

Double burden of malnutrition among female college students of Paschim Medinipur District, India

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Abstract

Some previous report reveals that environmental and geographical factors have influence the regional health standard. Paschim Medinipur District in India is semi urban and rural based region adjoined to some Jangal Mahal Districts with laterite soil with lower crop fertility. The college students of Paschim Medinipur District and their health standard have not been systematically explored with reference to the state, country and further global standard. In the current study female students of a women's college in this region has been employed for this kind of analysis. It was noted that their health status is significantly undernourished and malnourished with comparison to the World Health Organization Global and Indian standard. Socio-demographic condition of the inhabitant, soil quality and the water standard may be a determining factor for the proper macro-nutrient metabolism. Synergistic action of micro- and macro-nutrient might be the factor which should be explored in future studies.

Keywords: College students, Obesity, Undernutrition.

Introduction

India has now experienced the double burden of malnutrition (underweight and overweight/obesity) like many other developing countries.^{1,2} Undernutrition and the micronutrient deficiencies are a days old public health problems in India, but till persists, while overweight/obesity are the emerging public health issues.^{3,4} Inappropriate combination of foods and inadequate intake of quality food is common in young people and their immature and their irrational attitude are one of the causes for malnutrition.^{5,6} The physical inactivity, junk food intake, spending more time in electronic media are the other causes of obesity among college students.^{5,7}

Obesity is now regarded as global epidemic. The prevalence of obesity is rapidly increasing in the developed countries as well as developing countries during the few last decades.⁸⁻¹⁰ Recent report of World Health Organization indicated that, obesity has about tripled globally since 1975.¹¹ Obesity has a direct relationship with many chronic diseases including hypertension, coronary heart disease, type-2 diabetes mellitus, osteoarthritis, dyslipidemia, cholethiasis and certain types of cancer in all most all human organs.¹²⁻¹⁵ obesity is also responsible factors for different gynaecological disorders including amenorrhoea, menstrual irregularities, polycystic ovarian disease and infertility etc.¹⁵ obesity has also negative role on the academic performance during the student life.¹⁶

On the other hand, underweight/undernutrition is usually an outcome of inadequate dietary intake and/or diseases. It hampers the immune system of the body

that leads to longer, more severe and more frequent illness.¹⁷

The coexistence of undernutrition (underweight) and overnutrition (overweight/obesity) in the same population make the double burden for the society. In the developing countries, little work has been done on the obesity and mainly focus on the prevalence of undernutrition and particularly its causes and consequences.^{17,18} In this scenario, this study was conducted to find out the prevalence of undernutrition and overweight/obesity among the female college students in a women's college situated in a semi-urban location.

Materials and Methods

Study Location and Human Participants

The community based cross sectional study was conducted from September 2018 to November 2018. The present study was carried out among the female students aged between 18 and 20 years and inhabitants of Paschim Medinipur district or its neighbourhood areas.

Ethical Consideration

The study is approved by the Institutional Research Ethics Committee. The importance of the study was explained to potential participants and the students who gave written consent were included in the study. The anonymity of the participants is absolutely conserved.

Inclusion Criteria

Only the competent, consistent and psychologically healthy young adult female aged 18 to 20 years were included in this study. The participants who were suffering from significant health complication viz.

diabetes, hypertension and chronic infectious diseases were not included in the study.

Anthropometric Measurement: All the anthropometric measurements were taken by the trained professionals using the standard techniques.¹⁹ height was measured to the nearest 0.1 cm with the participant standing in erect position on a flat platform with the head oriented in the Frankfort horizontal plane using Martin's anthropometer. Body weight was recorded digitally with a weighing scale (Doctor Beliram and Sons, New Delhi, India) to the nearest 0.1 kg with the participant standing motionless. Errors of measurements were computed within acceptable limits.²⁰

The body mass index (BMI) of the individuals were computed using the standard equations: BMI

(kg/m^2) = Weight (kg)/height² (m^2). Nutritional status was evaluated using internationally accepted BMI guidelines.²¹ The following cut-off points were utilized: Grade III Thinness: BMI<16.0.

