

ORIGINAL ARTICLE

Are Slum Children at High Risk of Under Nutrition, Anemia and Childhood Morbidity? Evidence from India

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Abstract

Background: Urban population growth in developing countries especially in India is at a rapid pace in the past few decades. Growth of urban population is always accompanied by the growth of population in urban slums, which poses threat to the health of urban population, particularly, the health of the children. **Objective:** The present study aims to study whether the slum dwelling affects the child morbidity, low weight at birth, infant mortality, child malnutrition and anemia. **Methods:** Until NFHS-3, there was paucity of data on slums to analyze for a larger area and compare it with non-slum population. However, NFHS-3 provides data from slums in eight cities and is used for the present study. The child health aspects considered here are: prevalence of diarrhea among children, prevalence of fever among children, prevalence of cough among children, infant death, low birth weight, malnutrition among children and anemia among children. **Results:** Slum children belong to lower socioeconomic strata than children from non-slum areas. Children living in slum areas are 1.3 times, 1.5 times and 1.2 times more likely to suffer from diarrhea, cough and fever respectively than children living in non-slum areas. Multivariate results also showed that slum children have higher odds for low weight at birth (1.4 times) and child anemia (1.2 times) compared to non-slum children. **Conclusion:** Slum dwelling children are at a disadvantageous side in terms of child morbidity, anemia and weight at the time of birth.

Key Words

Slum; Morbidity; Anemia; Under Nutrition

Introduction

Rapidly increasing urban population increases the growth of slum population and poverty. According to 2011 census data [1], it is evident that 17 percent of urban India lives in slums. Generally, a larger proportion of slum population is migrants and they are continuously under the threat of displacement. Further, overcrowding, poor hygienic and sanitary conditions make slum population, especially, children more vulnerable for malnutrition and anemia. A number of studies [2-4] concluded that the health of the urban poor is worse than the rest of the urban population. Malnutrition and anemia are important dimensions of health among children in slums because malnutrition and anemia combined with poor living conditions would have detrimental effect on the health of children. Studies have shown that separate kitchen, use of public toilet and type of house have significant impact on the health of slum dwellers [5-7]. Researchers found that infant deaths beyond the neonatal period are common in slums due to diarrheal

disease and respiratory infections [8]. High prevalence of diarrhea is a stark reflection of the lack of clean drinking water and adequate sanitation facilities [9]. It is also found that malnourished and anemic children have higher risk of illnesses such as diarrhea, fever and acute respiratory infection [10-11].

Background clearly established that slums are characterized by poor health, especially, health of the children due to poor housing and environmental conditions. These conditions coupled with malnutrition and anemia among children would pose a high risk of infectious diseases. It is also evident that most of the studies are confined to either one slum or one city. In such cases, generalizations are difficult. It is also argued that all urban poor does not live in slums. A considerable proportion of urban poor live in non-slum areas as well. Therefore, it is necessary to have comparative picture with the non-slum areas and also from a larger area. Until recent rounds of NFHS, there was a paucity of data on slums. NFHS-2 collected data from Mumbai slums. The third round of NFHS collected

data from slums of eight cities and provides an opportunity to analyze data from slums of various parts of India and compare it with non-slum areas.

Aims & Objectives

This study aims to understand whether slum dwelling has any impact on the childhood morbidity, mortality, nutrition and anemia.

Material and Methods

This study utilizes data from the National Family Health Survey (NFHS)-3, India, the large scale survey on demography and health. The NFHS-3, conducted in 2005-06, collected information from 109,041 households and 124,385 ever married women in the age group 15-49. The survey provides estimates for the country as a whole and all the states existed at the time of survey. The survey collected information on fertility histories, contraception, maternal care, breastfeeding, child health and socioeconomic background. Further, some of the child health aspects such as survival status age at death, information is collected for all children and other aspects are collected for children born in the preceding five years of the survey. Present research work analyses the information for last child born during the preceding five years of the survey in order to maintain uniformity. NFHS-3 collected data from slums in eight cities (Chennai, Delhi, Hyderabad, Indore, Kolkata, Meerut, Mumbai and Nagpur). The child health aspects included in the present research work are discussed in detail in the following lines.

