million people – reside in India. The share of Southern Asia's slum dwellers constitutes 27 per cent of the global total; India alone accounts for 17 per cent of the world slum dwellers.

The size of the population of urban slum may vary by the country-specific definition of *slum*. However, at an Expert Group Meeting in 2002, UN-HABITAT and its partner came up with a provisional definition of "slum"; a settlement in an urban area in which more than half of the inhabitants live in adequate housing and lack of basic services-durable housing, sufficient living area, access to improved water, access to sanitation and secure tenure. Attention to slum dwellers' problems of the world has been largely a matter of inaction, inappropriate action and or insufficient action. The most common government policies over the past 40 years have ignored slums or, to bulldoze them when they are on valuable land. The most common were slum upgrading and housing finance systems. Slum up gradation was usually limited in extent and seldom maintained over time. It was rarely implemented on a scale that helped more than a few slum dwellers (UNCHS, 1996).

According to the Indian legislation, slums are defined as areas that are "environmentally and structurally deficient" (GOI, 1988). The 1981 Census of India in the light of slum area act 1956 defined slums as areas where buildings are unfit for human habitation for reasons such as dilapidation, overcrowding, faulty arrangement of streets, and lack of ventilation, light or sanitary facilities. In other words slums are groups of buildings, or areas characterized by over-crowding, deterioration, unsanitary condition or absence of facilities or amenities which because

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of these conditions or any of them endanger the health, safety or morals of its inhabitants or the community (*Census of India, 2001*). According to Ford Foundation, a slum is a residential area in which the housing is so deteriorated and substandard or as unwholesome as to be a menace to the health, safety, morality or welfare of the occupants (*Rathor, 2003*). The definition suggests that slums are those places where people face unhealthy living conditions and acute shortage of basic amenities and health infrastructure. The most vulnerable group on which these conditions must have influence is children. Diarrheal diseases, pneumonia and acute respiratory infections (ARIs) are the top three killers among young children in the developing world. Diarrhea diseases are faecal origin, intervention that prevents material entering the domestic environment of the susceptible child is likely to be is greatest significance for public health (Curtis, 2003). Acute respiratory infections are caused by bacteria and through regular irritation arise from air pollutants available in the living environment. Slums are quite natural territory for such bacteria and pollutant. Moreover, it is wide accepted that each and every slum child is equally vulnerable to face the mentioned health threats. Therefore, this paper attempts to understand whether the incidence of diarrhea and acute respiratory infections vary across socio-demographic and economic backgrounds of children.

2. Review of Literature

Prasad and Somayajulu (1992) the paper is based on data collected for such study carried by ORG for USAID in Calcutta, Indore and Bharuch, representing different population size. The analysis of community data further revealed that the slum dwellers government for the treatment of acute, chronic health problem as well as for maternal and child health (MCH) and family planning services. In Maharashtra, *Kapadia-Kundu and Kanitkar (2002)* found that the state of child health in urban slums is comparable to that in rural area and in some cases even worse. This is especially so in immunization. The urban poor are spending substantial amount on childhood illness such as Diarrhea and acute respiratory infection (ARI). A study by *Gupta, et. al. (2007)* reveals that though aware of danger sign of ARI, care takers were still seeking medical advice for mild cases of ARI and doctor were prescribing drugs. Correct home based management e.g. use of ORS, continued feeding etc. was deficient in the community. Knowledge of danger symptom was low and medical advice was being sought and drugs were being prescribed for acute Diarrhea diseases too. *Vaid et. al. (2007)* shows the level of infant and child mortality is a basic indicator of the quality if the life in a society. The infant mortality rate (IMR) recorded for poorer urban communities in India during the National Family Health Surveys (NFHS-2) in 1992 for the preceding 5 years period was 76 per 1000 live births. In Tamil Nadu, urban poor infants over one month of age, the leading cause death was Diarrheal disease. Neonatal mortality, which is preventable by better antenatal and perinatal care, continue to be high in urban slums in south India. In the post-neonatal period of infancy, infectious disease mortality is high although healthcare is accessible *Vaid et al. (2007).*

