

# An Assessment of Nutritional Status Among Students of Government Primary Schools in Semi-Urban Areas of Chitradurga Region

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## Abstract

*Understanding children's nutritional status is crucial for enhancing future generations' quality of life, as evidenced by the elevated prevalence of stunting (36.2%), wasting (26%), and underweight (35.2%) in Karnataka according to the National Family Health Survey. This study aimed to assess the nutritional status, dietary habits, socio-economic conditions, and demographic profiles of students in government primary schools in the semi-urban Chitradurga region. Using a validated questionnaire, data from 441 students across four schools were collected over six months and analyzed with SPSS. Findings revealed that most students were 9 years old, with a dietary split of 11.6% vegetarians and 88.4% non-vegetarians. All students were below the poverty line, and the nutritional assessment showed that 22% were moderately underweight, 63.3% had normal weight, 1.1% were obese, 2.7% were overweight, and 10.9% were severely underweight. According to the study, underweight and malnutrition are more common in female students than in male children. To address these issues, nutritional education and improved parental knowledge on providing nutritious foods and enhancing personal hygiene are recommended to better the children's health outcomes.*

**Keywords:** Nutrition, body mass index, underweight, overweight, nutritional status

## INTRODUCTION

It is widely held that a nation's socioeconomic progress greatly depends on its level of nutrition. Lack of access to nutrient-dense food, insufficient nursing, serving the incorrect meals, and failing to make sure the child consumes enough nutritious food are the major reasons for malnutrition [1]. A cellular mismatch between the body's requirements for nutrients and energy for growth, maintenance, and certain tasks and the availability of these resources is known as malnutrition, according to the World Health Organization [2].

Malnutrition is a major public health issue that contributes to child morbidity, and it is the primary factor in more than half of all child fatalities worldwide, especially in poor socio-economic areas of developing nations [3]. According to a global nutrition report, Africa and Asia suffer significant economic losses from malnutrition, equivalent to approximately 11% of GDP annually [4]. Stunted children never reach their full potential and become stunted adults [5]. In addition to compensating for nutritional inadequacies from childhood, it's essential to eat healthily when a child is in school [6].

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Received Date: August 22, 2024

Accepted Date: October 09, 2024

Published Date: November 06, 2024

**Citation:** Vijay Kumar M., Benjamin Zothantluanga, S. T. Lalthlamuana, Abubaker Siddiq. An Assessment of Nutritional Status Among Students of Government Primary Schools in Semi-Urban Areas of Chitradurga Region. Research & Reviews: A Journal of Pharmacology. 2024; 14(3): 61–67p.

Stunting increases a woman's risk of dying during childbirth and has a negative impact on the birth process [5]. Children who are malnourished

are more likely to have common diseases more frequently, more severely, and ultimately die from them. These infections can also cause a delay in healing [7]. Combined stunting and wasting are significant causes of infant death [8]. To alleviate childhood malnutrition and its effects, the mid-day meal program for students was introduced in 1995. Under this program, cooked mid-day meals were provided in schools to satisfy half of students' daily protein needs, and one-third of their daily calorie needs [9].

About 50% of all deaths among school-age children worldwide are thought to be related to malnutrition. According to UNICEF data, 40% of the world's hungry people live in India [10]. In India, there is a dual risk of malnutrition, i.e., children living in urban areas have issues with overnutrition, while those living in rural regions experience undernutrition [11].

Although there are several approaches to determining nutritional status, anthropometry is particularly relevant during childhood and adolescence. To evaluate nutritional status throughout the childhood stage, three anthropometric parameters are frequently used: they are underweight (weight for age), stunting (height for age), and thinness (BMI for age) [12]. Our purpose here is to give a review of recent information on the nutritional status of school-aged children in developing nations, as well as to identify public health risks [13].

Nutritional interventions can significantly influence the pharmacological profiles of children by affecting drug metabolism, efficacy, and toxicity. The production of cytochrome P450 enzymes, which are essential for drug metabolism, is regulated by vitamin D [14]. Iron is essential for several enzymatic processes in the liver, including those involved in drug metabolism. Iron deficiency can impair liver function, altering the pharmacokinetics of drugs [15]. Many different enzymes, including those involved in drug metabolism, depend on zinc for proper operation. Zinc deficiency can impact these enzymes, potentially altering drug metabolism and efficacy [16]. A calcium imbalance can impact the toxicity of drugs since calcium is involved in many cellular functions [17]. Vitamin K is crucial for blood clotting, and its deficiency can lead to increased bleeding risks, especially in children on anticoagulant therapy [18].