Birth Weight: Birth weight is an important indicator because of its relationship with the high risk of childhood illnesses and death. In the absence of information on birth weight, mother's assessment on the size of the baby at birth is a useful proxy for birth weight. In NFHS-3, mother's estimate of size of the baby at birth was obtained for all births regardless of whether or not they were weighed at birth. Information on size of the baby at birth is recorded as very small, smaller than average, average or larger. For this study, information on size of the baby at birth is categorized as: No low birth weight (includes average or larger) and low birth weight (includes very small and smaller than average).

Prevalence of diarrhea, fever and cough: Information on childhood morbidity such as diarrhea, fever and cough is collected for children who were born during the preceding five years of the survey. Information on morbidity is collected for the two weeks preceding the survey in order to avoid any recall lapse.

Infant Death: Information on mortality among children is gathered for all children in NFHS. Information is collected on survival status of children and age at death in days, months and years.

Malnutrition among Children: NFHS-3 presents three standard indices of physical growth among children, namely, height for age (stunting), weight for height (wasting) and weight for age (underweight). Each of three nutritional status indicators is expressed in standard deviation units from the median of the reference population. In the present work, weight for age (underweight) is considered for further analysis. Children whose weight for age Z-score is below -2 standard deviations are considered underweight and below -3 standard deviations are considered severely underweight. For the study purpose, a child whose weight for age Z-score is below -2 standard deviations is considered.

Child Anemia: Anemia is the level of measurement of hemoglobin levels in the blood which is necessary for the growth and functioning. NFHS-3 undertook direct measurement of hemoglobin levels for all children under age five years. Children with hemoglobin levels 10.0-10.9g/dl are considered mildly anemic, children with hemoglobin levels 7.0-9.9g/dl are moderately anemic and children with hemoglobin levels below 7.0g/dl are considered severely anemic. This study considers children with any kind of anemia as anemic.

Analysis: At the first stage, background characteristics of slum and non-slum residents are discussed. Percent distribution of child health indicators in slum and non-slum areas is compared. Finally, multivariate logistic regression is used in order to see the net influence of place of residence controlling for the effect of other background factors.

Statistical Methods - Logistic Regression Analysis: To see the effect of explanatory variables on the dependent variable, which is dichotomous, it is preferable to use logistic regression, instead of multiple linear regression technique since in such a case the error term would not be normally distributed [12]. The logit of the probability of occurrence (p) is expressed as a function of explanatory variables as $\text{Logit}(p) = \log(p/1-p) = \beta_0 + \sum \beta_i X_i$

Where X_i are the explanatory variables and β_i are the coefficients. Logistic regression coefficients and also the level of significance have been estimated for each of the dependent variable separately.

Explanatory Variables: Objective of the study is to determine the influence of slum dwelling and hence, slum dwelling is used as an explanatory variable (non-slum and slum). Women's age at the time of birth has been used as an explanatory variable because maternal age plays a vital role in child health and care. Women's age at the time of birth is categorized into two categories: adolescent (women who had birth at the age of 19 or below) and adult (women who had birth at the age of 20 and above). Women's literacy level has strong impact on the health of their children. Educated

women have awareness about health facilities available and child care. Hence, literacy level of women is included as one of the explanatory variable (Illiterate and Literate women). Births with lower birth order often receive better care and therefore birth order was included in the analysis as control variable (first birth order and second & higher order births). Income level of the household is an important factor influencing the child health and care. However, NFHS-3 provides household wealth status as a proxy for income (for details see IIPS and ORC Macro, 2007)[13]. Wealth status is categorized into two categories: Poor (includes poorest and poor) and Non-poor (includes average, richer and richest). Studies have shown that work participation of women would influence the child health negatively and hence is included in the multivariate model (as non-working and working). Religion, caste and exposure to mass media are also included in the multivariate analysis. In India, region in which the child lives influences the health of the child due to wide variations in the culture and practices

Results

Bivariate Results: [Table-1](#) provides the background characteristics of slum and non-slum children. It is evident from the results that 44 percent of the slum children and 28 percent of the non-slum children are born to adolescent women (women's age at the time of birth is 19 or below). It is also noted that 14 percent of the children's mothers in non-slums and 27 percent of the children's mothers in slums are illiterates. Percent of mothers in work participation does not seem to differ between slum and non-slum areas.