Agarwal and Taneja (2005) describe the rationale for identifying the most vulnerable among the urban poor, while planning city level child health interventions. It also shows how standard successful programs in one slum do not bring about the same result in another area owing to differential vulnerability. This paper also describes an approach by which the urban poor can be

identified and classified at different levels of health vulnerability. Child mortality and morbidity (Diarrhea in particular) have been associated with poor quantity and quality, lack of sanitation and poor hygiene practice. Condition differs with some slums having adequate water point of other slums having to stand in queues to access poor quality water. Health facilities proximal to slums affect awareness and health beahaviour. ICDS which cover a population of approximately 28 million (22), has a poor reach in urban areas, with only 278 urban ICDS projects out of 4348 project (23). The status of mothers in the families affects children health and survivals.

Buttenheim (2008) evaluated how improved sanitation effects child nutritional status by limiting exposure to diarrheal diseases burden and investigate a neglected issue in the literature on sanitation improvement: how do parents dispose of children's feces, and does this behavior change when sanitation infrastructure is installed?

Researcher concludes that latrine improvements projects that do not change the disposal practice for children feces do not ensure improvement in children's health. Sanitation upgrades are also ineffective in improving child health when implemented in dispersed households, but more effective when implemented in neighborhood clusters. A key message from this study is that the environment versus behavior dichotomy is a false one. A study conducted to assess the magnitude of the problem in fewer than five children of different socio-economic status, in an urban area of West Bengal *(Banerjee, et. al., 2004)*.

Another study assessed the influence of socio-demographic, economic and diseases related factors in health care seeking for child illnesses among slum dwellers of Nairobi, Kenya *(Taffa and Chepngeno, 2005)*. The study revealed that household income was significantly associated with health care seeking up to threshold levels, above which its effects stabilized. Improving caretaker skills to recognize danger sign in child illnesses may enhance health seeking behaviour. *Curtis et al. (2000)* suggested that hygiene promotion should focus on the elimination of human stools from the domestic environment and effective hand washing after stool contact

3.1 Data and Methodology

Acute Respiratory Infection (ARI) it may cause inflammation of the respiratory tract anywhere from nose to alveoli, with a wide range of combination of symptom and sign. Hospital records from states with high infant mortality rates shows that up to 13 per cent of inpatient death in paediatrics wards are due to ARI. The proportion of death due to ARI in community is much higher as many children die at home. *Acute Diarrhea Diseases (ADD)* it is defined as the passage of loose, liquid or watery stools. These liquid stools are usually passed more than three times a day. Diarrhea is major public health problem in developing countries. An estimated 1.8 billion episodes of Diarrhea occur each year and 3 million children under the age of 5 years die of Diarrhea (Park, 2002).

The utilize data from third round of National Family Health Survey (2005-06). To understand the incidence of Diarrhea and ARI, logit regression analysis along with percentages was carried out.

4.1 Analysis

The prevalence for all diseases is higher among 0-11 months age group, in which cough/fever are very high at 43.3 per cent level fallowed by any disease at 31.1 per cent than Diarrhea and ARI at 14.6 and 12.4 per cent. As age increases the prevalence Diarrhea, ARI and cough/ fever decreases. It's also shows in the age group 48-59 months. Contaminated drinking water continues to be the source for most diarrheal outbreak recorded in India. Availability of portable drinking water for a large proportion of the Indian population of the Indian population is a major public health concern. Again the prevalence of all the diseases with their birth order like Diarrhea and ARI are around 9 per cent and cough/fever and any diseases are 20 and 25 per cent. Here also increasing the birth order decreases the prevalence of diseases. The drastic change is in gender based that is Diarrhea 9 per cent and 8 per cent for male and female respectively. Mothers age does not affected more for all the diseases. Child line number also affects the Diarrhea and ARI prevalence. The prevalence of all the three diseases such as Diarrhea, ARI and cough/fever with any disease is higher among other backward classes fallowed by SC/ST than others, same it also found higher in Diarrhea for Hindu and less in ARI for Muslims. Wealth index also affect the prevalence of all the diseases are high for middle class (9 per cent) fallowed by poor (8.7 per cent) than richer which is 8 per cent. Effect of mass media is high on the prevalence of such diseases, who have no exposure is 8.4 per cent for Diarrhea 12 per cent for ARI and 22 percent for cough and fever, and low for who have full exposure to mass media that is 6.7 per cent for Diarrhea, 10 per cent for ARI and 19 per cent for cough/fever, where as cooking food outside house higher than cooking food in kitchen. Using mattress has great impact on cough/fever whereas window with glasses has lesser impact on ARI. Types of toilet facility such as flush toilet have lesser impact such as Diarrhea (6 per cent), ARI (7 per cent) and cough/fever (14 per cent) diseases, whereas other type of toilet facility has greater impact on such as Diarrhea (11 per cent), ARI (11 per cent) and cough/fever (22 per cent) diseases. Unsafe water has also greater impact on Diarrhea (9 per cent), ARI (10 per cent) and cough/fever (22 per cent) diseases. The most important actor is that if any person using substances in the family have most effective on Diarrhea 13 per cent and cough 21per cent.

