

# Correlation Between Diet Preference and Protein Consumption in Low Socio-Economic Female Adolescents in Navi Mumbai, India

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## Abstract

**Objective:** Studies have shown the prevalence of Protein Energy Malnutrition (PEM) in adolescents among low socio-economic group. Thus, this study was carried out to understand link between protein intake and diet preference across Body Mass Index (BMI) categories in female adolescents belonging to low socio-economic group.

**Method:** 486 female adolescents between age group 10-17 years were randomly selected. Of which, 123, 48 and 315 preferred vegetarians, eggetarian and non-vegetarian respectively. The school faculties and parents of the children were prior consented for the data collection of the observatory study. The 3 categories of BMI were considered- Underweight/ Poor weight, Healthy weight and Overweight/Obese. Height, Weight, Diet preference and 7-day food recall was recorded for each of them. Consumed protein intake was then calculated using Ntuitive software which was then compared with Recommended Dietary Allowance (RDA). Statistical analysis was conducted using IBM SPSS version 20 to evaluate association between protein intake and dietary preference across BMI.

**Results:** Statistical analysis showed that protein consumption in non-vegetarians was found to be significantly correlated ( $p=0.006$ ) across all BMI categories. However, there was no association found in vegetarians and eggetarians with respect to protein consumption and BMI ( $p>0.05$ ). 60.7% were found to be deficit in protein consumption among non-vegetarians which may be due to their low socio-economic status and affordability.

**Conclusion:** The socio-economic factors that significantly influenced protein consumption among them can be the parent's income status and family's affordability, number of siblings in the family, lack of knowledge and awareness in family, preparation or method/ way of cooking techniques. The diet preferences did influence the protein intake in low socio-economic status female adolescents. Further research will enable better insights to improve protein consumption in Indian children.

**Keywords:** Protein, recommended dietary allowance, low socio-economic, Body Mass Index, diet preference, female adolescents

**Source of Support:** Nil

**Conflict of Interest:** There are no conflicts of interest.

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## Introduction

### Objectives

1. To study the prevalence of protein energy malnutrition (PEM) in adolescents among low socio-economic groups.
2. To understand link between protein intake and diet preference across Body Mass Index (BMI) categories in female adolescents belonging to low socio-economic group.

It is well known fact that prosperity of a nation depends upon the quality of its human resources. Adolescents constituting 21.2% of the total population of India,<sup>[1]</sup> are the future generation of any country and their nutritional needs are critical for the well-being of society.<sup>[2]</sup> Being a vital stage of physical growth and development in the entire lifespan experiences unique changes, that occur in an individual during this period which are accompanied by progressive achievement of biological maturity. Protein deficiency has been shown to reduce growth during adolescence.<sup>[3]</sup> Protein-energy malnutrition (PEM) is a form of malnutrition that is defined as a range of pathological conditions arising from coincident lack of dietary protein or energy in varying proportions. PEM affects children the most because they have less protein intake.

As Adolescence is a crucial period in a women's life. Health and Nutritional status during this phase is critical for the physical maturity.<sup>[1]</sup> Thus, the requirement of energy as well as proteins increases considerably during this period. The peak in energy and protein requirements coincides with the peak in growth of adolescents. Actual needs also vary with physical activity. Therefore, monitoring weight and height and body mass index [BMI (weight/height in mtr<sup>2</sup>)] is essential to determine the adequacy of energy intake for individual adolescents. Body mass index (BMI) is a commonly used anthropometric measurement to estimate the level of nutritional indices (underweight/overweight) of adolescents and adults. Studies and surveys have shown that the diets of low-income group population are inadequate when compared to recommended standards.<sup>[4]</sup> However, age and other aspects of socio-economic status, such as educational level, occupation, and living status (living alone or not), may also affect food intake.<sup>[5]</sup>

Often nutrition initiatives focus on children and women, thus neglecting adolescents. The young women who are at brink of women hood, constitute the most crucial segment of our population from the

point of view of the quality of our future generation.<sup>[6]</sup> Therefore, the study was conducted to understand the relation between the diet preference among female adolescents from low socio-economic group and their protein consumption.