- Grade II Thinness: BMI=16.0–16.99.
- Grade I Thinness: BMI=17.0–18.49.
- Normal: BMI=18.50–24.99.
- Overweight: BMI \geq 25.0.

To determine the condition of the population according the prevalence of low BMI <18.5 the WHO Classification of public health problem of low BMI based on BMI distribution in adult populations were followed (Table 1).²¹

The neck-circumference (NC) of the individuals was measured as length around the neck in a horizontal plane at the level of the most prominent portion of the thyroid cartilage (Adam's apple) with the head at erect and resting position.²²⁻²⁴

Table 1: Classification of public health problem of low BMI based on BMI distribution in adult populations²¹

Classification	Percentage of population with BMI<18.5
Low prevalence (Warning sign, monitoring required)	5-9%
Medium prevalence (Poor situation)	10-19%
High prevalence (Serious situation)	20-39%
Very high prevalence (Critical situation)	\geq 40%

Table 2: Age and anthropometric parameters of the female college students aged 18–20 years

Parameters	Mean \pm SD	95% CI
Age (years)	19.20 \pm 0.75	19.01–19.38
NC (cm)	30.30 \pm 2.25	29.75–30.86
Weight (kg)	49.71 \pm 8.33	47.66–51.76
Height (cm)	154.45 \pm 5.28	153.15–155.75
BMI (kg/m^2)	20.87 \pm 3.56	19.99–21.75

Table 3: Pearsons product moment correlation between age and different anthropometric parameters.

Parameters	NC (cm)	Weight (kg)	Height (cm)	BMI (kg/m^2)
Age (years)	0.086	0.009	-0.030	0.024
NC (cm)		0.828***	0.066	0.796***
Weight (kg)			0.170	0.918***
Height (cm)				-0.231
Significant at ***P<0.001				

Statistical Analysis

The statistical analyses were computed by using the Statistical Package for Social Sciences (SPSS) for Windows statistical software package (SPSS Inc., Chicago, IL, USA, 2001). Normally distributed data were tested by Kolmogorov-Smirnov test. One-way ANOVA analysis was undertaken to test for age differences in mean height, weight, BMI and NC.

Product moment correlation coefficient (r) between intra-parameters of anthropometric measurements was also calculated. Linear regression analysis was done to assess the best anthropometric predictive of BMI and the coefficient of determination (R^2) and standard error of estimate (SEE) were calculated for NC. P value<0.05 is considered statistically significant.

Table 4: Comparative prevalence of underweight and overweight/obese of women's of different districts of West Bengal with the present study²⁷

Districts	Underweight	Overweight/obese
Bankura	33.3	9.4
Bardhaman	24.0	17.0
Birbhum	30.3	10.3
Dakshin Dinajpur	24.9	12.1
Darjiling	15.4	23.6
Haora	16.5	25.9
Huglii	18.3	29.9
Jalpaiguri	26.1	14.8
Koch Bihar	24.8	9.7
Kolkata	7.3	40.6
Maldah	23.9	12.0
Murshidabad	21.1	14.8
Nadia	11.9	24.9
North 24 Parganas	11.5	28.9
Paschim Medinipur	29.9	15.9
Purba Medinipur	19.4	20.9
Puruliya	47.5	4.7
South 24 Parganas	18.8	22.6
Uttar Dinajpur	25.7	11.1
Paschim Medinipur (Present Study)	24.2	15.2

Table 5: Comparative prevalence of underweight and overweight/obese of women's of different states/union territory of India with the present study²⁸