Malnutrition can have profound effects on drug metabolism, absorption, and response, leading to significant pharmacological consequences. Malnutrition, particularly protein-energy malnutrition, can impair liver function. Many medications are metabolized by the liver through the cytochrome P450 enzyme system. Malnutrition can lead to altered enzyme activity and impaired drug clearance [19]. Malnutrition can impact gastrointestinal (GI) function, affecting drug absorption in several ways, such as altered gastric pH, delayed gastric emptying, and impaired intestinal motility and mucosal integrity [20].

Malnutrition often leads to a variety of medical conditions that require pharmacological intervention, such as anemia, infections, and other nutrient deficiencies. Malnutrition frequently results in anemia, which is frequently brought on by iron, vitamin B12, or folic acid deficits. To treat iron deficiency anemia, doctors usually prescribe oral iron supplements, such as ferrous sulfate. Oral or intramuscular vitamin B12 and folic acid supplements are prescribed for vitamin B12 and folic acid deficiency [21]. People who are undernourished are more vulnerable to illnesses because their immune systems are affected. Malnourished individuals often have significant electrolyte imbalances, which must be corrected by giving oral rehydration salts or intravenous fluids with electrolytes [22].

The majority of studies on nutritional status have concentrated on preschoolers and adolescents. Anthropometric evaluations are a trustworthy and economical method of determining the nutritional status and general health of an individual or society. Therefore, our goal was to conduct an anthropometric evaluation of the nutritional status and food intake of schoolchildren from the Chitradurga district, ages 6 to 12, and to determine how these characteristics related to socioeconomic factors [23].

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## MATERIALS AND METHODS

### Study Site and Participants

This study was conducted in four selected government primary schools in semi-urban areas of the Chitradurga region for a period of six months. The study population included 441 participants who met inclusion criteria, among children aged 6 to 11 years.

### Ethical Approval

- i. Ethical permission statement: On May 6, 2023, the SJM College institution ethics committee on human subjects' research approved the project under reference number SJMCP/101/2023-24. Subject privacy was protected both before and after the data was gathered.
- ii. Statement of informed consent: The headmasters of the four schools that were chosen provided their informed consent for their students to be included in the study.

### Data Collection and Study Procedure

The institutional ethics committee granted ethical clearance prior to data collection. For data collection, a self-designed validated questionnaire form was prepared, which includes sections I and section II, in which sections I contain socio-demographic details of the participants and sections-II contain nine questions that determine the dietary habits and lifestyle of the participants. The data were obtained through direct interaction with the participants using questionnaire forms that were specifically designed for the study and stored electronic-based evidence; after that, it was subjected to statistical analysis.

### Validation of Questionnaire

A previously validated and pre-tested questionnaire included demographic information and questions related to knowledge of nutritional status. It was used to assess nutritional status, dietary habits and socio-economic status and investigate anthropometric measurements among students at government primary schools in semi-urban areas of the Chitradurga region. The IBM SPSS Statistical Software was used to analyze all the pertinent data that had been loaded into Microsoft Excel 2020. The WHO Anthroplus Software was used to compute the mean and SD for BMI-for-age (BAZ).

### Statistical Analysis

In this study, we examined the association between BMI, socio-economic status, and dietary habits in government school-going children located in semi-urban areas of Chitradurga. A cross-sectional observational study was conducted wherein the obtained anthropometric data was categorized based on WHO guidelines.

## RESULTS

### Baseline Characteristics

In our study, 441 participants were included to assess their nutritional status; the majority were aged 9, with a higher representation of females than males. In this, 88.4% were non-vegetarian and 11.6% were vegetarians. Most of the participants were Hindus, and the least number of participants were Christians. All the participants involved in the study came below the poverty line. Baseline socio-demographic characteristics of the study group are enumerated in Table 1.

### Response Given by the Study Participants

In this study, we have used the validated questionnaire, which includes questions regarding dietary habits, consumption of food, and its types, and it was given to every participant who was included in the study. The responses that were given to the questionnaire are shown in Table 2.

