Research Article

Thinness and Stunting Among School Children in the Perspective of Socio-economic Disparity in Punjab, India

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Abstract

The objective of the study was to assess socio-economic disparity in the prevalence of thinness and stunting among school children enrolled in government schools of three regions of Punjab namely Majha, Doaba and Malwa. For the selection of the subjects, thirty-cluster multistage sampling technique was used. Height-for-age and BMI-for-age Z scores of children were calculated and interpreted based on WHO Growth Standards. The results showed that overweight/obesity was scarce (6%) among Punjabi school children as compared to undernutrition in terms of thinness (24%) and stunting (18%). Height-for-age Z scores for the assessment of stunting showed substantial disparity ($p \leq 0.01$) with respect to family income and parent's education, while on the basis of BMI-for-age Z scores, only religion had a significant ($p \leq 0.05$) relationship with thinness. BMI-for-age Z scores, an indicator of short term malnutrition was not found to be influenced by socio-economic factors except religion; whereas, family income and parent's education affected the Height-for-age Z scores, representing the long term malnutrition.

Keywords: Nutrition, Health, Income, Education, Caste, Religion

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Introduction

Health inequalities are differences in health status experienced by various individuals or groups in a society. These can be the result of genetic and biological factors, choices made or by chance, but often they are because of unequal access to socio-economic factors such as income, education, employment, standard of living and social support. Each component of socio-economic status (SES) displays varied relationships to various health outcomes and provides different resources [1]. Beside these socio-economic factors, the social identity of persons also acts as an additional aggravating factor in nutritional inequity [2]. Poor health of lower caste individuals may be attributed to discrimination and exclusion associated with untouchability, economic disadvantages faced by these groups and lack of access to nutrition supplements and services like improved institutional health care [3]. The nutritional status of children does not only directly reflect the SES of the family and social well-being of the community, but also the efficiency of the health care system and the influence of the surrounding environment [4]. Hunger and malnutrition, therefore, are not due to lack of food alone, but are also the consequences of poverty, inequality and misplaced priorities [5]. Therefore, improving nutrition of children is increasingly recognized as vital for reducing poverty, promoting sustainable social and economic development and narrowing inequities within the nation [6].

The Northwest state of India, Punjab is known as "The Bread Basket of India". It is considered to have the best infrastructure in India that includes road, rail, air and river transport links that are extensive throughout the regions. According to Economic Survey of Punjab [7], the literacy rate of the state (76.70%) is higher than the national literacy levels and the poverty ratio in the state is one of the lowest among the major states of the country. Rapid urbanization and industrialization result in such a transition in the state that over the years, significant changes occur in occupation, economy, food consumption, dietary intake, physical activity levels, and overall lifestyle of Punjabi population. Despite the economic growth, Punjab lags behind in social development, particularly in the area of child health and nutrition such as undernutrition, anemia and other nutritional disorders. On the whole, the state has not fully translated its agricultural-led economic growth into improvements in nutritional conditions [8]. Addressing the problem of malnutrition requires a change in social, economic and behavioral aspects with a proactive involvement of the state to improve targeting and strengthen the implementation of various programs [9].

Most of the previous studies reported so far have focused either on the prevalence of undernutrition among children belonging to low SES families or on the prevalence of overweight and obesity among affluent school children from metropolitan cities [10-12]. Recently, there has been lot of interest among researchers and policy

makers in examining the socio-economic disparities in health outcomes; however, there is limited number of comprehensive studies that explored the impact of socio-economic factors on nutritional status of school-aged children in Punjab. Understanding the nature and determinants of socio-economic inequality in malnutrition is important in contemplating the health of sub-groups of a population. More importantly, there is a great need to focus the attention of stakeholders and policy-makers, particularly on the nutritional status of school-going children as one of the main indicators of development and as a pre-condition for the socio-economic advancement of societies in the long term.