The prevalence of Diarrhea is higher in unsafe toilet facility with 7 per cent; similarly it is higher in ARI with 7 per cent and cough/fever with 15 per cent. Other type of unsafe toilet facility has greater impact Diarrhea with 6 per cent, ARI with 8 per cent and cough and fever with 20 per cent. Unsafe disposal of child's stool in latrine/rinse/diaper also has less impact on Diarrhea 11 per cent, ARI 12 per cent and cough/fever 23 per cent, whereas other method of disposing child stool has greater impact on Diarrhea 10 per cent, ARI 12 per cent and cough/fever 23 per cent (Table 2).

Table 1: Percentage distribution of children suffering from Diarrhea and Acute Respiratory Infection (ARI) in India

Characteristics	Diarrhea	ARI	Cough	Fever	Any Disease	N
AGE (Months)* **						
0-11	14.6	12.4	21.4	16.4	31.1	460
12-23	12.1	11.9	21.3	19.2	28.7	505
24-35	6.4	8.6	18.8	16.0	23.4	547
36-47	4.5	6.7	15.7	12.8	19.6	537
48-59	5.3	3.8	13.8	10.4	16.4	531
BIRTH ORDER						
1	9.2	9.5	19.5	14.8	25.1	856
2	7.3	8.3	18.1	14.3	22.2	809
3+	8.4	7.9	17.1	15.4	23.3	915
SEX						
Male	9.1	8.6	18.6	15.5	24.9	1399*
Female	7.5	8.4	17.6	14.3	21.9	1181
MOTHER AGE						
15-24	8.5	9.7	19.6	15.4	24.6	968
25-29	8.2	7.5	17.1	14.5	23.1	1025
30+	8.3	8.3	18.2	14.7	22.7	587
PREECEDING BIRTH INTERVAL						
First Child	9.4	9.6	19.6	14.8	25.3	863
9-35 (Months)	7.3	7.6	17.1	14.7	22.6	1059
36+ (Months)	8.7	8.5	18.2	15.4	22.9	658
CHILD LINE NUMBER						
Up to 5	7.4’	9.5’			22.2’	1142
5+	9.1	7.8			24.7	1438
WEIGHT AT BIRTH						
Up to 2500 gms	10.5’	9.1	18.9	16.0	25.3	685
<2500 gms	7.5	8.8	18.5	13.9	22.9	956
Not reported third category	7.6	7.9	17.8	15.0	23.0	939
COUPLE EDUCATION						
Both not lit	7.8	5.7	16.5	15.0	18.4’	348
One lit	7.6	8.9	19.2	15.5	24.3	655
Others	8.8	9.0	18.4	14.6	24.4	1577
CASTE						
SC/ST	8.7	7.8’	16.9	14.0	25.0***	665
OBCs	9.5	10.5	17.0	14.6	27.9	778
Other	7.3	7.6	21.0	16.4	19.8	1134
RELIGION						
Hindu	8.9	8.0	17.2	13.9	23.7	1666
Others	7.2	9.4	21.5	18.7	23.3	914