### Method

The study was conducted among 486 school going females aged between 10-17 years from Navi Mumbai municipal school. All study subjects belonged to low socio-economic status, who sent their children to municipal school, and were randomly selected.

The study consisted of anthropometric measurements with a detailed 7 day filled food diary. The school authorities and parents of the children were prior consented for all the data collected with respect to the observatory study.

### Inclusion criteria:

1. Female adolescents
2. Age group between 10-17 years
3. Lower socio-economic group
4. Not suffering from any kind of diseases

### Exclusion criteria:

1. Male adolescents
2. Age group below 10 years and above 17 years
3. Middle and Higher socio-economic group
4. Suffering from any kind of health/medical conditions

### Procedure:

For anthropometric measurements, subjects with light clothes and no shoes were measured for weight and height using Healthsense weighing scale with the precision of 0.1 kg and Indosurgicals height scale to the nearest 0.1 cm respectively. The measurements were performed once and the subjects were informed about the results of their anthropometric measurements in written forms. IAP Growth charts<sup>[7]</sup> were used to assess the BMI of the female adolescents. The subjects were then categorized into 3 categories of BMI-

- Underweight/ Poor Weight
- Healthy Weight
- Overweight/Obese

7-day food diary (refer Appendix) was introduced in the classroom which was filled by the subjects. The dietary assessment covered the habitual dietary intake including meal pattern as well as quantity of meal intake. The food diary was structured into sec-

tions i.e. breakfast, lunch, dinner, in-between meals and intake during weekends. Height, Weight, Diet preference and 7-day food recall was recorded for each of the subject. Consumed protein intake was then calculated using 'Ntuitive' software, where nutritive value of the food is calculated as per Indian Foods Composition Table (IFCT)<sup>[8]</sup> and United States Department of Agriculture (USDA)<sup>[9]</sup> standards. The protein consumed from 7 days food recall was then compared with the Recommended Dietary Allowance (RDA) of the subject in the same engine itself. Based on this an analysis report was generated. Statistical analysis was performed with Statistical Package for Social Science (SPSS) IBM version 20 to evaluate an association between protein intake and dietary preference across BMI categories. Furthermore, Chi Square Test was performed to understand the correlations between these variables. P-values < 0.05 were considered statistically significant.

### Results and Interpretation

The results of the subjects were evaluated through statistical analysis which is explained in the Figures 1, 2, 3 and 4.

Figure 1 shows the number of subjects belonging to each category as per their diet preference and it was found that 64.8% being the major part of the total subject size preferred non-vegetarian diet.

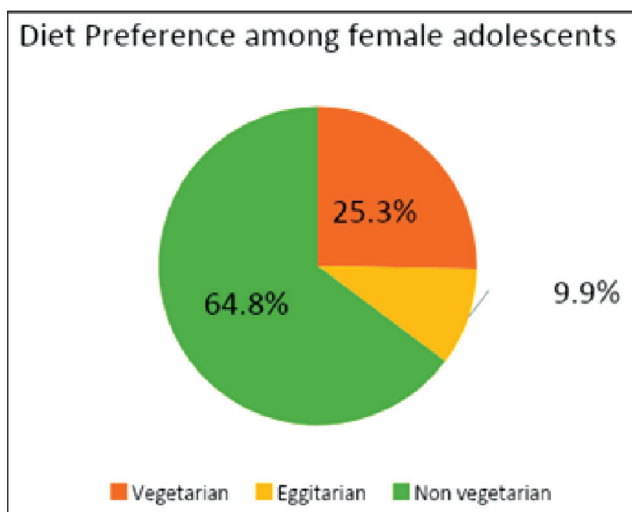


Figure 1: Diet Preference among female adolescents (n=486)

