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Dietary Diversity and Nutritional Status among Young Adults in Urban India: A Cross-Sectional Study

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Abstract: ***India is experiencing a rapid nutritional transition characterized by the coexistence of undernutrition and overnutrition, particularly in urban populations. Dietary diversity is widely recognized as a proxy indicator of diet quality and micronutrient adequacy. The present cross-sectional study aimed to assess dietary diversity and its association with nutritional status among young adults aged 18–25 years in an urban Indian setting. A total of 150 participants were selected using stratified random sampling from higher education institutions in Madhya Pradesh. Dietary intake was assessed using a 24-hour dietary recall and semi-quantitative food frequency questionnaire. Dietary Diversity Score (DDS) was calculated based on nine food groups following FAO guidelines. Anthropometric measurements including height, weight, and Body Mass Index (BMI) were recorded according to WHO standards. The mean DDS was 4.8 ± 1.2, indicating moderate dietary diversity. Only 32% of participants achieved high dietary diversity (DDS ≥6). BMI classification revealed 28% underweight, 47% normal weight, 19% overweight, and 6% obese individuals. A statistically significant association was observed between DDS and BMI category ($p < 0.05$). Low intake of fruits, green leafy vegetables, pulses, and dairy products was observed, while refined cereals and processed snacks were frequently consumed. The findings highlight the emerging double burden of malnutrition among urban youth and underscore the need for nutrition education and dietary diversification strategies to improve overall nutritional status.***

Keywords: Dietary diversity; Young adults; Urban nutrition; Body Mass Index; Double burden of malnutrition; Micronutrient adequacy; India; Nutrition transition

1. Introduction

India is undergoing rapid socio-economic transformation, urbanization, and lifestyle shifts that have profoundly influenced dietary patterns and nutritional status. Traditional diets rich in whole grains, pulses, seasonal fruits, and vegetables are gradually being replaced by energy-dense, nutrient-poor processed foods. This phenomenon, commonly termed the "nutrition transition," has led to the coexistence of undernutrition and overnutrition within the same population, often referred to as the double burden of malnutrition.

Young adulthood (18–25 years) represents a critical life stage characterized by increased autonomy in food choices, academic stress, irregular meal patterns, and growing exposure to fast food culture. Dietary habits established during this phase often persist into later adulthood, influencing long-term health outcomes. Poor dietary diversity during this period may result in micronutrient deficiencies, impaired immunity, reduced cognitive performance, and increased risk of obesity and non-communicable diseases (NCDs).

Dietary diversity refers to the number of different food groups consumed over a reference period and serves as a simple indicator of nutrient adequacy. The Food and Agriculture Organization (FAO) has emphasized dietary diversity as a practical tool for assessing diet quality at the individual level. Numerous studies have demonstrated positive associations between higher dietary diversity and improved micronutrient intake, better anthropometric status, and reduced morbidity.

Despite national surveys such as NFHS-5 reporting malnutrition prevalence, limited empirical evidence exists focusing specifically on dietary diversity and its relationship with nutritional status among urban young adults in India. Therefore, the present study was undertaken to assess dietary diversity and examine its association with Body Mass Index (BMI) among urban youth.

2. Review of Literature

Dietary diversity has emerged as a critical component in nutritional epidemiology and public health research. Several international and Indian studies have explored the relationship between dietary diversity, nutrient adequacy, and anthropometric outcomes.

1) Concept of Dietary Diversity

The FAO (2011) defined dietary diversity as the number of different food groups consumed over a given reference period. Higher dietary diversity is strongly associated with improved micronutrient adequacy ratios. Kennedy et al. (2007) observed that individuals consuming a minimum of five food groups had significantly better nutrient profiles compared to those consuming fewer groups.

2) Dietary Diversity and Micronutrient Adequacy

Arimond and Ruel (2004) reported that dietary diversity is positively correlated with micronutrient density among women and children in developing countries. Low dietary diversity has been linked to deficiencies of iron, zinc, vitamin A, and folate, which remain prevalent in India. Indian studies conducted among adolescents have reported inadequate consumption of protective foods such as fruits and green leafy vegetables. A study by Rathi et al. (2018) among urban Indian adolescents found high consumption of refined cereals and sugary beverages, contributing to poor diet quality.

3) Nutrition Transition in India

Urbanization has significantly influenced dietary patterns. The increasing availability of processed foods, fast-food outlets, and digital food delivery services has altered traditional meal patterns. According to the Global Nutrition Report (2022), India faces a dual burden of malnutrition, with rising obesity rates alongside persistent undernutrition. Young adults in urban settings often skip meals, consume fast foods, and exhibit sedentary lifestyles, contributing to increased risk of overweight and obesity. Simultaneously, inadequate intake of micronutrient-rich foods results in hidden hunger.