Eco-Zones of India	State/Union Erritory	Mean BMI	Under Weight	Overweight/Obese
	India	21.9	22.9	20.7
North	Chandigarh	24.3	13.3	41.4
	Delhi	23.5	14.8	33.5
	Haryana	22.3	15.8	21.0
	Himachal Pradesh	22.8	16.2	28.7
	Jammu & Kashmir	23.2	12.1	29.1
	Punjab	23.5	11.7	31.3
	Rajasthan	21.1	27.0	14.1
	Uttarakhand	22.1	18.4	20.5
Central	Chhattisgarh	20.9	26.7	11.9
	Madhya Pradesh	21.0	28.4	13.6
	Uttar Pradesh	21.4	25.3	16.5
East	Bihar	20.6	30.5	11.7
	Jharkhand	20.5	31.6	10.3
	Odisha	21.3	26.5	16.5
	West Bengal	21.8	21.3	19.9
Northeast	Arunachal Pradesh	22.5	8.5	18.8
	Assam	21.0	25.7	13.2
	Manipur	23.0	8.8	26.0
	Meghalaya	21.7	12.1	12.2
	Mizoram	22.6	8.4	21.1
	Nagaland	21.9	12.3	16.2
	Sikkim	23.3	6.4	26.7
	Tripura	21.7	19.0	16.0
West	Dadra & Nagar Haveli	21.4	28.7	19.2
	Daman & Diu	23.3	12.9	31.7
	Goa	23.5	14.7	33.5

	Gujarat	22.0	27.2	23.8
	Maharashtra	22.1	23.5	23.4
South	Andaman & Nicobar Islands	23.3	13.1	31.8
	Andhra Pradesh	23.3	17.6	33.2
	Karnataka	22.3	20.8	23.3
	Kerala	23.5	9.7	32.4
	Lakshadweep	24.2	13.5	40.6
	Puducherry	23.9	11.3	36.7
	Tamil Nadu	23.2	14.6	30.9
	Telangana	22.6	22.9	28.7
	East	West Bengal (Present Study)	20.9	24.2

Table 6: Prevalence of underweight among adults (BMI < 18) and overweight (BMI ≥ 25) crude Estimates by WHO region^{29,30}

WHO region	Underweight (crude estimate) (%)	Overweight (crude estimate) (%)
Africa	9.9 [8.2-11.9]	34.8 [32.2-37.5]
Americas	2.2 [1.7-2.8]	62.1 [59.3-64.9]
South-East Asia	20.8 [17.0-24.8]	23.7 [20.7-27.0]
Europe	1.9 [1.5-2.4]	58.8 [56.2-61.4]
Eastern Mediterranean	7.6 [5.7-9.7]	49.8 [46.9-52.8]
Western Pacific	7.2 [5.5-9.4]	31.1 [27.3-35.1]
(WHO) Global	9.4 [8.1-10.7]	39.7 [37.8-41.6]
South-East Asia (Present study)	24.24 [13.6-34.9]	15.15 [6.3-24.0]

