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Original Research Article

Prevalence of Malnutrition among the Preadolescent Brickfield Workers of West Bengal, India

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ABSTRACT

Background: Children and preadolescent are universally considered to be the most important asset for any nation; hence their health and well-being are crucial. Malnutrition is the most common nutritional disorder in developing countries and it remains one of the most common causes of morbidity and mortality among children and preadolescent worldwide.
Objective: The main aim of the present study was to determine and compare the nutritional status of male and female preadolescent brickfield workers. This paper also focused on the socio-demographic as they affect the nutritional status of the male and female preadolescent brickfield workers.
Materials & Methods: A cross-sectional study was conducted on 116 brickfield workers (54 male and 62 female) from 12 Brickfields, working in a selected brick field unit of Bhadrakali in Hooghly District. A cross-sectional community-based descriptive study was conducted, to collect primary information from households using a scientific questionnaire, anthropometric measurements including height, weight as well as BMI and waist-hip ratio (WHR) were measured.
Results: This study also concludes that based on BMI, 68.96% of preadolescents were severe thinness or undernourished, having a Chronic Energy Deficiency (CED) Grade I, Whereas 22.4% of preadolescents were moderate thinness or undernourished, having a Chronic Energy Deficiency (CED) Grade II. This study also indicates that male preadolescent brickfield workers (75%) were more affected in this regard than female preadolescent brickfield workers (59%).
Conclusion: This study indicates that most of the preadolescent brickfield workers (95.7%) were underweight category, which is alarming nutritional status among preadolescent.

Keywords: Preadolescent, Brickfield workers, Nutritional status, BMI, Malnutrition.

INTRODUCTION

The brickfield industry is one of the oldest industries in India, which employs a large number of workers of poor socioeconomic status. Brickfield industry is one of the more hazardous and risky occupations in terms of safety and health. Workers in the brickfield industry work under tough conditions to perform the desired task. The brickfield workers are frequently exposed to awkward work postures, physical demands and different types of problems. [1] In the brickfield industry, the workers perform heavy manual tasks in a repetitive manner for a prolonged period of time, which may lead to severe physical stress among them. [2] A large number of brick carriers perform heavy Manual Material Handling (MMH) jobs in developing countries, especially in the brick-making sector. Manual Material Handling (MMH) activities such as pulling, pushing, carrying green bricks, carrying burn bricks, preparation of clay, lifting, bending, stretching, drying bricks, burning bricks etc are the important activities in brick manufacturing. Due to the high level of manual handling involved in brick making operations, the workers are exposed to higher levels of risk and high physical

workload. [3] Carrying bricks is one of the most strenuous jobs in brick making process, where the workers have to carry the bricks in their head and to travel lot of distance which requires extreme physical efforts and imposes additional load on physiological system as well as this might affect on their cardiovascular system. [4]

Nutrition is one of the most important factors influencing the quality of human life. Nutritional status is an important health indicator to assess a country's health status and morbidity pattern. Nutrition in the early years of life plays a big role in physical, mental and emotional development. Poor and inadequate nutrition leads to malnutrition, morbidity and mortality among children. [5] Nutritional assessment is an integral part of optimal pediatric care. Undernutrition, which may be primarily due to inadequate food intake or secondary to infection, injury, or disease, is the most important cause of growth retardation in children. Child growth is the universal means to assess adequate nutrition, health and development of individual children, and to estimate overall nutritional status and health of populations. Compared to other health assessment tools, measuring child growth is a relatively inexpensive, easy to perform and non-invasive process. [6] Several factors have been shown to contribute to the development of malnutrition. The relationships between sociodemographic variables and the nutritional status of children have been reported in earlier studies. [7] Factors such as income, parents' age, education, occupation, and household size have been examined with various outcomes. Poverty, however, is the root cause of undernutrition. Both acute and chronic undernutrition primarily affect young children in poor and marginalized families who cannot produce or procure adequate food, live in unsanitary environments without access to clean water, lack basic services and are poorly educated. Because economic setbacks have affected the rubber smallholders, it is imperative to investigate not only their socioeconomic profile but also its influence on the nutritional status of the children. [8]

BMI is an objective indicator of generalized adiposity [9] and is the most widely used [10-12] anthropometric indicator for assessing nutritional status of adults. It is a non-invasive technique used for nutritional surveys [13] and can also provide insight into the socioeconomic status of a population, particularly in developing countries. [14,15] BMI <18.5 kg/m^2 is considered an indicator of undernutrition and it predicts an individual's morbidity or other physiological and functional impairments. [16] Anthropometry has been accepted as an important tool for the assessment of nutritional status. Anthropometric measurements, such as body mass index (BMI) and waist circumference (WC) have been the subject of much epidemiological and physiological research involving overweight, obesity and body fat distribution and health outcomes. [17] Anthropometry and nutrition are interrelated and include genetic and environmental characteristics, sociocultural conditions, lifestyle, functional status, and health. Anthropometric evaluation is an essential part of nutritional assessment in children, to determine conditions, such as malnutrition, overweight, and obesity, as well as loss of muscle and gain of fat mass and the redistribution of adipose tissue. These anthropometric indicators have been used to evaluate the prognosis of acute and chronic diseases and also to guide medical intervention in the elderly.