4) Dietary Diversity and BMI

Studies in South Asia have demonstrated mixed associations between dietary diversity and BMI. Some research indicates that low dietary diversity is associated with undernutrition, while excessive consumption of diverse but energy-dense foods may contribute to overweight. A study conducted among university students in Delhi reported that moderate dietary diversity was associated with normal BMI, whereas low diversity was linked to underweight status. Similar findings were observed in urban Maharashtra.

5) Gaps in Literature

Although several studies have examined adolescent nutrition, limited research specifically addresses dietary diversity among young adults aged 18–25 years in urban Indian contexts. Moreover, few studies have quantitatively assessed the association between DDS and BMI categories in this demographic group. The present study attempts to bridge this gap by providing empirical data from an urban educational setting in Madhya Pradesh.

3. Materials and Methods

Study Design

A descriptive cross-sectional study design was adopted.

Study Area and Population

The study was conducted in selected higher education institutions in urban Madhya Pradesh. Participants included male and female students aged 18–25 years.

Sample Size

A total of 150 participants were selected using stratified random sampling. Sample size was determined based on prevalence estimates of malnutrition among urban youth with 95% confidence level.

Inclusion Criteria

- Age between 18–25 years
- Apparently healthy individuals
- Willingness to participate

Exclusion Criteria

- Chronic illness
- Pregnancy
- Special therapeutic diets

4. Data Collection Tools

1) Socio-Demographic Questionnaire

Collected data on age, gender, family income, and educational background.

2) Dietary Assessment

- 24-hour dietary recall
- Food Frequency Questionnaire (FFQ)

Dietary Diversity Score (DDS) was calculated using nine food groups:

1) Cereals
2) Pulses/Legumes
3) Green leafy vegetables
4) Other vegetables
5) Fruits
6) Milk and milk products
7) Meat/Fish/Egg
8) Nuts and seeds
9) Fats and oils

Each consumed food group scored 1 point. Maximum score = 9.

DDS categories:

- Low diversity: ≤3
- Moderate diversity: 4–5
- High diversity: ≥6

3) Anthropometric Measurements

- Height measured using stadiometer
- Weight measured using digital weighing scale
- BMI calculated using WHO formula

BMI Classification (Asian Cut-offs):

- Underweight: <18.5
- Normal: 18.5–22.9
- Overweight: 23–24.9
- Obese: ≥25

Statistical Analysis

Data were analyzed using SPSS (Version 25).

- Mean and Standard Deviation calculated
- Chi-square test used for association
- Pearson correlation applied
- Significance set at $p < 0.05$

5. Results and Discussion

Socio-Demographic Profile

Among 150 participants, 60% were female and 40% male. Majority belonged to middle-income families.

Dietary Diversity Score Distribution

Table 1: Distribution of Participants by Dietary Diversity Score (n=150)

DDS Category	Score Range	Frequency (n)	Percentage (%)
Low	≤3	24	16%
Moderate	4–5	78	52%
High	≥6	48	32%

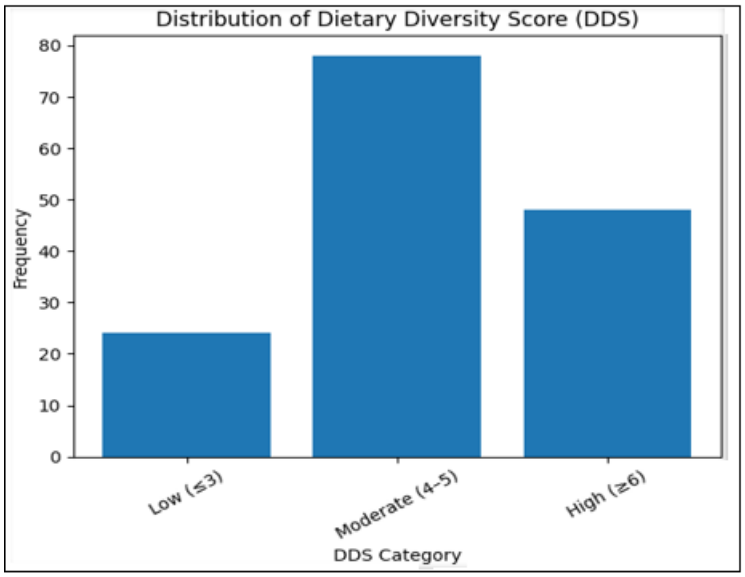

Figure 1: Distribution of Participants by Dietary Diversity Score (n=150)
Mean DDS = 4.8 ± 1.2

The mean Dietary Diversity Score was 4.8 ± 1.2, indicating moderate dietary diversity among the majority (52%) of participants. Only 32% achieved high diversity. Low intake of fruits (38%), green leafy vegetables (41%), and pulses (55%) was observed.