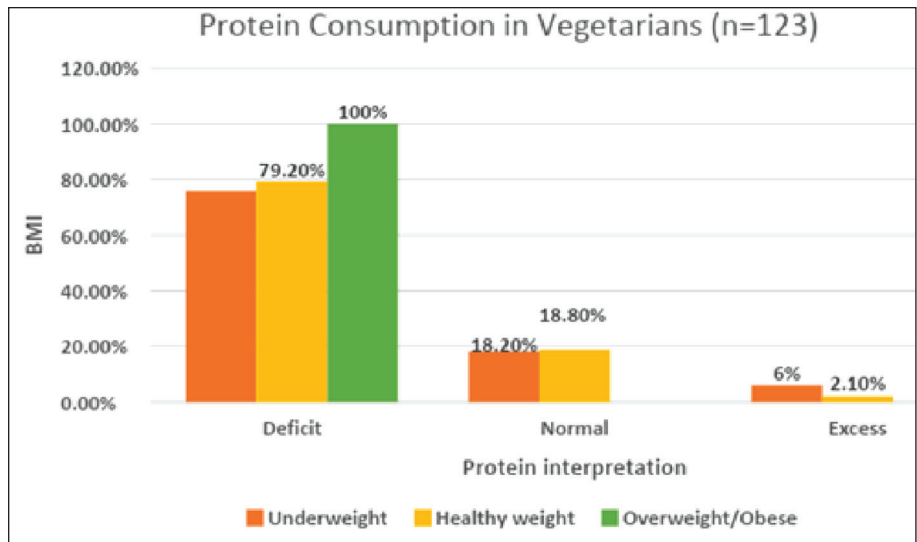


Figure 2: Protein interpretation among vegetarians across all BMI categories

As shown in Figure 2, 100% subjects in vegetarian overweight/obese category were found to be deficit in consuming protein as per their ideal requirement. This indicates the alarming step to provide the awareness of protein in weight management among these subjects. Some appropriate protein consumption as per RDA was also seen in 18.20% and 18.80% of total subjects belonging to underweight and healthy weight categories respectively. Being vegetarians, there is a need to provide these subjects with the knowledge of good vegetarian protein sources.

Figure 3 signifies that 88.90% of total subjects belonging to vegetarian overweight/obese category were found to be deficit when compared with RDA. Higher number of subjects who were consuming protein as per their RDA was found in vegetarians (25%) when compared with eggeterians (17%) across all BMI categories. It was also seen that eggeterians had lower rate of deficit protein consumption when compared to vegetarians. As per this observation, it is clear that although eggeterians are consuming better protein food sources but there is need to spread the awareness more so that appropriate consumption of protein could be seen in almost 100% subjects.

As observed in the Figure 4, subjects being non-vegetarians showed higher deficit rate in protein intake across all the 3 BMI categories out of which 93.10% of total subjects in overweight/ obese category was found to have highest deficit rate compared to ideal protein requirement.

The results of the study interpreted through the chi square test run for statistical analysis showed that