Materials and Methods

Study Area

Multistage random sampling technique was used for the study. A total of five districts; one each from Majha (Amritsar) and Doaba (Jalandhar) regions and three districts from Malwa region (Ludhiana, Faridkot and Patiala) of Punjab were selected targeting school-going children. In the next stage of sampling, two blocks from each district were selected. The last stage included selecting two rural and one urban government schools from each block selected in order to have a total random sample size of 1050 children in the age group of 11-17 years (**Figures 1** and **2**).

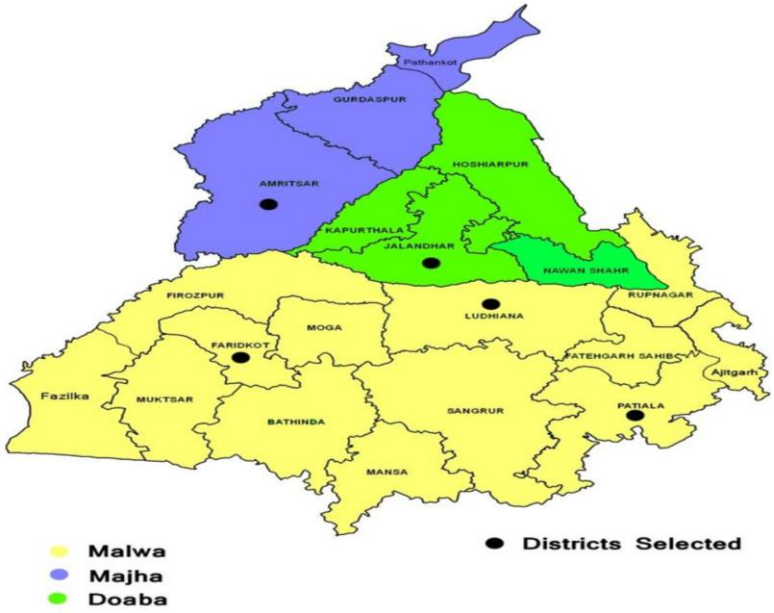

Figure 1 Map of the study area

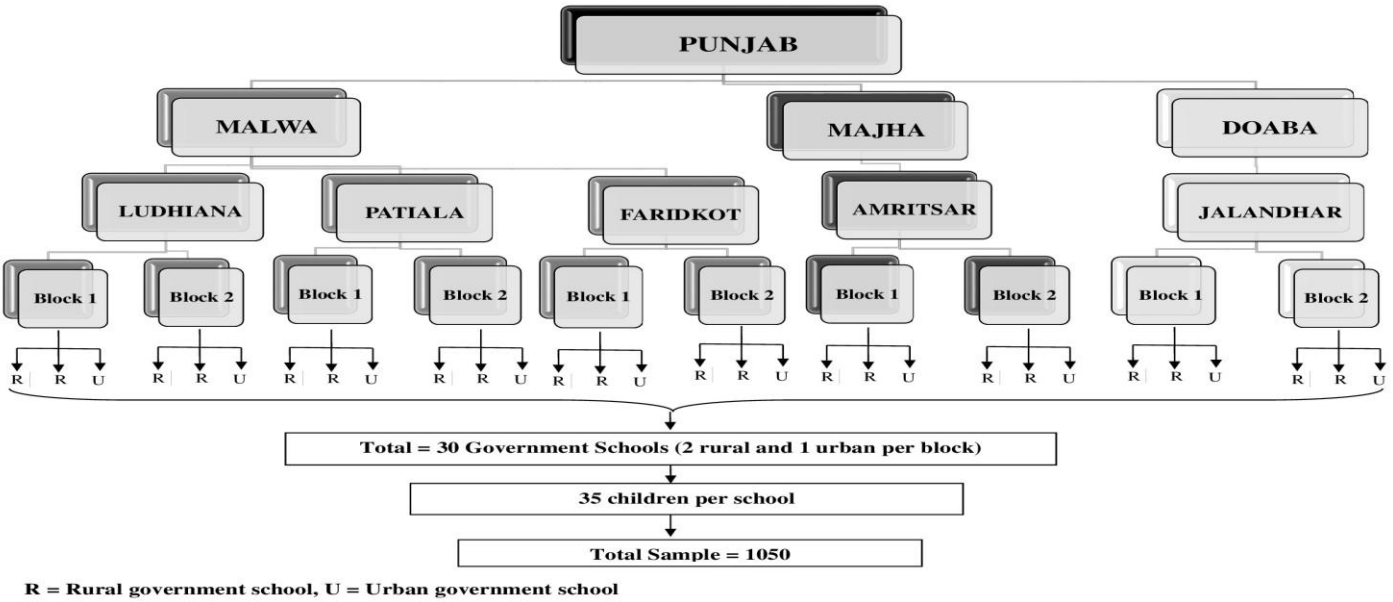

Figure 2 Sampling design for the assessment of nutritional status of school children from Punjab

Demographic and Socioeconomic Profile

Information related to age, gender, caste, religion of the subjects was obtained on a well-structured questionnaire. Data pertaining to parent's occupation, education and income was also recorded through school authorities. The caste was divided into three classes, the general class represented upper social class while scheduled class represented the lowest class while backward class represented socially backward class as per the legislation of Government of India. The main religions followed by the subjects were Hinduism and Sikhism. Other religions included Christianity Jainism, Buddhism and Islam.

Anthropometric Profile

Anthropometric measurements, i.e., height and weight of each subject were taken according to the standard procedures [13]. Age and sex specific mean height and weight of the subjects were compared with the ICMR standards [14]. Derived anthropometric indices (BMI) were calculated using a standard equation [15]. Height-for-age (HAZ) and BMI-for-age Z scores (BAZ) were calculated using WHO AnthroPlus software and were interpreted based on WHO Global Database on Child Growth and Malnutrition [16]. The classification of Z scores for Height-for-age (HAZ) and BMI-for-age (BAZ) is given in **Table 1**.