The main aim of the present study was to determine and compare the nutritional status of male and female preadolescent brickfield workers. This paper also focused on the socio-demographic as they affect the nutritional status of the male and female preadolescent brickfield workers.

MATERIALS AND METHODS

STUDY POPULATION:

A cross-sectional study was conducted on 116 brickfield workers (54 male and 62 female) from 12 Brickfields, working in a selected brick field unit of Bhadrakali in Hooghly District, which was situated in the side of the Hooghly River. This brick field unit was selected randomly from the surrounding area. Prior permission was obtained from local community leaders as well as relevant authorities before the commencement of the study and ethical approval was approved by the Institute Ethical Committee.

MEASUREMENT OF SOCIOECONOMIC STATUS:

Socio-demographic profile data were collected using a set of questionnaires among both male and female child brickfield workers.

ANTHROPOMETRIC MEASUREMENT:

The height and weight of both male and female child brickfield workers were measured by an anthropometer (Martin's Anthropometer) and "Crown" weighing machine (Mfg. by Raymon Surgical Co.) respectively. Height and weight were recorded with a barefooted, wearing only light clothes. Height and weight were measured using standardized calibrated scales to the nearest 0.1 cm and 0.5 kg respectively. Weighing scale was calibrated periodically against known standards and weighing scale was calibrated to the zero before taking every measurement. The Body Mass Index (BMI) of all the subjects was also computed by using the following formula:

BMI (kg/m2) = Weight (kg) / height (m2)

The Waist-Hip Ratio (WHR) and Conicity Index (CI) were computed by using the following formula: WHR = Waist circumference (cm)/ Hip circumference (cm) [18]

CI = Waist Circumference (m)/0.109×√weight (kg)/height (m)

ASSESSMENT OF NUTRITIONAL STATUS:

Nutritional status was evaluated using internationally accepted World Health Organization [16] BMI guidelines. The following cut-off points were used:

Undernutrition: BMI < 18.5; Normal: BMI 18.5-25.0; Overweight: BMI ≥25.0. [19]

Undernutrition was further classified as moderate malnutrition and severe malnutrition. BMI <18 to 17 is known as undernutrition, whereas BMI <17 to 15 and BMI <15 is mainly known as moderate malnutrition and severe malnutrition respectively. [20]

STATISTICAL ANALYSIS:

One-way ANOVA tests were done to evaluate the F ratio to determine any significant differences ($p < 0.05$) in the stature, weight, BMI, waist and hip circumference and waist/hip ratio among male and female child brickfield workers. Chi-square test was utilized to compute sex differences in nutritional status among the child brickfield workers for the chosen level of significance ($p < 0.05$). The Student's t-test was performed among the child agricultural workers and control group of workers to find out whether there was any significant difference in between the heart rates, blood pressures and handgrip strength. Statistical analysis was performed using the statistical package PRIMER OF BIOSTATISTICS (Primer of Biostatistics5.0.msi, Msi Version = 1.20.1827.0, Primer for Windows, McGraw-Hill).

RESULTS

Sociodemographic factors relating to the study population, including age, religion, family Structure, education status of children and family, no of children in a family and annual per capita income (Quartiles) of a family are given in Table 1.In table 1 it was also stated that out of 116 respondents 8 (6.9%) were 09 years old, 18 (15.5%) were 10 years old, 21 (18.1%) were 11 years old, 24 (20.7%) were 12 years old,

12 (10.3%) were 13 years old, 22 (19.0%) were 14 years old and 11 (9.5%) were 15 years old. This study shows that 76.7% were from nuclear family and 23.3% were from joint family. This study showed that the maximum number of respondents do not have any formal education (87%), whereas only 9.5% and 3.5% have primary education and secondary education respectively. This study also revealed that 94.8% of parents do not have any formal education. Whereas, only 4.3% of parents do have primary education.