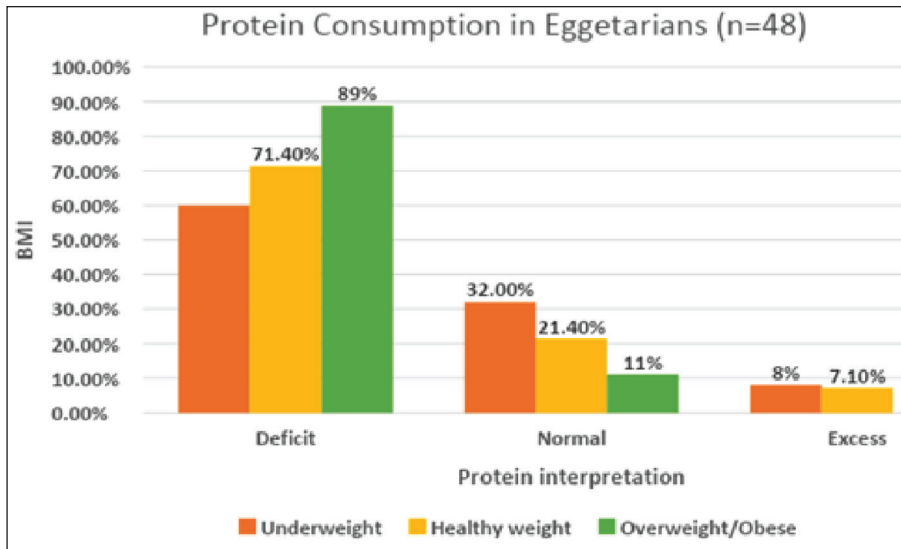


Figure 3: Protein interpretation among eggetarians across all BMI categories

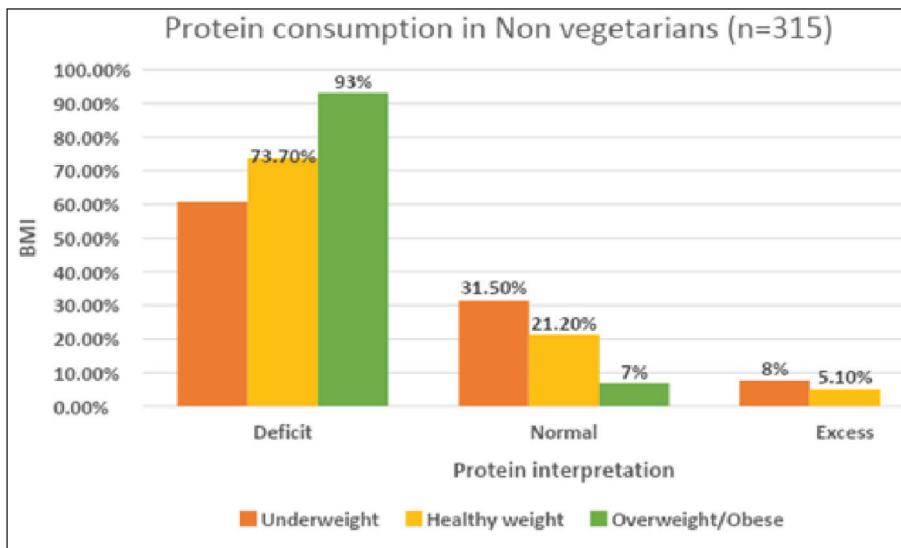


Figure 4: Protein interpretation among non-vegetarians across all BMI categories

there was a significant correlation ( $p=0.006$ ) between non-vegetarians and protein consumption across all BMI categories.

## Discussion

The findings of the study revealed the following:

### 1. To study the prevalence of protein energy malnutrition (PEM) in adolescents among low socio-economic groups.

In the current study, to see the prevalence of protein energy malnutrition in female adolescents among low socio-economic groups, protein interpretation of the subjects was analysed under the categories of deficit, normal and excess. As seen in the interpretation, 71.1%

of total subjects fall under the deficit protein category. Adolescence is a crucial period in a woman's life<sup>[1]</sup> who are the future generation of any country requires adequate nutritional intake for the well-being of society.<sup>[2]</sup> However, it is affected by inadequate or inappropriate food intake due to household economic and social disadvantages.<sup>[10]</sup> Previous studies from developing countries have indicated that younger adolescents who are at greater risk of being undernourished than their older counterparts, should consume adequate protein intake as per the recommended standards.<sup>[11]</sup>

### 2. To understand link between protein intake and diet preference across Body Mass Index (BMI) categories in female adolescents belonging to low socio-economic group.