**Table 1.** Baseline characteristics of study participants.

| Sl No. | Variables           | Frequency | Percentage (%) |
|--------|---------------------|-----------|----------------|
| 1.     | Age in years        |           |                |
|        | 6                   | 65        | 14.7           |
|        | 7                   | 92        | 20.9           |
|        | 8                   | 85        | 19.3           |
|        | 9                   | 107       | 24.3           |
|        | 10                  | 89        | 20.2           |
|        | 11                  | 3         | 0.7            |
| 2.     | Gender              |           |                |
|        | Male.               | 202       | 45.8           |
|        | Female.             | 239       | 54.2           |
| 3.     | Food preference     |           |                |
|        | Veg.                | 51        | 11.6           |
|        | Non-veg.            | 390       | 88.4           |
| 4.     | Economic status     |           |                |
|        | Below poverty line. | 441       | 100            |
| 5.     | Religion            |           |                |
|        | Hindu.              | 411       | 93.2           |
|        | Muslim.             | 29        | 6.6            |
|        | Christian.          | 1         | 0.2            |

**Table 2.** Study participant's answers for the questionnaire.

| S. N. | Question                                             | Response Given by the Participant                                                                                                                       | Frequency                  | Percentage (%)                   |
|-------|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------------|
| 1.    | How many meals do you per day?                       | <ul style="list-style-type: none"> <li>More than threetimes a day.</li> <li>Three times a day.</li> <li>Two times a day.</li> </ul>                     | 206<br>212<br>23           | 46.7<br>48.1<br>5.2              |
| 2.    | What type of breakfast do you have most of the time? | <ul style="list-style-type: none"> <li>Biscuits.</li> <li>Cereals.</li> <li>Chapatti, Roti, etc.</li> <li>Cooked breakfast.</li> <li>Others.</li> </ul> | 65<br>6<br>132<br>234<br>4 | 14.7<br>1.4<br>29.9<br>53<br>0.9 |
| 3.    | How often do you skip breakfast?                     | <ul style="list-style-type: none"> <li>Always.</li> <li>More than 3 timesa week.</li> <li>Never.</li> </ul>                                             | 28<br>280<br>133           | 6.3<br>63.5<br>30.2              |
| 4.    | What do you normally have for lunch?                 | <ul style="list-style-type: none"> <li>Cooked meal.</li> <li>Fast food.</li> </ul>                                                                      | 434<br>7                   | 98.4<br>1.6                      |
| 5.    | How often do you eatcandy or sweetened products?     | <ul style="list-style-type: none"> <li>1–2 times a week.</li> <li>Everyday.</li> <li>Never.</li> <li>Several times amonth.</li> </ul>                   | 277<br>23<br>10<br>131     | 62.8<br>5.2<br>2.3<br>29.7       |
| 6.    | How often do you consume fast-food products?         | <ul style="list-style-type: none"> <li>Everyday.</li> <li>1–2 times a week.</li> <li>Several times a month.</li> <li>I do not use any.</li> </ul>       | 49<br>133<br>218<br>41     | 11.1<br>30.2<br>49.4<br>50.6     |
| 7.    | Does your school provide mid-day meals?              | <ul style="list-style-type: none"> <li>Yes.</li> </ul>                                                                                                  | 441                        | 100                              |
| 8.    | Do you attend any kind of sports?                    | <ul style="list-style-type: none"> <li>Do not attend any kind of sports.</li> <li>Not very often.</li> <li>Regularly.</li> </ul>                        | 13<br>187<br>241           | 2.9<br>42.4<br>54.6              |
| 9.    | Are you an active person during the day?             | <ul style="list-style-type: none"> <li>Intensive.</li> <li>Light.</li> <li>Moderate.</li> </ul>                                                         | 57<br>118<br>248           | 12.9<br>26.7<br>56.2             |

|  |  |             |    |     |
|--|--|-------------|----|-----|
|  |  | • Sedentary | 18 | 4.1 |
|--|--|-------------|----|-----|

### Details of Body Mass Index

In this study, we found that most of the participants had a normal body weight, 22.0% had moderate underweight, and 10.9% had severe underweight, respectively. We also found that 2.7% and 1.1% of the participants were overweight and obese respectively. Details of BMI are enumerated in Table 3.