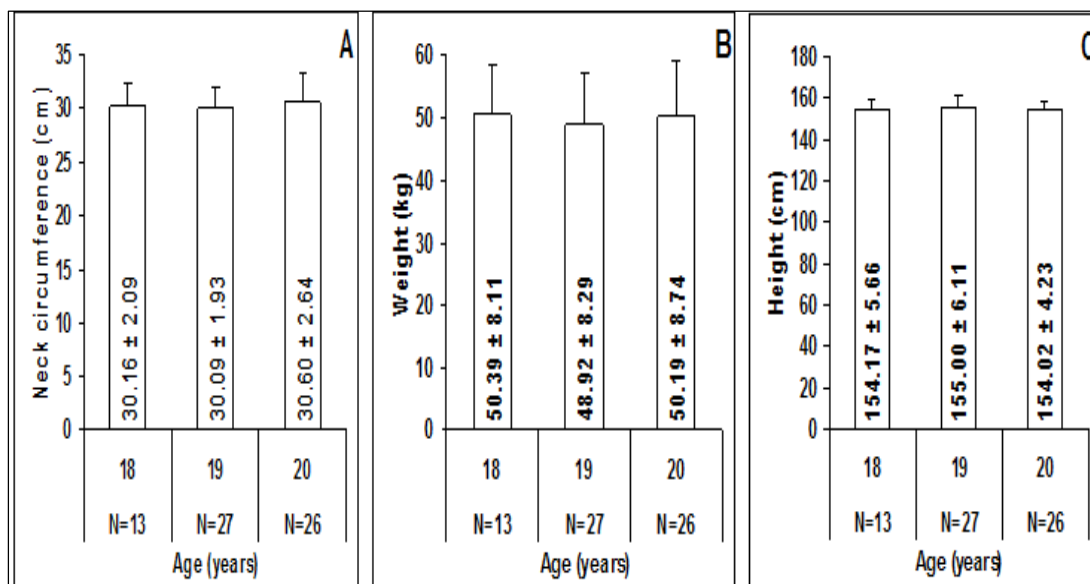


Fig. 1: (A-C): Impact of age on neck circumference, weight and height of the female college students.

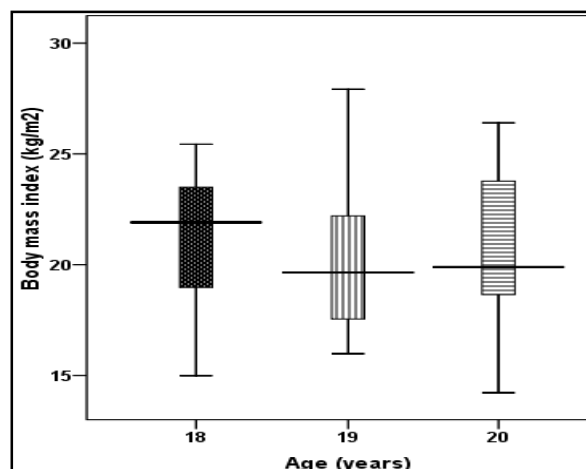


Fig. 2: Box plot of Body mass index (kg/m^2) among the female college students according to age.

Results

The study group was consisted of sixty six female undergraduate students. The mean and standard deviation of the age of the students were 19.20 ± 0.75 (years 19.01–19.38 years) with a range of 18 to 20 years (Table 2). The students were segregated into three groups, according to their age viz. 18, 19 and 20 years. The frequency of these age-groups was 13, 27 and 26 respectively. The mean BMI and NC of the students were $20.87 \pm 3.56 \text{ kg}/\text{m}^2$ [19.99 – $21.75 \text{ kg}/\text{m}^2$] and $30.30 \pm 2.25 \text{ cm}$ [29.75 – 30.86 cm] respectively (Table 2).

Fig. 1 shows the mean of NC, height, weight according to age. The study showed that NC was highest among the students of 20 years though no significant age difference was observed ($F=0.361$; $P>0.05$).

Fig. 2 shows the box plot of BMI according to age. The mean BMI of the students of 18, 19 and 20 years

were $21.19 \pm 3.10 \text{ kg}/\text{m}^2$, $20.41 \pm 3.58 \text{ kg}/\text{m}^2$ and $21.19 \pm 3.82 \text{ kg}/\text{m}^2$ with $F=0.371$ ($P>0.05$).

While studying the intra-relationship of the anthropometric parameters, it was noted that NC positively associated with weight and BMI (Table 3).

The linear regression analysis indicated that the NC of the students was considered to be a significantly ($p<0.01$) better predictor variable of BMI (Fig. 3).

The prevalence underweight and overweight among the students was 24.24% and 15.15% respectively (Fig. 4). The prevalence of Grade III Thinness, Grade II Thinness, Grade I Thinness among the students were 4.54%, 9.09% and 10.61% respectively (Data not shown). Figure 4 also shows that the highest prevalence of underweight was noted among the female students of 19 years (29.63%) while highest prevalence of overweight was observed among the students of 20 years (19.23%).

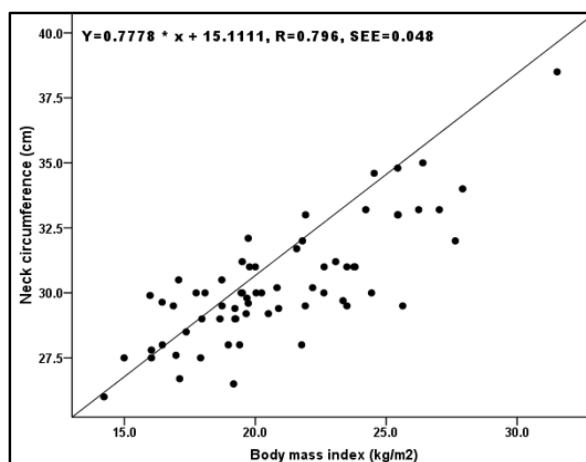


Fig. 3: Linear regression analysis between NC and BMI.