In the current study, on performing the chi square test, a significant correlation was observed in the non-vegetarian subjects with a value of ( $p=0.006$ ) at a confidence level of 96%. On analysis, 93.1% of non-vegetarian obese subjects were seen to consume protein in deficit amounts across all BMI categories. Body mass index (BMI) is a commonly used anthropometric measurement to estimate the level of

nutritional indices i.e. underweight/healthy weight/overweight of adolescents and adults.<sup>[11]</sup> Studies on diet surveys have shown that the diets of low income group population are inadequate when compared to their recommended standards. The common causes among adolescents from lower socio-economic group can be less access to food, inadequate knowledge about dietary requirements,<sup>[4]</sup> age and other aspects of socio-economic status, such as educational level, occupation, and living status (living alone or not) which affects food intake.

## Conclusion

Therefore, in conclusion, the protein intake of the female adolescents is much lower among the lower so-



cio-economic group. Also, in the middle and high socio-economic group, female adolescents were observed to have less protein intake when compared with their ideal requirements. The socio-economic factors that significantly influenced protein consumption among them can be the parent's income status and family's affordability, number of siblings in the family, lack of knowledge and awareness in family, preparation or method/ way of cooking techniques. These all factors may contribute to the low protein consumption when compared to their ideal requirement among female adolescents belonging to lower socio-economic group. The study was done to identify underfed female adolescents and suitable interventions in the form of nutrition education and emphasis on improvement of food intake may be made in order to reduce the deficits.<sup>[1]</sup>

## References

1. Sharma AK, Shukla D, Kannan A. Calorie and protein intake and its determinants among adolescent school girls in Delhi. *Indian Journal of Community Medicine*. 2005 Jan 1;30(1):8-10.
2. Spear BA. Adolescent growth and development. *Journal of the Academy of Nutrition and Dietetics*. 2002 Mar 1:S23.
3. Khan MR, Ahmed F. Physical status, nutrient intake and dietary pattern of adolescent female factory workers in urban Bangladesh. *Asia Pacific journal of clinical nutrition*. 2005 Mar 1;14(1):19.
4. Chaturvedi S, Kapil U, Gnanasekaran N, Sachdev HP, Pandey RM, Bhanti T. Nutrient intake amongst adolescent girls belonging to poor socioeconomic group of rural area of Rajasthan. *Indian pediatrics*. 1996 Mar 1;33:197-202.
5. Sakurai M, Nakagawa H, Kadota A, Yoshita K, Nakamura Y, Okuda N, Nishi N, Miyamoto Y, Arima H, Ohkubo T, Okamura T. Macronutrient intake and socioeconomic status: NIPPON DATA2010. *Journal of epidemiology*. 2018 Mar 5;28(Supplement\_III):S17-22.
6. Kapil U, Manocha S, Bhasin S. Dietary intake amongstwell to do adolescent boys and girls in Delhi. *Indian pediatrics*. 1993 Aug;30:1015.
7. Khadilkar V, Yadav S, Agrawal KK, Tamboli S, Banerjee M, Cherian A, Goyal JP, Khadilkar A, Kumaravel V, Mohan V, Narayanappa D. Revised IAP growth charts for height, weight and body mass index for 5-to 18-year-old Indian children. *Indian pediatrics*. 2015 Jan 1;52(1):47-55.
8. Longvah T, Ananthan R, Bhaskar K, Venkaiah K. Indian Food Composition Tables 2017. **National Institute of Nutrition**. 2017 [Accessed on 29 October, 2019].
9. USDA Food Composition Table. 2019. Available from: <https://fdc.nal.usda.gov/>
10. Yetubie M, Haidar J, Kassa H, Fallon F. Socioeconomic and demographic factors affecting body mass index of adolescents students aged 10–19 in Ambo (a rural town) in Ethiopia. *International Journal of Biomedical Science: IJBS*. 2010 Dec;6(4):321.
11. Bhutia DT. Protein energy malnutrition in India: the plight of our under five children. *Journal of Family Medicine and Primary Care*. 2014 Jan;3(1):63.

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