**Table 3.** Details of body mass index (BMI) of study participants.

| S. N. | BMI Status            | Frequency | Percentage |
|-------|-----------------------|-----------|------------|
| 1     | Moderate underweight. | 97        | 22.0       |
| 2     | Normal weight.        | 279       | 63.3       |
| 3     | Obese.                | 5         | 1.1        |
| 4     | Overweight.           | 12        | 2.7        |
| 5     | Severe underweight.   | 48        | 10.9       |

## DISCUSSION

The current study was a descriptive cross-sectional study to assess the nutritional status of students of government primary schools in semi-urban areas of Chitradurga. The study was carried out among the primary schools of class 1 to class 5 students between the age groups of 6 and 11 years old in four different government primary schools in semi-urban areas of Chitradurga. The study evaluated the students' dietary preferences and socioeconomic standing in addition to looking into their demographic profile. Anthropometric measures were utilized in the study to evaluate the primary school children's nutritional status.

A total of 441 students from government primary schools in Chitradurga who satisfied the study criteria and gave consent for the study are enrolled. The study result shows that out of the total 441 students, 202 (45.8%) were males and 239 (54.2%) were females. The study results show that among the total 441 students, 97 (22.0%) were moderately underweight, 48 (10.9%) were severely underweight, 12 (2.7%) were overweight and 5 (1.1%) were obese as per the WHO classification of BMI.

Our study results show that out of the total 441 students, the frequency of underweight children was found to be 32.9%, overweight 2.7%, and obese 1.1%. Whereas in a study conducted by Farhin *et al.*, the overall prevalence of underweight was found to be 25.3%, overweight 7.5%, and obese 12.8% [2].

In this study, we found that the prevalence of underweight was 74 (36.6%) in boys and 71 (29.7%) in girls, while the prevalence of overweight and obesity were 4 (2%) and 3 (1.5%) in boys and 8 (3.3%) and 2 (0.9%) in girls. In this study, we observed a comparatively higher prevalence of underweight, moderately underweight 97 (22.0%), and severely underweight 12 (2.7%) than that reported by Mukesh Sharma *et al.*, from Moradabad, with a prevalence of moderately underweight 28 (9.5%), while severely underweight was found in 06 (2.0%) of children [24].

The same study conducted by Amruth *et al.*, found that the prevalence of malnutrition among the surveyed primary school children is 26.5 %<sup>40</sup>. Also, another study conducted by Nitish Kumar Arya *et al.*, found that the prevalence of malnutrition among school-going children is 45% [25].

According to a study by Shivaprakash *et al.*, 30.3% of the school children in the study were underweight overall. For males, the underweight frequency was 32.3%, while for girls, it was 28.3%. In comparison to girls, boys were more likely to be underweight (32.3% vs. 28.3%). In contrast, the study found that females had a 29.7% prevalence of underweight while boys had a 36.6% prevalence [26].

## CONCLUSIONS

The intersection of pharmacology and nutrition offers fertile ground for future research, particularly in addressing the complex challenges associated with malnutrition. Drug-nutrient interactions investigating how commonly prescribed medications affect nutrient absorption, metabolism, and excretion in different populations, including the malnourished. For example, studying the long-term effects of proton pump inhibitors (PPIs) on vitamin B12 and magnesium absorption could inform safer prescribing practices. The creation of nutraceutical product made from food sources that precisely meet the demands of malnourished communities and provide additional health advantages over and beyond their basic nutritional worth. This could include formulations enriched with bioavailable vitamins, minerals, and essential fatty acids tailored for specific deficiencies.

This study shows that the prevalence of malnutrition or being underweight is high among government primary school students in semi-urban areas of Chitradurga. Our findings show that out of all total students enrolled, the male students have a higher BMI than the females. The female students had a higher percentage of malnourished and underweight students compared to the male students, as per the WHO classification of BMI.

This study also demonstrates that starvation affects men more frequently than it does women. This study shows that most of the students were non-vegetarian as compared to vegetarians. It also shows that all the students were below the poverty line and that every student received mid-day meals. Most of the children missed breakfast more than three times per week.

To improve the nutritional status of the children, nutritional education is one of the most effective approaches, and improving the knowledge of parents to feed their children nutritious foods could improve their dietary habits and personal hygiene.

## Acknowledgment

I would like to extend my gratitude to all our teachers, colleagues, staff, and all the participants involved in this study. We extend our heartfelt gratitude to the teachers of government schools involved in this study who have played an important role in obtaining the necessary approvals to conduct this study.

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