Contd…Table 1

Characteristics	Diarrhea	ARI	Cough	Fever	Any Disease	N
WEALTH INDEX						
Poor	(8.7)	9.7	18.2	15.2	26.5	196
Middle	9.3	10.1	19.1	15.0	24.8	537
Rich	8.0	8.0	17.5	14.4	22.9	1847
MOTHER WORK STATUS						
Not worked (in 12 months)	8.8	8.3	18.0	14.9	23.5	2060
Worked (in 12 months)	6.5	9.2	18.3	15.0	23.7	520
MASS MEDIA						
No exposure	8.4	11.8*	17.3	15.0	25.5	263
Partial exposure	8.9	7.6	18.6	15.0	23.6	1732
Full exposure	6.7	9.9	18.2	14.2	22.6	585
FAMILY STRUCTURE						
Nuclear	8.2	9.3	17.7	15.0	23.5	1309
Other	8.5	7.7	18.5	14.9	23.7	1271
COOKING						
Kitchen only	6.3**	7.6*	17.5	14.8	21.2***	694
No kitchen	8.1	8.1	17.2	14.3	22.2	1512
Outside house	12.8	11.8	20.2	16.1	33.4	374
FUEL USED						
Safe		7.8	16.1	13.4	22.9	1237
Semi safe		9.9	17.1	14.1	25.3	423
Unsafe		8.8	20.3	16.6	23.7	920
MATRESS						
No		7.6	18.0	15.5	23.2	839
Yes		8.1	18.3	14.3	23.7	1739
WINDOW WITH GLASS						
No		8.8	16.4	13.8	24.2’	2147
Yes		7.2	18.3	15.0	20.3	428
TOILET						
Flush	6.0***	6.6**	15.9	12.5	18.8***	1280
Other type	11.2	10.7	19.6	15.7	28.9	1056
No facility	8.2	9.0	17.5	14.7	25.8	244
WATER QUALITY						
Unsafe	9.3’	9.8*	18.4	15.4	27.6***	1188
Safe	7.5	7.5	16.8	12.7	20.1	1392
DISPOSAL OF CHILD’S STOOL						
Latrine/ rinse/Diaper	6.9**	6.8**	19.3	15.2	21.5*	1253
Others	9.7	10.2	17.9	14.8	25.5	1327
SUBSTANCE USE						
No	8.0*	8.5	18.1	14.9	23.3	2437
Yes	(13.3)	(9.1)	18.4	15.4	28.7	143
TB/ASTHAMA						
Yes	8.3	8.4’	18.0	14.8	23.3’	2493
No	(8.9)	(13.9)	24.7	20.8	31.6	79
TOTAL	**8.3**	**8.5**	**18.1**	**14.9**	**23.6**	**2580**

163 missing cases on SLI; ‘Others’ category in disposal of child stool shows using drain/ditch/in to garbage/ buried/ rinse away/open/left open/others; Window with glass – 10 cases are missing

Table 2: Percentage of children age below six years suffering from Diarrhea, ARI and Cough/Fever by drinking water quality by toilet facility and disposal of child's stool

Characteristics	Diarrhea		ARI		Cough/Fever		N	
	Unsafe	Safe	Unsafe	Safe	Unsafe	Safe	Unsafe	Safe
TOILET FACILITY								
Flush	7.0*	5.7***	6.7*	6.6	15.2**	14.6	328	952
Other type	11.4	10.9	11.8	8.8	25.5	18.7	600	396
No facility	6.0	(18.2)	(8.0)	(13.6)	20.0	22.7	200	44
CHILD'S STOOL DISPOSAL								
Latrine/Rinse/Diaper	6.3	7.1	6.3	7.0	19.9**	16.3	413	840
Others	10.8	8.2	11.6*	8.2	22.7	15.6	775	552

Table 3a: Odds of children suffering from diarrhea in slums of eight major cities of India