Table 1 WHO Classification for the assessment of stunting and thinness (WHO 2007)

Z scores	Category
Height-for-age (HAZ)	
-2SD to +1SD	Normal
< -2SD	Moderate stunting
< - 3SD	Severe stunting
BMI-for-age (BAZ)	
-2SD to +1SD	Normal
< -2SD	Moderate thinness
< -3SD	Severe thinness
> +1SD	Overweight
> +2SD	Obese

SD: Standard Deviation

Statistical Analysis of the Data

Statistical analysis was performed using SPSS Windows version 16.0 (SPSS Inc., USA). The mean, standard deviation and percentages were calculated. Tukey's post-hoc test was applied to assess socio-economic disparity in the prevalence of thinness and stunting.

Results and Discussion
Demographic and Socioeconomic Profile

As shown in **Table 2**, demographic profile of the subjects from Punjab state revealed that more than half of the sample (58%) was comprised of girls. Majority (68%) of the subjects were Sikhs, followed by Hindus (29%) and rest were belonging to other religions. Over half (56%) of the subjects were SCs, whereas, GC and BC subjects constituted almost equal proportion. Similarly, Census of India [17] reported that Punjab has the highest percentage of SCs (32%) in the country which is nearly two times higher than the national average (16%). Sikhism and Hinduism form the major religions of the state, others being Islam, Christianity, Jainism and Buddhism, though comparatively low in proportion. Data on socio-economic status of the subjects showed that even though, most of the parents were educated up to matriculation; the number of those without any worthwhile schooling was also quite substantial. Labour was the most pursued occupation of the fathers, while, mothers were mostly housewives/non-working. Regarding monthly income, it was found that majority (40%) of the subjects belonged to families earning Rs. 5001-10000 followed by up to 5000 (35%), 10001-20000 (16%) and above 20000 (9%). The results indicated that most of the children were from low income families, mainly engaged in casual labour.