Table 1: Socio-Demographic characteristics of the Child brick field Workers

Variables	No of subjects (N=116)	Percentage
Gender		
Male	54	46.5
Female	62	53.5
Religion		
Hindu	82	70.7
Muslim	34	29.3
Age Structure		
09	08	6.9
10	18	15.5
11	21	18.1
12	24	20.7
13	12	10.3
14	22	19.0
15	11	9.5
Family Structure		
Nuclear	89	76.7
Joint	27	23.3
Education Level of Children		
No Formal Education	101	87.0
Primary Education	11	9.5
Secondary Education	04	3.5
Higher Education	00	0.0
Education Level of Parents		
No Formal Education	110	94.8
Primary Education	05	4.3
Secondary Education	01	0.9
Higher Education	00	0.0
No. of children in family		
1-2	50	43.1
3-5	58	50.0
6-9	08	6.9
Annual Per capita income (Quartiles) of family		
I (Rs. 1500- 2000)	27	23.3
II (Rs. 2000- 2500)	42	36.2
III (Rs. 2500- 3500)	34	29.3
IV (Rs. 3500-4000)	13	11.2

Table 2: Mean weight, mean height, mean BMI and Waist Hip ratio of preadolescent boys and girls brickfield workers

Variables	Male (n=54)	Female (n=62)	t Value	P value
	Mean SD	Mean SD		
Height (cm)	147.9 (±8.82)	147.2 (±7.22)	0.470	0.639
Weight (kg)	29.6 (±7.85)	30.5 (±5.89)	0.704	0.483
BMI (kg/ m^2)	13.8 (±1.8)	14.2 (±2.1)	1.09	0.277
Waist Circumference (cm)	60.1 (±1.55)	60.5(±1.68)	1.32	0.188
Hip Circumference (cm)	79.8 (±2.42)	80.2 (±3.21)	0.749	0.456
Waist / Hip Ratio	0.75 (±0.021)	0.75 (0.028)	0.000	1.000
Conicity index (CI)	1.10 (±0.08)	1.11 (±0.09)	0.628	0.531

In table 2 it was observed that the mean height of the respondents (male and female) were 147.9 (±8.82) and 147.2 (±7.22) the mean weight of the male and female respondents were 29.6 (±7.85) and 30.5 (±5.89). The mean BMI of the male and female preadolescent brickfield workers were 13.8 (±1.8) and 14.1 (±1.7) respectively. The waist-hip ratio of both male and female respondents was 0.75. Finally, in table 2 the conicity index of both male and female preadolescent brickfield workers were 1.10 (±0.08) and 1.11 (±0.09) respectively.

Table 3 shows that majority of the male respondents (66.7%) had a severe thinness i.e. BMI of less than 16.0 kg/m2, 14 of them (25.9%) and 02 (3.7) of male respondents were of a moderate thinness and mild thinness respectively. Only 02 (3.7) of male respondents were of normal or healthy weight, No male respondents were found as overweight. Nearly two-third (70%) of the female respondents had a severe thinness, while 19.4 % and 4.8% of female preadolescents had a moderate thinness and mild thinness respectively. As shown in Table 3, only 02 (3.2%) and 01(1.6%) of female preadolescents were normal weight and overweight respectively, when their anthropometric indices were computed based on BMI only.

Table 4 indicates that nutritional status of male and female preadolescent brickfield workers based on BMI and different age group. This table shows that among the male preadolescent brickfield workers, 09 years age groups of male preadolescent brickfield workers suffered from severe, moderate and mild thinness, whereas in case of 10 years age group of male and female preadolescent 05 (9.3%) and 05 (8.0%) suffered from severe thinness respectively and only 03 (5.6%) and 03 (4.8%)suffered from moderate thinness respectively.09 (16.7%) male and 07 (11.3%) female respondents of 11 years of age group suffered from severe thinness, whereas in the 12 years age group the percentage of the severe thinness of male and female respondents was 07 (13.0%) and 09 (14.5%) respectively. In the age group 14 of female respondents, 13 (21.0%) were suffered from severe thinness and lastly in the age group 15 of male respondents, thirteen percent 07 (13.0%) suffered from severe thinness. Table 4 also indicates that only one (1.85%) female respondents were found as an overweight according to anthropometric indices were computed based on BMI only.