It is surprising to note that major percentage of slum children belong middle, richer and richest categories. This raises concern about the sensitivity of the wealth index in identifying the poor 24. Percent of mothers who have no exposure to mass media is higher in slums (11 percent) than non-slums (6 percent). There are little differences in percentage of caste wise population in slums and non-slums. The slum population comprises of 68 percent of non-Hindus and 32 percent of Hindus. The results also show that for 87 percent of the children in non-slum areas and for 91 percent of the children in slum areas piped water is the source of drinking water. It is also observed that 98 percent of children in non-slum areas and 95 percent of children in slum areas use flush/ pit toilet.

[Table-2](#) brought out that prevalence of diarrhea, fever and cough is higher among children who live in slum than children live in other areas. It is also found that percent of low birth weight babies and percent of children suffering from anemia is higher among slum children compared to non-slum children. However, in the case of malnutrition and infant mortality, no differentials are found by place of residence.

Prevalence of Diarrhea among Children: It is evident from the results that slum children are at higher risk of suffering from diarrhea during the two weeks prior to the survey compared to children who live in other areas. Children who live in slums are 1.3 times at higher risk of suffering from diarrhea than non-slum children [\[Table-3\]](#). Region of residence of children also plays a significant role in influencing the prevalence of diarrhea. Children who live in western, eastern and southern regions are significantly less likely than children who live in northern regions to suffer from diarrhea. Other variables used in the model did not show any significant relationship with the prevalence of diarrhea among children.

Prevalence of Cough among Children: The multivariate results found that slum children are at 1.5 times higher risk of cough than non-slum children [\[Table-3\]](#). Mother's education has significant influence on the prevalence of cough among children. Children whose mothers are literates have lower odds of prevalence of diarrhea than children illiterate mothers. Exposure to radio or television or both reduced the risk of cough. Religion, caste and region of residence also exhibited significant influence on the prevalence of cough.

Prevalence of Fever among Children: [Table-3](#) also shows that dwelling in slum increased the likelihood of suffering from fever among children. Children whose mothers have education, children whose birth order is second or higher are less likely to suffer from fever than their counterparts. Children of working mothers are at higher risk of suffering fever than children of non-working mothers. It is also noted that religion, caste and region of residence play a significant role in the case of fever among children.

Infant Death: The logistic regression results revealed that the place of residence does not exert any significant influence on the infant death [\[Table 4\]](#). Mother's age at the time of birth appears to be a significant predictor of infant death. Children whose mothers were in the age group 20 and above during the birth have lower odds of infant death. Children who live in southern region are less likely to die during infancy as compared to children from Northern region.

Low Birth Weight: The multivariate results show that slum children had 1.4 times higher risk to be born with low birth weight than non-slum children [\[Table 4\]](#). Children whose birth order is second or higher and children belong to Hindu religion are less likely to have low birth weight than their counterparts.

Malnutrition among Children: It is evident from the results that children living in slum are at higher risk of being malnourished than children living in other areas [\[Table 5\]](#). Maternal age has greater influence on the child malnutrition. Children who live in western, eastern and southern regions have lower odds for child

malnutrition than children who live in northern regions. Other explanatory variables do not exert any significant influence on malnutrition among children.

Anemia among Children: The results from [Table-5](#) brought out that slum children are at a disadvantageous side in the case of prevalence of anemia. Slum children are at 1.2 times higher risk child anemia than that of other children. Children born to adult women, children belong to OBC and other caste groups have lower odds for anemia than children born to adolescent women and children belong to SC/ST. Children of birth order second and above have higher likelihood of suffering from anemia as compared to children of first birth order. Region of residence is also a significant factor in the case of child anemia.

Discussion

Paucity of data on slums in the past and rapid urbanization, especially growth of urban population in India demands for the present study. Children living in the slum communities were more likely to belong to lower socioeconomic groups and mothers have lower levels education. It is also evident from the results that slum dwelling children are at higher risk of morbidity, low weight at birth and anemia. The study clearly brought out that malnutrition and anemia appeared to be higher among slum children which indicate that the government sponsored programs such as ICDS might not have fully covered slum children. This can be supported by the immunization coverage in the slums [14]. Other studies from Indian slums have also supported this finding [15-16]. It is also found that prevalence of morbidity is higher among slum children compared to other children. As discussed earlier, the high prevalence of morbidity among slum children is due to the poor environmental conditions and overcrowding in slums. Earlier studies also have brought out these [17-18]. Higher percentage of low birth weight babies in slum areas again confirms the non-availability of services for expectant mothers by the government in slum areas. Other studies have also have shown the higher incidence of low birth weight babies in slum areas compared to other areas [19].