Anthropometric Profile

The mean height, weight, BMI, BAZ and HAZ scores of school children has been shown in **Table 3**. The average height of all the subjects was slightly lower than ICMR [14] standards, ranging between 94-98% of the reference

standards. The average weight of both girls and boys was far lower than the reference values, ranging between 83-84% and 87-92% of the standard values, respectively. Average BMI of the subjects was almost comparable to the standard values, i.e., 89-98% of the standards. These results are broadly consistent with those reported in previous studies from other states of India [11, 18-20].

Table 2 Demographic and socio-economic profile of the school children from Punjab (N = 1050)

Parameter	Category	Number (%)
Gender	Girls	613 (58)
	Boys	437 (42)
Religion	Sikh	710 (68)
	Hindu	303 (29)
	Others (Muslim, Christian, Jain)	37 (3)
Caste	General class	242 (23)
	Scheduled class	586 (56)
	Backward class	222 (21)
Parent's education		
Mother	No education	383 (37)
	Up to matric	591 (56)
	Above matric	76 (7)
Father	No education	264 (25)
	Up to matric	651 (62)
	Above matric	135 (13)
Parent's occupation		
Mother	Labour	170 (16)
	Housewife/non-working	798 (76)
	Self-employed/service/farming/any other	82 (8)
Father	Farming	136 (13)
	Business	48 (5)
	Service	119 (11)
	Labour	546 (52)
	Self-employed	168 (16)
	Any Other	12 (1)
	Non-working/Late	21 (2)
Family income (Rs.)	≤ 5000	363 (35)
	5001-10,000	423 (40)
	10,001-20,000	164 (16)
	Above 20,000	100 (9)

The mean HAZ scores of the girls aged 11-12, 13-15 and 16-17y, from Punjab were -1.4, -1.4 and -1.1; and of boys were -0.9, -1.4 and -0.9, respectively. The mean BAZ scores of girls aged 11-12, 13-15 and 16-17y were -1.1, -1.2 and -1.2; and of boys were -0.9, -1.0 and -1.3, respectively. The Z scores of the subjects in comparison to WHO reference standards [16] showed that majority of the children from Punjab were well nourished. Well-nourished children perform better in school, grow into healthy adults and in turn give future generations a better start in life [21].

Prevalence of Thinness and Stunting

Distribution of school children from Punjab, on the basis of WHO [16] Z-scores of Height-for-age (HAZ) and BMI-for-age (BAZ) is shown in **Table 4**. Out of the total children surveyed from government schools of Punjab, the prevalence of undernutrition in terms of thinness and stunting was found to be 24 and 18%, respectively; whereas, very small percentage (6%) of the subjects were overweight/obese. An examination of the results in relation to existing research showed that Punjab has relatively much lower prevalence of stunting and thinness than most of the other states of India and some of the developing countries [3, 22, 23], that may be attributed to school health programs of Punjab such as subsidized food grain through the Public Distribution System (PDS), Mid-Day Meal Scheme (MDMS) and other nutritional supplementation programs sponsored by the Government of India.

Table 3 Average height, weight, Body Mass Index (BMI), Height-for-age (HAZ) and BMI-for-age (BAZ) Z scores of school children from Punjab (N = 1050)

