

# Impact of malnutrition on children in slum areas of Haryana

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**ABSTRACT:** *Energy efficiency projects in the industrial sector provide a source for reducing greenhouse gas emissions under a Clean Development Mechanism (CDM) scheme as laid out in Article 12 of the Kyoto Protocol. The CDM offers a mechanism for developed countries to meet greenhouse gas (GHG) reduction requirements by gaining offsets from projects they fund in developing countries. To receive these offsets – known as Carbon Emission Reduction Units (CERs) – the project should demonstrate “real, measurable, and long-term benefits” and the reductions should be “additional to any that would occur in the absence of the project.”(UNFCCC, 1997) In other words, energy-efficiency CDM projects must be compared against some baseline to quantify the carbon reduction, and this baseline should reflect, as closely as possible, what would have happened in the absence of the CDM project.*

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## INTRODUCTION

One of the greatest problems for India is under nutrition among children. The country is still struggling with this problem. Malnutrition, the condition resulting from faulty nutrition, weakens the immune system and causes significant growth and cognitive delay. Growth assessment is the measurement that best defines the health and nutritional status of children, while also providing an indirect measurement of well-being for the entire population.

## METHODS

This cross-sectional study, in which we explored nutritional status in school-age slum children 5 to 15 years old, took place between December 2010 and April 2011 in urban slums of Haryana, India. The sample size of 384 was calculated assuming the prevalence of malnutrition was 50%, with relative precision of 10% at 95% confidence. For this study, 3 slums (Faltuganj, Kurramgotia and Kalibadi) were randomly selected from the urban area of the Bareilly district. All children aged 5-15 years from each of these slums were examined. A total of 512 children (297 boys and 215 girls) were interviewed and examined. A pre-designed and pre-tested questionnaire was used to interview the study participants to elicit information on family characteristics like residence, religion, type of family, education and occupation of parents; and information on individual characteristics like age, sex and eating habits. Anthropometric measurements were taken and noted by

trained field workers. The questionnaire was pre-tested on 5 children from each slums. Necessary modifications were made in the questionnaire before the start of the study.

Ethical approval was obtained from Shri Ram Murti Smarak Institute of Medical Sciences, Haryana Institution Review Board. For participation of the study subjects parents/guardians/caregivers were informed about the study objectives and gave informed written consent prior to inclusion into the study.

Each child's height and weight were measured in the metric system, using standardized technique recommended by Jelliffe [6]. A stadiometer (measuring rod) capable of measuring to an accuracy of 0.1 cm was used to assess height of the subjects. The subject was made to stand without footwear with the feet parallel and with heels, buttocks, shoulders, and occiput touching the measuring rod, hands hanging by the sides. The head was held comfortably upright with the top of the head making firm contact with the horizontal head piece. A portable balance with an accuracy of 100 g was used to record the weight of the subjects. Children were instructed to stand on the balance with light clothing and without footwear and with feet apart and looking straight. Weight was recorded to the nearest value.

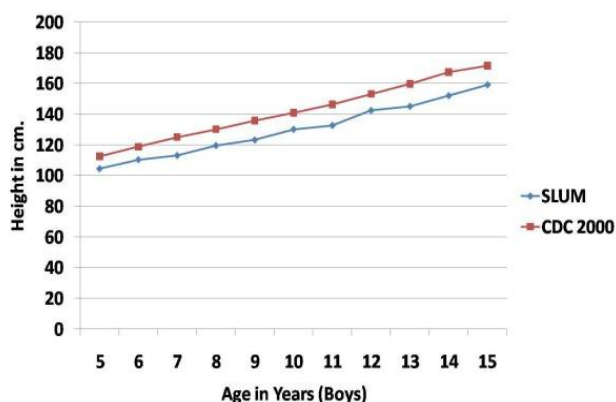
Height for age (stunted), weight for height (wasted), and weight for age (under weight) for each child were calculated [3] and compared with the CDC 2000 [4]. Cut-off point values between  $\pm 2$  SD were considered normal [5].

Vitamin A deficiency was diagnosed by the presence of Bitot's spots and conjunctival xerosis. Rickets was diagnosed by abnormality in skeletal development, like knock-knees and bowed legs. Anaemia was diagnosed from clinical signs such as pallor of the conjunctiva/tongue.