Conclusion

In India, government policies and programs so far paid attention on rural areas. However, with increasing urbanization, especially concentration of population in slum areas, demands for specific programs in urban areas in order to improve health conditions in urban areas, especially for the poor. Need to empower communities by increasing their participation in identifying their health needs and measures to address them. It is also important to address the issues

regarding basic amenities such as drinking water, toilet facilities etc. in slums. It is difficult to address these issues in a short duration as the size of the population is large. Therefore, simultaneous efforts should be made to educate the community about the importance of cleanliness and hygiene.

Recommendation

It is highly advisable to focus on the basic amenities in slums. Further, slums have specific health problems due to its prevailing environmental conditions; slum specific policies programs should be formulated. Further, communities should be involved in identifying the health needs and based on the needs, it should be addressed.

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Tables

TABLE NO. 1 BACKGROUND CHARACTERISTICS OF SLUM AND NON-SLUM CHILDREN

Background Characteristics	Non-slum	Slum
Age of women at birth		
Adolescent	28.3	44.0
Adult	71.7	56.0
Mother's Literacy Status		
Illiterates	13.6	26.5
Literates	86.4	73.5
Work Status of Women		
Non-working	80.0	79.5
Working	20.0	20.5
Household Wealth Status		
Poorest	0.2	0.6
Poorer	2.0	3.6
Middle	6.7	15.6
Richer	23.4	39.5
Richest	67.8	40.7
Exposure to Mass Media		
No exposure	5.5	10.7
Exposure to Radio/ television	38.9	41.6
Exposure to Radio and television	55.6	47.7
Caste		
SC/ST	15.4	19.4
OBC	25.6	22.5
Others	59.0	58.1
Religion		
Non-Hindu	76.9	68.0
Hindu	23.1	32.0
Source of Drinking Water		
Others	5.9	2.7
Bore Well	6.7	6.1
Piped	87.4	91.2
Type of Toilet		
No Toilet Facility	2.2	5.3
Flush/ Pit toilet	97.8	94.7

TABLE NO. 2 PERCENTAGE DISTRIBUTION OF CHILD HEALTH INDICATORS BY SLUM STATUS

Child Health Indicators	Non-Slum	Slum
Prevalence of Diarrhea	7.3	8.5
Prevalence of Fever	11.2	13.3
Prevalence of Cough	13.3	18.4
Low Birth Weight Babies	11.4	15.2
Infant Deaths	10.4	10.1
Malnutrition	2.2	2.0
Child Anemia	55.4	60.0

TABLE NO. 3 LOGISTIC REGRESSION RESULTS OF PREVALENCE OF DIARRHEA, COUGH AND FEVER AMONG CHILDREN

Explanatory Variables	Diarrhoea		Cough		Fever	
	Coeff	OR	Coeff	OR	Coeff	OR
Slum Status						
Non-slum						
Slum	0.23	1.26*	0.38	1.46***	0.20	1.22*
Women's age at Birth						
Adolescent						
Adult	-0.07	0.93	-0.14	0.87	-0.10	0.91
Women's Education						
Illiterates						
Literates	-0.06	0.94	-0.34	0.71***	-0.31	0.74**
Birth Order						
First						
Second and Above	-0.08	0.84	-0.16	0.85	-0.20	0.83*
Work Status of Women						
Non-working						
Working	-0.21	0.81	0.06	1.06	0.20	1.22*
Wealth Status of the Household						
Poor						
Non-poor	-0.12	0.88	0.11	1.11	-0.13	0.88
Religion						
Non-Hindu						
Hindu	0.13	1.14	0.20	1.22*	0.39	1.47***
Caste						
SC/ST						
OBC	0.19	1.21	0.09	1.09	0.39	1.48***
Others	-0.07	0.93	-0.38	0.68***	-0.07	0.93
Exposure to Mass Media						
No Exposure to Radio/ Television						
Exposure to Radio or Television	0.04	1.04	-0.29	0.75*	-0.13	0.88
Exposure to Radio and Television	-0.14	0.87	-0.38	0.68**	-0.31	0.73
Region						
North						
West	-1.01	0.36***	0.10	1.11	-0.16	0.85
East	-0.57	0.57***	0.02	0.99	-0.12	0.88
South	-1.04	0.35***	-0.68	0.51***	-0.75	0.47***
Constant	-1.76	0.17***	-0.94	0.39***	1.50	1.22***
Log likelihood	2930.83		4371.87		3806.12	
Chi-Square Value	90.00		112.71		92.86	
Level of Significance	0.000		0.000		0.000	
Number of Children	4767		4766		4766	