Table 3: Nutritional status of preadolescent brickfield workers based on BMI

Chronic Energy Deficiency (CED)	BMI (kg/m2)	Males (n=54)		Females (n=62)		χ^2 value	OR	95% CI	P value
		N	%	N	%				
Grade I	BMI (<16.00) Severe thinness	36	66.7	44	70.1	0.089	0.818	0.3721 to 1.7991	0.765
Grade II	BMI (16.00- 16.99) Moderate thinness	14	25.9	12	19.4	0.389	1.458	0.6073 to 3.5019	0.533
Grade III	BMI (17.00- 18.49) Mild thinness	02	3.7	03	4.8	0.025	0.756	0.1216 to 4.7043	0.874
	BMI 18-24.9 Normal Weight	02	3.7	02	3.2	0.136	1.153	0.1570 to 8.4822	0.712
	BMI 25.0 – 29.9 Over weight	00	0.0	01	1.6	0.005	0.376	0.0150 to 9.4271	0.945

Table 4: Nutritional status of male and female Preadolescent brickfield workers based on BMI and different age group

Sex	Age group	BMI (<16.00) Severe thinness	BMI (16.00- 16.99) Moderate thinness	BMI (17.00- 18.49) Mild thinness	BMI (18.00-24.99) Normal Weight	BMI (25.0 – 29.99) Over Weight	Total
Male	9	01 (1.85)	01 (1.85)	01 (1.85)	00 (0.00)	00 (0.00)	03 (5.6)
	10	05 (9.3)	03 (5.6)	00 (0.00)	00 (0.00)	00 (0.00)	08 (14.8)
	11	09 (16.7)	01 (1.85)	00 (0.00)	01 (1.85)	00 (0.00)	11 (20.4)
	12	07 (13.0)	03 (5.6)	00 (0.00)	00 (0.00)	00 (0.00)	10 (18.5)
	13	04 (7.4)	02 (3.7)	00 (0.00)	00 (0.00)	00 (0.00)	06 (11.1)
	14	03 (5.6)	03 (5.6)	01 (1.85)	01 (1.85)	00 (0.00)	08(14.8)
	15	07 (13.0)	01 (1.85)	00 (0.00)	00 (0.00)	00 (0.00)	08(14.8)
Total		36 (66.7)	14 (26.0)	02 (3.7)	02 (3.7)	00 (0.00)	54 (100)
Female	9	03 (4.8)	02 (3.2)	00 (0.0)	00 (0.0)	00 (0.0)	05 (8.0)
	10	05 (8.0)	03 (4.8)	01 (1.6)	01 (1.6)	00 (0.0)	10 (16.1)
	11	07 (11.3)	03 (4.8)	00 (0.0)	00 (0.0)	00 (0.0)	10 (16.1)
	12	09 (14.5)	03 (4.8)	01 (1.6)	01 (1.6)	00 (0.0)	14 (22.6)
	13	05 (8.0)	01 (1.6)	00 (0.0)	00 (0.0)	00 (0.0)	06 (9.7)
	14	13 (21.0)	00 (0.0)	01 (1.6)	00 (0.0)	00 (0.0)	14 (22.6)
	15	02 (3.2)	00 (0.0)	00 (0.0)	00 (0.0)	01 (1.85)	03 (5.6)
Total		44 (70.1)	12 (19.4)	03 (4.8)	02 (3.2)	01 (1.85)	62 (100)

Percentage of total number of subjects in parentheses

It is clearly seen from Figure 1 prevalence of undernutrition in the preadolescent boys was high 52 (96.3%) in comparison to preadolescent girls 59 (94.3%) and prevalence of overweight in adolescent girls is 01 (1.6%) was higher than male preadolescent. Figure 2 indicates that 09 – 11 years and 12 -13 years of age group had a same number 35 (30.2%)of underweight respondents according to BMI. Whereas in case of 14 – 15 years age group the underweight respondents are little low 31 (26.7%).

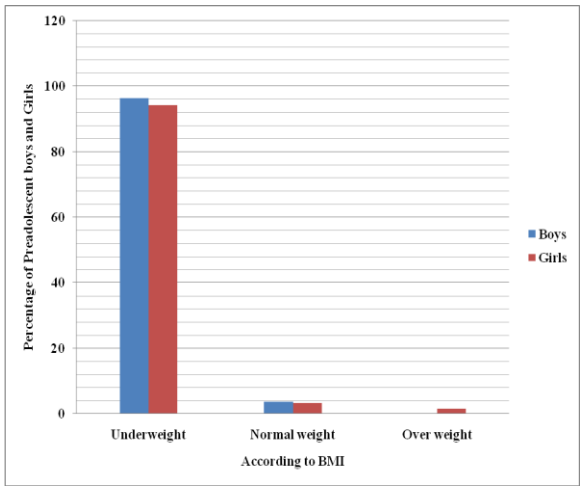

Fig1. Nutritional status of preadolescent boys and girls according to body mass index (BMI).

