

Effect of socio-economic differentials on growth and development of children in five metropolitan cities of India

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ABSTRACT

Background: Children's growth and development depend on their parents' socio-economic status. Adequate nutrition of children influence their anthropometric measures proper growth and development and reduces morbidity and mortality among children.

Objective: To understand the growth and development pattern of children dwelling in the slum environment and to compare some of their growth parameters with non-slum children. **Methods:** This was a record review of National Family Health Survey-3 (NFHS-3) data, freely available from Measure DHS USA. Data for five major metropolitan cities, namely, Delhi, Mumbai, Kolkata, Chennai, and Hyderabad were used for this study. The households classified as slum and non-slum by two agencies, viz., NFHS and census of India were considered for analysis. Variables more relevant as an indicator for the growth and development of children, viz., height, weight, hemoglobin, standard of living index (SLI), age (in months), and place of residence were selected for this study. Place of residence (slum or non-slum) and SLI, which is proxy to socio-economic status, were considered to understand their influence on height, weight, and hemoglobin values of the children. **Results:** About 75% of the slum dwellers were in low SLI category, and 69% of non-slum residents were in high SLI category. There is a significant difference ($p=0.001$) between slum and non-slum residence on the proportions of SLI. Multivariate analysis showed that all the variables significantly differ by SLI except age of the children. **Conclusion:** It is concluded that the observed difference between slum and non-slum children's height, weight, and hemoglobin are due to differences in SLI. Growth and development of children dwelling in slum or non-slum area depend on the socio-economic status of their parents and not by their place where they are growing.

Key words: Anthropometric measures, Children, Metro cities, Slums, Standard of living index

In the last two decades, the rate of growth among slums has been more than the Indian population growth rate [1]. Due to rapid mushrooming of slums in urban areas, slum dwellers are deprived of access to basic services such as clean water, toilets, and health-care amenities. It is well-known that the morbidity and mortality rates are higher in slum areas than in non-slum areas [2]. Health and literacy levels are inversely related, and low literacy level is one of the most common factors contributing to the high prevalence of morbidities in slum areas [3]. Although urban areas have good medical facilities, they are under-utilized by the slum population. The majority of infant deaths occur during the 1st months of life mainly due to diarrheal diseases and respiratory infections. Slum dwellers are not ready to accept scientific explanations for the cause of disease and deaths. Most of the slum dwellers seek medical and easy accessibility care from quack and religious healers [4].

The health hazards of the urban slum dwellers are mainly due to poverty, malnutrition, and contaminated environment

exposing them to many communicable diseases. Nutritional status is directly related to the growth and development of the children. Malnutrition not only retards physical and psychological developmental but also escalate the infants/child mortality rates. The human brain develops more during postnatal than prenatal periods, and brain development occurs more in the first 6 months of age. It is reported that the infant mortality rate was 37.9 per 1000 live births in the slum population; of which, more than 50% of the deaths occurred in the neonatal period [5]. Hence, in this study, we attempted to investigate some of the growth parameters of children of slums and non-slum areas of five major/metropolitan cities of India.

METHODS

This study was based on secondary data from the National Family Health Survey-3 (NFHS-3). Data for five major metropolitan cities, namely, Delhi, Mumbai, Kolkata, Chennai, and Hyderabad were used for the analysis. These data were

obtained from Measuresdhs USA [6]. Slum and non-slum household data, as classified by both Census of India and NFHS-3, were considered for analysis. Variables, which are more relevant as the indicator for the growth and development of children, namely, height, weight, hemoglobin, standard of living index (SLI), age (in months), and place of residence were considered for this study.

SLI [7] is a proxy measure for determining the socio-economic condition of a household. Scores are given by examining/interviewing a household in terms of type of house and ownership of household goods and by adding these scores, total of SLI is obtained. SLI is classified as low (score 0-14), medium (score 15-24), and high (score 25+) categories. During NFHS-3 survey, HemoCue system (Hb 201+) was used for anemia testing. This system consists of a battery-operated photometer and a disposable microcuvette, coated with a dried reagent that serves as the blood-collection device. Trained interviewers first get the consent by reading the consent form then they used HemoCue system for estimation of hemoglobin. The detailed method is explained in field testing manual for NFHS-3 [8].

NFHS-3 included 16 mega and medium cities of India for collecting slum and non-slum data. About 1000 sample households were the target from each city, and the detailed sampling plan is available in NFHS-3 slum report [9]. Data of total 3431 children <60 months of age were available from five cities (slum 1710 and non-slum 1421) which were included in both NFHS-3 and census of India data. These data were selected for analysis, and mean values of age, weight, height, and hemoglobin between slum and non-slum were compared.

Independent t-test was used for comparing the mean values of age, weight, height, and hemoglobin between slum and non-slum areas. Chi-square test applied to compare the proportions of SLI between slum and non-slum areas. Finally,

the multivariate procedure by the general linear model was used to test the difference in these variables by considering slum and non-slum locations and SLI as independent variables. Data were analyzed using SPSS 11.0 Statistical package.

RESULTS

Data of total 3431 children <60 months of age from five metropolitan cities (slum 1710 and non-slum 1421) are available, and demographic profile is given in Table 1.

A significant difference was observed ($p < 0.003$ and 0.001) in mean weight and hemoglobin of children from the slum and non-slum areas, and mean weight and hemoglobin were less among the slum children than their counterparts. However, no significant difference ($p > 0.104$) was seen in mean age and height (Table 1).

Fig. 1 for SLI in slum and non-slum areas and these proportions showed a significant difference ($p < 0.001$). Approximately 70% of the children with low and medium SLI were living in slum areas, and more than 60 % with high SLI were living in non-slum areas.