TABLE NO. 4 LOGISTIC REGRESSION RESULTS OF INFANT MORTALITY AND LOW BIRTH WEIGHT AMONG CHILDREN

Explanatory Variables	Infant Death		Low Birth Weight	
	Coeff	OR	Coeff	OR
Slum Status				
Non-slum				
Slum	-0.15	0.86	0.37	1.44***
Women's age at Birth				
Adolescent				
Adult	-0.61	0.54***	-0.14	0.87
Women's Education				
Illiterates				
Literates	-0.11	0.90	0.12	1.13
Birth Order				
First				
Second and Above	0.11	1.11	-0.23	0.79**
Work Status of Women				
Non-working				
Working	0.32	1.38	0.01	1.01
Wealth Status of the Household				
Poor				
Non-poor	0.70	2.02*	0.41	1.50
Religion				
Non-Hindu				
Hindu	0.09	1.10	-0.23	0.79*
Caste				
SC/ST				
OBC	-0.34	0.71	-0.10	0.38
Others	-0.30	0.74	-0.26	0.02
Exposure to Mass Media				
No Exposure to Radio/ Television				
Exposure to Radio or Television	0.32	1.38	0.31	1.36
Exposure to Radio and Television	0.15	1.16	0.52	1.69
Region				
North				
West	-0.24	0.79	0.24	1.27
East	-0.50	0.61	-0.19	0.83
South	-0.93	0.39***	-0.27	0.77
Constant	-3.19	0.04***	-1.90	0.15***
Log likelihood	1053.850		3906.540	
Chi-Square Value	36.120		78.950	
Level of Significance	0.000		0.000	
Number of Children	4894		4849	

TABLE NO.5 LOGISTIC REGRESSION RESULTS OF CHILD MALNUTRITION AND CHILD ANEMIA

Explanatory Variables	Child Malnutrition		Child Anemia	
	Coeff	OR	Coeff	OR
Slum Status				
Non-slum				
Slum	0.20	1.22*	0.18	1.20***
Women's age at Birth				
Adolescent				
Adult	0.21	1.24*	-0.29	0.75***
Women's Education				
Illiterates				
Literates	-0.01	0.99	0.34	1.40***
Birth Order				

Explanatory Variables	Child Malnutrition		Child Anemia	
	Coeff	OR	Coeff	OR
First				
Second and Above	-0.01	0.99	0.16	1.17**
Work Status of Women				
Non-working				
Working	0.11	1.12	0.04	1.04
Wealth Status of the Household				
Poor				
Non-poor	0.34	1.41	0.72	2.06***
Religion				
Non-Hindu				
Hindu	-0.15	0.86	0.01	1.01
Caste				
SC/ST				
OBC	0.08	1.09	-0.23	0.80**
Others	-0.10	0.90	-0.25	0.78***
Exposure to Mass Media				
No Exposure to Radio/ Television				
Exposure to Radio or Television	0.07	1.08	-0.30	0.74***
Exposure to Radio and Television	0.15	1.16	-0.46	0.63***
Region				
North				
West	-0.19	0.83	-0.18	0.84***
East	-0.25	0.78*	0.17	0.84***
South	-1.96	0.77*	0.23	1.25***
Constant	-1.96	0.14***	0.82	2.27***
Log likelihood	3262.74		10242.94	
Chi-Square Value	26.57		291.77	
Level of Significance	0.000		0.000	
Number of Children	3952		3273	

***- $p > 0.001$, **- $p > 0.01$, *- $p > 0.05$