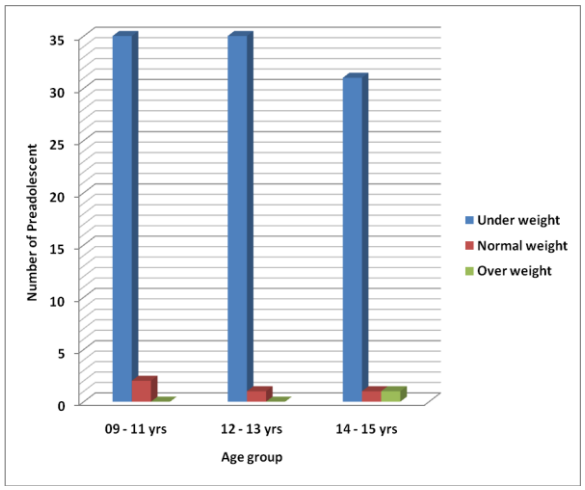

Fig 2. Prevalence of Under nutrition according to Age group

DISCUSSION

Under-nutrition continues to be a problem of considerable magnitude in most developing countries of the world. [21] The prevalence of undernutrition among children and preadolescent are considered as a serious public health problem in developing countries such as India where the vast majority of the populations are undernourished and underprivileged. [22,23] Anthropometry assessments are important for the improvement of their nutrition and health status, thereby overall development of the community concerned, where use of anthropometric measurements plays a pivotal role in the assessment of nutritional status. [16,23] In the present study the assessment of undernutrition among the preadolescent brickfield workers aged 9 years to 15 years. The results of the present study indicated that the prevalence of undernutrition among preadolescent brickfield worker was very high due to poverty and low literacy level of parents. Apart from overall poverty, the health status of the rural population reflects an inequitable distribution of health resources, low purchasing capacity of foods and unequal food sharing pattern in the families making them socially and biologically vulnerable. Undernutrition is an indicator of poor nutrition and poor health of a population. However, very little information is available on the nutritional status of adolescents from rural areas of West Bengal. This lack of useful epidemiological data is the reason why we have attempted to investigate the nutritional status of adolescents from the rural areas of West Bengal state. [24]

This study revealed that the respondents' parents were mostly uneducated, a possible contributor to the fact that most (more than a half) of them had a poor nutritional status. However, the findings from this study showed that based on BMI, 68.96% of preadolescents were severe thinness or undernourished, having a Chronic Energy Deficiency (CED) Grade I, (BMI<16.00). Whereas 22.4% of preadolescents were moderate thinness or undernourished, having a Chronic Energy Deficiency (CED) Grade II, (BMI= 16.00-16.99). In a Chronic Energy Deficiency (CED) category only 4.3% of preadolescents were mild thinness or

undernourished, having a Chronic Energy Deficiency (CED) Grade III, (BMI=17.00-18.49). Only 02 (3.7%) male and 02 (3.2%) female preadolescent were of a normal or healthy weight and finally, only one participant (0.86%) out of 116 were considered as overweight or obese. This study indicates that most of the preadolescent brickfield workers (95.7%) were the thin or underweight category which is alarming nutritional status among children or preadolescent. This result of the study corroborates with the work of Deshmukh et al, [25] who reported that the majority of their adolescent (53.8%) subjects were thin or undernourished. The same findings of this study, in relation to undernutrition prevalence in preadolescents, are similar to those of Dey, et al., [26] who in their study conducted on adolescents in India, found that 28–40% of their study subjects were undernourished to assess nutritional status. 96.3% male preadolescent brickfield workers were suffered from undernutrition whereas, 95.2 % female preadolescent brickfield workers were suffered from undernutrition. This result corroborates with the work of Shahabuddin et al., [27] who reported that boys (75%) were more affected in this regard than girls (59%). This study also stated that a higher prevalence of undernutrition in preadolescent brickfield workers aged 12 years (27.9%) than another age group.

CONCLUSION

This study concludes that the prevalence of undernutrition among preadolescent brickfield worker was very high due to poverty and low literacy level of parents. This study also concludes that based on BMI, 68.96% of preadolescents were severe thinness or undernourished, having a Chronic Energy Deficiency (CED) Grade I, (BMI<16.00). Whereas 22.4% of preadolescents were moderate thinness or undernourished, having a Chronic Energy Deficiency (CED) Grade II, (BMI= 16.00-16.99).This study indicates that most of the preadolescent brickfield workers (95.7%) were the thin or underweight category which is alarming nutritional status among children or preadolescent. This study also indicates that male preadolescent brickfield workers (75%) were more affected in this regard than female preadolescent brickfield workers (59%). This study also stated that a higher prevalence of undernutrition in preadolescent brickfield workers aged 12 years (27.9%) than other age groups.

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Conflict of interest: none

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