Parameter	Age	Gender	Mean ± SD	Reference standards†	Percent of reference standards†
Height (cm)	11-12y	Girls	138.8 ± 9.8	147.8	94.0
		Boys	139.6 ± 8.7	148.0	94.3
	13-15y	Girls	149.8 ± 8.2	156.5	95.7
		Boys	152.6 ± 12.3	162.1	94.0
	16-17y	Girls	155.3 ± 6.0	160.0	97.0
		Boys	166.7 ± 7.9	169.0	98.6
Weight (Kg)	11-12y	Girls	30.9 ± 6.2	37.0	83.5
		Boys	31.5 ± 5.6	36.0	87.5
	13-15y	Girls	38.9 ± 7.2	46.6	83.5
		Boys	41.0 ± 8.4	47.6	86.0
	16-17y	Girls	43.9 ± 6.5	52.0	84.4
		Boys	51.1 ± 8.3	55.4	92.2
BMI (Kg/m^2)	11-12y	Girls	16.0 ± 2.1	16.9	94.7
		Boys	16.2 ± 2.7	16.5	98.2
	13-15y	Girls	17.3 ± 2.8	19.0	91.0
		Boys	17.6 ± 3.3	18.1	97.2
	16-17y	Girls	18.2 ± 2.6	20.4	89.0
		Boys	18.4 ± 2.9	19.4	95.0
BAZ	11-12y	Girls	-1.1 ± 1.4	-2SD to +1SD††	-
		Boys	-0.9 ± 1.5		
	13-15y	Girls	-1.2 ± 1.3		
		Boys	-1.0 ± 1.6		
	16-17y	Girls	-1.2 ± 1.1		
		Boys	-1.3 ± 1.4		
HAZ	11-12y	Girls	-1.4 ± 1.3	-2SD to +1SD††	-
		Boys	-0.9 ± 1.3		
	13-15y	Girls	-1.4 ± 1.1		
		Boys	-1.4 ± 1.5		
	16-17y	Girls	-1.1 ± 0.9		
		Boys	-0.9 ± 1.0		

† ICMR (2010); ††WHO (2007)

Table 4 Distribution of school children from Punjab, assessed on the basis of Z scores of Height-for-age (HAZ) and BMI-for-age (BAZ) (WHO 2007)

Z scores	Category	Number (%)		
		Girls (n=613)	Boys (n=437)	Overall (N=1050)
HAZ				
-2SD to +1SD	Normal	497 (81)	368 (84)	865 (82)
< -2SD	Moderate stunting	71 (12)	32 (7)	103 (10)
< -3SD	Severe stunting	45 (7)	37 (9)	82 (8)
BAZ				
-2SD to +1SD	Normal	449 (73)	287 (66)	736 (70)
< -2SD	Moderate thinness	91 (15)	72 (16)	163 (16)
< -3SD	Severe thinness	46 (7)	40 (9)	86 (8)
> +1SD	Overweight	23 (4)	31 (7)	54 (5)
> +2SD	Obese	4 (1)	7 (2)	11 (1)

Socio-economic Disparity in the Prevalence of Thinness and Stunting

Mean BAZ and HAZ scores of school children, with respect to socio-economic disparity in Punjab is shown in **Table 5**. While investigating socio-economic disparity in the prevalence of thinness among school children from

Punjab, statistically, no significant difference was observed in the mean BAZ scores of the subjects with respect to family income, parent's education and caste; whereas, substantial ($p \leq 0.05$) differences were noted in the mean BAZ scores of the subjects with respect to religion. However, a Tukey post-hoc test revealed that significant ($p \leq 0.05$) difference was observed only between Sikh vs. Hindu subjects and those belonging to other religions (Muslim, Christian, Jains). The mean BAZ scores (-1.5) of the subjects belonging to other religions were found to be lower as compared to those belonging to Sikh (-1.0) and Hindu religion (-1.2); thus indicating that children belonging to other religions had the poorest nutritional status. Similarly, it has been reported that Hindu population with better household status had better nutritional level than the Christian population [24]; whereas, a national level survey showed that Muslim children's nutritional status was lower than other religious groups [3]. Differences in religious practices related to food like fasting, consumption of vegetarian or non-vegetarian food, seeking medical care by religion may filter through to short term and long term child health outcomes [25].

Table 5 Mean Height-for-age (HAZ) and BMI-for-age (BAZ) Z scores of school children with respect to socio-economic disparity in Punjab (N = 1050)