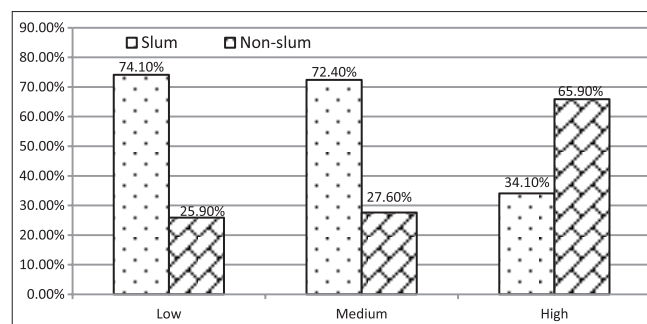


Figure 1: Standard of living index by place of residence ($p < 0.001$)

Table 1: Measures of growth and development variables by place of residence

Variables	Slum			Non-slum			t	p
	Mean	N	SD	Mean	N	SD		
Age (in months)	33.57	1710	15.11	32.69	1721	15.26	1.41	0.159
Weight in kilograms	10.80	1190	3.72	11.26	1127	3.40	3.12	0.002
Height in centimeters	84.00	1182	14.27	84.96	1125	14.29	1.62	0.105
Hemoglobin level	10.41	993	1.57	10.77	928	1.49	5.20	0.000

SD: Standard deviation

Table 2: Multivariate test of Pillai's trace

Effect	Value	F	Hypothesis df	Error df	p-value
Intercept	0.974	17354.92	4	1856	0.000
Slum and non-slum	0.002	0.98	4	1856	0.417
SLI	0.042	10.03	8	3714	0.000
Slum and non-slum*SLI	0.004	1.03	8	3714	0.412

SLI: Standard of living index

Table 2 is presented for the multivariate test using general linear model analysis on age, height, weight, and hemoglobin by considering the place of residence and SLI as independent variables. From multivariate analysis, it was found that Pillai's trace, Wilks's Lambda, Hotelling's trace, and Roy's largest root (Table 2) show no significant difference on the basis of place of residence ($p=0.417$). That is, no significant difference in mean age, height, weight, and hemoglobin was seen between slum and non-slum areas. However, the mean differences in height, weight, and hemoglobin on the basis of SLI, as revealed by Pillai's trace, Wilks's Lambda, Hotelling's trace, and Roy's largest root, were significant ($p<0.001$) [10].

DISCUSSION

From the univariate analysis using independent t-test, it was found that height and weight were significantly different between children living in slum and non-slum areas. However, multivariate analysis revealed that difference observed in univariate analysis was not due to the difference in the place of residence, but it was due to socio-economic differences as SLI is a proxy to the socio-economic determinant. Further "ANOVA [10] for between-subjects effect" revealed that height ($p=0.002$), weight ($p<0.001$), and hemoglobin ($p<0.001$) significantly differ on the basis of SLI while none of these variables were significantly different by the place of residence (that is slum and non-slum). The interaction between places of residence with SLI was also not significant. Further, post hoc test (by contrast) for the effect of SLI on age, height, weight, and hemoglobin revealed that the difference between children of medium and low SLI categories was not significant except for hemoglobin ($p=0.013$). On the contrary, the difference in children's height, weight, and hemoglobin was statistically significant ($p<0.001$) between medium and high categories of SLI.

We have noted that the mean weight, height, and hemoglobin values of slum children were less than the mean values of non-slum children. This could be due to higher proportions (70%) of household with low socio-economic condition living in the slum areas. One of the targets under United Nation's Millennium Development Goals 4 (Target number 5) is a reduction of infant mortality rates by two-third. It is mentioned that all indicators should be disaggregated by sex and urban/rural as far as possible, and it should be noted that urban population includes slum population as well, which is the major contributing factor of infant mortality rates in urban areas [11].

A cross-sectional study conducted in Bagalkot slum including 183 under-five children had shown that mean weight was 14.18 kg and mean height was 78.71 cm [12]. In our study, mean weight was 10.8 kg and mean height was 84 cm for slum children. This observed difference between two studies could be due to the sample size as in our study, the sample size for slum area was 1710. Another cross-sectional study was

conducted in Western Maharashtra to document the nutritional status of 146 under-five slum children [13]. Authors found that socio-economic class was significantly ($\chi^2=8.18$, $p<0.003$) associated with under-weight and higher percentage (82/146, 56.14%) of underweight children was observed in the low socio-economic category. In our study also, we found that low SLI was associated with less weight and height of the children.

Another cross-sectional study conducted in Bangladesh with the objective of assessing the nutritional status of 105 children <5 years of age in different slums of Kushtia district. Mean weight was 13 kg and mean height was 91.76 cm which was higher than the mean weight and height found in our study. This difference could be due to food habit between two countries and due to the difference in sample size [14]. Domestic crowding is associated with lower socio-economic status, and it has inverse effect with physical, psychological, and health status of the children [15]. Adler et al., have shown that low socio-economic class is inversely associated with children well-being and behaviors [16]. Parents of lower social classes use more tobacco and alcohol and tend to eat less food. The behavioral differences are determining the attitudes that differentiate higher and lower social classes. These factors are related to lesser physical and mental health, which may make it tougher for low socio-economic status parents to give warm, responsible care or to look after their children [17].

CONCLUSION

Slum children with high SLI are healthier than the non-slum children with low SLI. Higher proportions of low socio-economic and newly migrated people are staying in the slum areas; hence, SLI is related to the observed differences. Growth and development of children dwelling in slum or non-slum area depend on the socio-economic status of their parent and not by their place where they are growing. These results emphasize the need to improve socio-economic conditions of slum dwellers which will increase the nutritional levels of children and their growth and development. Hence, the chance of child survival is expected to rise.

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