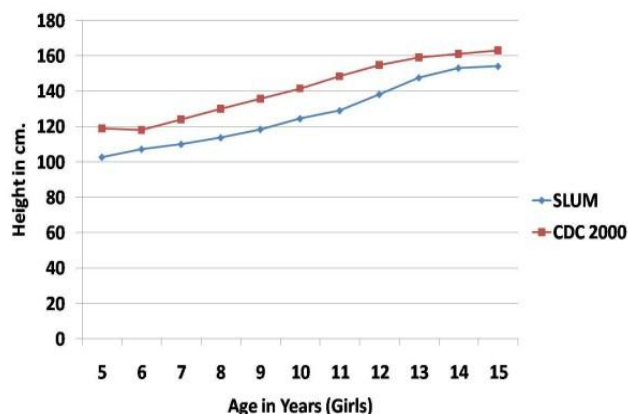
After collection, all data were compiled and analyzed and appropriate statistical tests were applied.  $P < 0.05$  was considered as statistically significant. Multivariate analysis was carried out, using the odds ratio (OR) to test for associations between various socio-economic indicators and nutritional status.

## RESULTS

The mean height of girls was lower than that of the boys in all age groups except the 13-14 years old age group in which girls were taller than boys. This difference in height of boys and girls was not significant in any age group. The mean height of boys and girls of the study group was lower than the CDC 2000 standards in all age groups. (Figures 1 and 2)

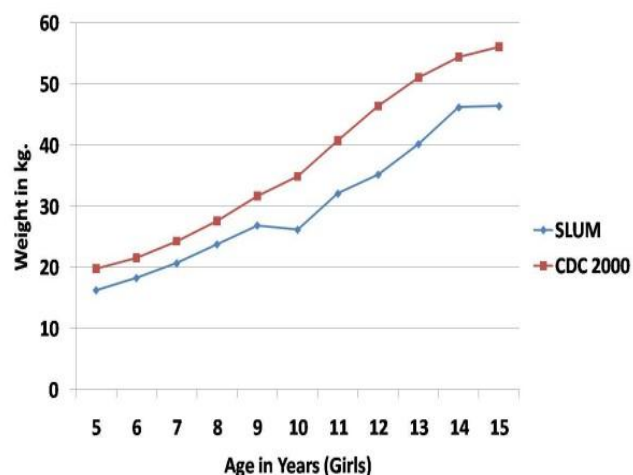


**Figure 1. Mean height (in cm) of school-age boys in urban slums of Haryana, India (2010-2011) compared to the CDC 2000 reference.**

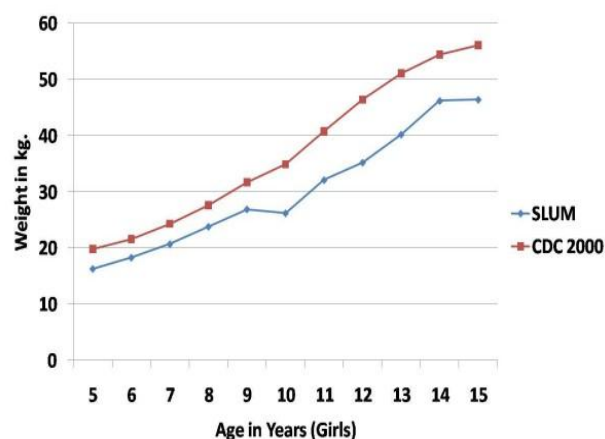


**Figure 2. Mean height (in cm) of school-age girls in urban slums of Haryana, India (2010-2011) compared to the CDC 2000 reference.**

The mean weight increased from 16.46 kg and 16.28 kg for boys and girls respectively in the 5 yr age group to 49.40 kg and 46.38 kg respectively in the 15 yr age group. The mean weight of girls was higher than the boys, in most of the age groups. However, there was no statistically significant difference in the mean weights of boys and girls in any of the age groups. In comparison with the CDC 2000 standard, the mean weight of boys and girls of the present study was found to be lower in all age groups. (Figures 3 and 4)



**Figure 3. Mean weight (in kg) of school-age boys in urban slums of Haryana, India (2010-2011) compared to the CDC 2000 reference.**



**Figure 4. Mean weight (in kg) of school-age girls in urban slums of India (2010-2011) compared to the CDC 2000 reference.**

## **CONCLUSIONS**

Most of the school-age slum children in our study had a poor nutritional status. Interventions such as skills-based nutrition education, fortification of food items, effective infection control, training of public healthcare workers and delivery of integrated programs are recommended.