Characteristics	**Categories**	**Odds ratio (Slum)**	**Odds ratio (Urban)**
Birth order	1®	1.000	1.000
	2	2.759	1.060
	3+	3.276	1.159
Current age of child	Less than 2 years®	1.000	1.000
	2 or more years	0.404***	0.369***
Sex of the child	Male®	1.000	1.000
	Female	0.826	0.906*
Preceding birth interval	First Child®	1.000	1.000
	9-35 (Months)	0.282	1.038
	36+ (Months)	0.323	1.001
Birth weight	Up to 2500 gms.®	1.000	1.000
	<2500 gms.	0.753	1.036
	Do not Know	0.543**	1.151*
Caste	SCs/STs®	1.000	1.000
	OBCs	1.181	0.968
	Other	0.912	0.792**
Religion	Hindu®	1.000	1.000
	Others	0.895*	1.181*
Household structure	Nuclear®	1.000	1.000
	Other	0.910	1.090
Couple education	Both non- literate®	1.000	1.000
	One literate	0.983	1.063
	Others	1.165	1.105*
Wealth index	Poor®	1.000	1.000
	Middle	1.068	1.283*
	Rich	0.998	1.252**
House type	Kaccha®	1.000	1.000
	Semi pucca	1.164	0.717**
	Pucca	0.829	0.756*
Mass media	No exposure®	1.000	1.000
	Partial exposure	0.905	1.133
	Full exposure	0.618	0.811*
Type of toilet	Flush®	1.000	1.000
	Other type	2.029***	1.076
	No facility	1.207	1.201*
Water treatment	Unsafe®	1.000	1.000
	Safe	0.818*	1.166
Disposal of toilet	Latrine/ Rinse/Diaper®	1.000	1.000
	Others	1.087	0.948*
Slum cities	North®	1.000	NA
	West	1.097	
	South	0.463***	

Table 3b: Odds of children suffering from Acute Respiratory Infections (ARI) diarrhea in slums of eight major cities of India

Characteristics	Categories	Odds ratio (Slum)	Odds ratio (Urban)
Birth order	1®	1.000	1.000
	2	3..428	1.652
	3+	3.197	1.658
Current age of child	Less than 2 years®	1.000	1.000
	2 or more years	0.517***	0.652***
Sex of the child	Male®	1.000	1.000
	Female	0.951	0.993
Preceding birth interval	First Child®	1.000	1.000
	9-35 (Months)	0.257	0.607
	36+ (Months)	0.260	0.644
Birth weight	Up to 2500 gms.®	1.000	1.000
	<2500 gms.	1.155	0.840
	Not reported	0.567**	0.920
Child's Line No.	Up to 5	1.000	1.000
	Above 5	0.800	0.960
Caste	SCs/STs®	1.000	1.000
	OBCs	1.532*	1.027
	Other	0.874	1.038
Religion	Hindu®	1.000	1.000
	Others	1.418*	1.054
Household structure	Nuclear®	1.000	1.000
	Other	0.740	1.457
Place for Cooking	Kitchen	1.000	1.000
	No Kitchen	1.480*	1.562
	Outside House	1.201	1.100
Couple education	Both non-literate®	1.000	1.000
	One literate	1.885*	1.666***
	Others	2.329**	1.463**
Wealth index	Poor®	1.000	1.000
	Middle	0.961	1.316*
	Rich	0.699	1.096
House type	Kaccha®	1.000	1.000
	Semi pucca	1.176	0.843
	Pucca	1.160	0.724*
Mass media	No exposure®	1.000	1.000
	Partial exposure	0.524**	0.845
	Full exposure	0.701	0.755*
Type of toilet	Flush®	1.000	1.000
	Other type	1.482	1.182
	No facility	1.068	1.000
Water treatment	Unsafe®	1.000	1.000
	Safe	0.836	0.897
Disposal of toilet	Latrine/Rinse/Diaper®	1.000	1.000
	Others	1.228	0.988
Fuel used	Safe®	1.000	1.000
	Semi safe	1.378	1.002
	Unsafe	1.238	1.003
Mattress	No®	1.000	1.000
	Yes	0.942	1.218*
Window with glass	No®	1.000	1.000
	Yes	1.062	0.850*
Slum cities	North®	1.000	1.000
	West	0.709	
	South	0.239***	

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