Food Group Consumption Pattern

Cereals were consumed by 100% participants. Processed snack consumption was frequent (72%). Fruit consumption was below recommended levels.

BMI Distribution

Table 2: Distribution of Participants by BMI Category (n=150)

BMI Category	BMI Range	Frequency (n)	Percentage (%)
Underweight	<18.5	42	28%
Normal	18.5–22.9	71	47%
Overweight	23–24.9	29	19%
Obese	≥25	8	6%

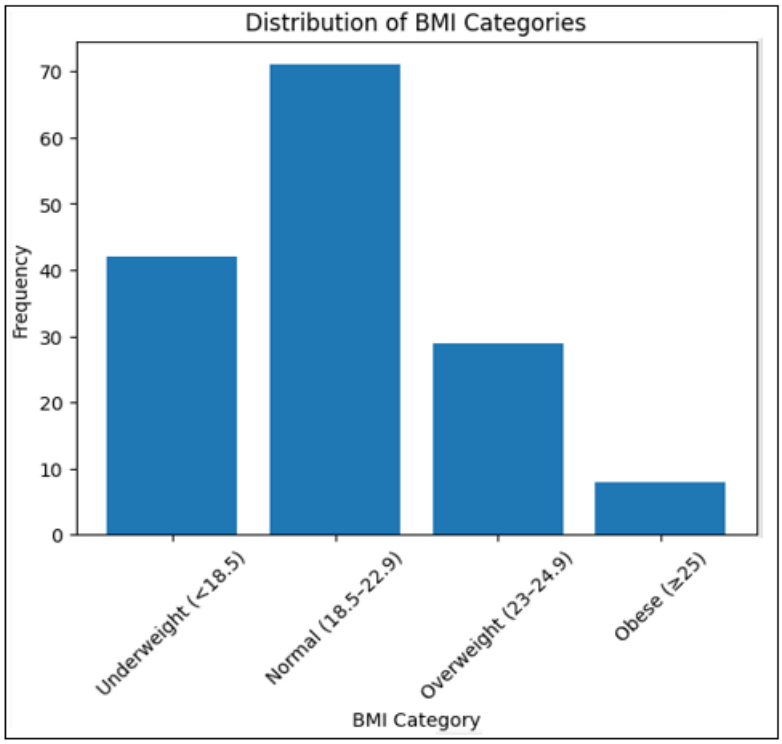

Figure 2: Distribution of Participants by BMI Category (n=150)

Nearly one-fourth (24.7%) of the participants were either overweight or obese, indicating emerging risk of non-communicable diseases. The data indicate coexistence of undernutrition (28%) and overweight/obesity (25%).

Association between Dietary Diversity Score and BMI

Table 3: Cross-tabulation of Dietary Diversity Score and BMI Category

DDS Category	Underweight	Normal	Overweight	Obese	Total
Low DDS	15	5	3	1	24
Moderate DDS	20	40	14	4	78
High DDS	7	26	12	3	48
Total	42	71	29	8	150

Chi-square test revealed a statistically significant association between Dietary Diversity Score and BMI category ($p < 0.05$), indicating that dietary diversity plays an important role in determining nutritional status.

Participants with low DDS showed higher proportion of underweight individuals, while moderate and high DDS categories had greater proportion of normal BMI participants. However, some overweight cases were observed even among high DDS, suggesting that dietary diversity alone does not account for portion size and caloric balance.

6. Discussion

The findings confirm moderate dietary diversity among urban young adults. Similar findings were reported in studies conducted in Delhi and Mumbai. The high prevalence of underweight (28%) suggests persistent energy inadequacy or poor meal patterns. Simultaneously, 25% overweight/obese prevalence reflects emerging obesity concerns.

Low fruit and vegetable intake contributes to micronutrient deficiencies, particularly iron, vitamin A, and folate. High consumption of refined cereals and processed foods may explain increased overweight risk.

The association between DDS and BMI suggests that diet quality significantly influences anthropometric status. However, dietary diversity alone may not capture portion size and caloric excess, explaining presence of overweight despite moderate diversity.

7. Conclusion

The present study highlights moderate dietary diversity and the coexistence of undernutrition and overnutrition among urban young adults. Dietary diversity was significantly associated with BMI status. Promotion of diversified, balanced diets through campus-based nutrition education and behavioral interventions is essential. Addressing dietary quality during young adulthood is crucial for preventing long-term non-communicable diseases and improving overall health outcomes.

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