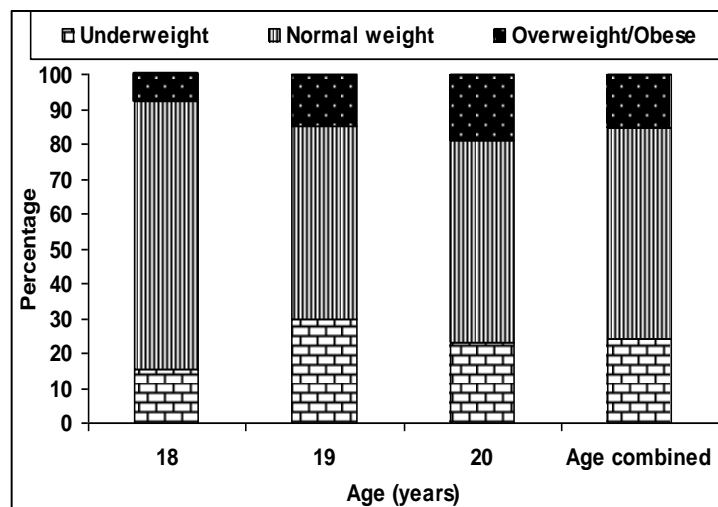


Fig 4: Impact of age on the prevalence of underweight and overweight/obese of the female college students

Discussion

The recent report of World Health Organization (WHO, 2011) stated that the undernutrition and infectious diseases continue to threaten serious health challenges in low-income countries. But overweight/obesity assumes important and major risk factors for cardiovascular diseases in the same settings.²⁵ It was well known that the overweight/obesity has been regarded as an alien phenomenon in many developing countries.²⁶ It has been raised dramatically in last few decades. Thus, overweight/obesity has become one of the major public health issues while undernutrition still raises a typical challenge in the developing countries.¹⁷

The double burden of malnutrition also found in this study population, and the underweight (24.24%) were more prevalent than the overweight (15.15%) among the female students of Pschim, Medinipur District. This high prevalence of undernutrition among these students put the population in serious situation as indicated by the WHO classification of public health problem of low BMI.²¹ The recent study of National Family and Health Survey-4 indicated that the prevalence of underweight and overweight among the adult female of Pschim, Medinipur District was 29.9% and 15.9% respectively.²⁷ In the present study, the prevalence of the overweight was similar to the previous study. But the prevalence of the underweight is higher in the previous study. While comparing this finding with the state level report documented in National Family and Health Survey-4, it was noted that the prevalence of underweight was higher in the present study (24.24%) than the previous report (21.3%) and prevalence of overweight were lower than the previous report (19.9%).²⁸ But when comparing the data of all over India it was noted that the prevalence of underweight of the female students were higher than the adult women of all over India (22.9) and are less likely to be overweight in comparison to that of the adult

women of all over India (20.7%).²⁸ The recent report of WHO.^{29,30} indicated that the female participants of Paschim, Medinipur, Districts are very much prone to underweight than the female of this earth. As the global prevalence of underweight and overweight among the females were 9.4% and 39.7%.

Conclusion

The socio-economic and geographical parameters could have been strong determinant in the assessment of health standard. In the present study the evaluation on the severity of undernutrition in the Midnapore region demands more focus on the socio-geographical parameters in this region. Some natural adverse situation like water quality with mineral and micronutrient availability may be drastically limited. And this may be a serious factor which has been overlooked and only the macronutrient factors are considered. But the normal metabolism and growth could have been only possible in the synergistic implications of different nutritional factors. This should be elaborately explored in future.

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