Socio-economic indicators	BAZ (Mean ± SD)	HAZ (Mean ± SD)
Family Income (Rs.)		
≤ 5000	-1.2 ± 1.3[a]	-1.3 ± 1.2[a]
5001-10,000	-1.1 ± 1.4[a]	-1.3 ± 1.3[a]
10,001-20,000	-1.1 ± 1.4[a]	-1.1 ± 1.3[ab]
Above 20,000	-0.9 ± 1.3[a]	-0.8 ± 1.0[b]
F-ratio	1.018[NS]	5.999**
Father's Education		
Illiterate	-1.1 ± 1.4[a]	-1.4 ± 1.3[a]
Up to matric	-1.1 ± 1.4[a]	-1.2 ± 1.2[ab]
Above matric	-1.1 ± 1.5[a]	-0.9 ± 1.2[b]
F- ratio	0.101[NS]	6.226**
Mother's Education		
Illiterate	-1.1 ± 1.3[a]	-1.3 ± 1.2[a]
Up to matric	-1.1 ± 1.4[a]	-1.2 ± 1.2[a]
Above matric	-1.2 ± 1.5[a]	-0.9 ± 1.2[b]
F- ratio	0.104[NS]	4.218**
Caste		
General class	-1.1 ± 1.4[a]	-1.2 ± 1.3[a]
Scheduled class	-1.1 ± 1.4[a]	-1.3 ± 1.2[a]
Backward class	-1.0 ± 1.3[a]	-1.2 ± 1.1[a]
F- ratio	1.009[NS]	1.223[NS]
Religion		
Sikh	-1.0 ± 1.4[a]	-1.2 ± 1.3[a]
Hindu	-1.2 ± 1.3[b]	-1.2 ± 1.1[a]
Other religions	-1.5 ± 1.3[b]	-1.3 ± 1.1[a]
F- ratio	3.561*	0.016[NS]

[NS] Non-significant; **Significant at 1%; *Significant at 5%
Means sharing same superscript are not significantly different from each other
Means sharing different superscript are significantly different from each other

Regarding socio-economic disparity in the prevalence of stunting among children, a significant ($p \leq 0.01$) difference was observed in the mean HAZ scores of the subjects with respect to family income (only between those belonging to families earning above Rs. 20,000 vs. those earning ≤ 5000 and 5001-10,000) and parent's education (only between those whose parents were educated above matric vs. illiterates), whereas, no substantial differences were seen with respect to caste and religion of the subjects. The findings indicated that as compared to those belonging to lower income group families and whose parents were illiterates, the subjects belonging to higher income group families and whose parents were more educated, had better nutritional status with respect to height-for-age. Consistently, the literature showed that the determinants of the underweight, wasting and stunting may be different and particularly that parents' schooling and other socio-economic factors are more likely to have a larger effect on child stunting than on underweight and wasting [26, 27]. The socio-economic determinants have major role in assessing the nutritional status of the population. As income increases, families start to invest in food consumption;

they had better access to health services, ability to purchase more diverse foods, improved water and sanitation systems and greater access to information [28]. Therefore, higher family income can act as a protective factor of stunting. Education could simply reflect the effect of household economic welfare on child health [29]. The pathway specifically connecting a mother's education and child nutrition is empowerment; more educated women are more self-confident and participate more in household and community decision making. Since women are usually the primary child caregivers of a family, empowerment is likely to result in better health and nutritional status for children [27]. There are evidences of similar findings from various studies [30-34]. Therefore, investing in education particularly of females is one of the best long-term intergenerational interventions to combat child malnutrition. Under these socio economic disparities, planning and resource allocation based on the proximate factors that would help improve the nutritional status becomes more complex. This would not only require more expertise at the regional levels to tackle the problems but also coordination across different governmental departments and across the three tiers of administrative set-up [9]. Based on the findings of the study and other previous studies, the government need to take cognizance of the nature of health disparity and reorient health projects with an attention towards socio-economic dimensions of health [35].

Conclusion

BAZ, the indicator of short term malnutrition was not found to be influenced by socio-economic factors except religion whereas, family income and parent's education affected the HAZ, representing the long term malnutrition. The lower prevalence of thinness and stunting may hide some of the socio-economic disparities among the studied children, however the study recommends the policy-makers to offer utmost priority to poverty alleviation, improvement in education and more privileges to marginalized communities in the framework of development programs of the state in order to achieve optimum physical, nutritional and health parameters of school children.

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