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RESEARCH ARTICLE

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NUTRITIONAL PROFILING OF ADOLESCENT STUDENTS OF GOVERNMENT SECONDARY SCHOOL OF PALI VILLAGE UNDER TAKHATPUR TEHSIL

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ABSTRACT

Adolescent nutrition directly influences both physical development and academic performance. Every regional area has its own culture and nutritional sources inside India. Therefore, each area needs to be evaluated scientifically to maintain adolescent health across India. Hence, present study was done to measure nutritional profile of high school adolescent students through standard Body Mass Index (BMI) matrix. A cross-sectional anthropometric assessment was conducted with 155 adolescent students (99 girls and 56 boys) from a government secondary school in Pali Village, under Takhatpur Tehsil who were enrolled in the 9th and 10th grades. Present results showed significant female majority with 58.1% of 9th grade and 72.6% of 10th grade representation. BMI analysis revealed that slightly Low BMI category was prevalent which affected 59.6% of girls and 58.9% of boys. Most often slightly Low BMI category does not require immediate action in terms of medical condition. But it requires a routine awareness program to prevent potential health issues when this persists for long time along with other medical complications. A slightly high BMI category was also observed in 40.4% of girls and 41.1% of boys which is an indicator of obesity. The present study has certain limitations. For instance, it was conducted with a restricted sample size and inherent constraints of using BMI as sole indicator of nutritional health without accounting for muscle mass and fat distribution. Future prospects of present study could be expanded with large sample across diverse educational districts and integration of more rigorous dietary assessment methods to obtain more authentic and systematic scientific nutritional profiling of adolescents across study area.

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INTRODUCTION

The relationship between nutrition and health constitutes the foundation of human development. Nutrition is a physiological process involve ingestion of food for growth, tissue repair, and energy production, whereas health is a state of complete physical, mental, and social well-being. These elements are inherently interconnected (Blankenship *et al.*, 2020), as good health is not possible without adequate nutrition. Globally, undernutrition and obesity (overweight) are prime concerns due to insufficient access to daily nutritious food (Singh *et al.*, 2023). Adolescent students need proper nutrition. Their growing bodies demand extra energy to build dense bones. Nutritious food fuels rapid brain development. Healthy diets improve academic focus. Adolescent students are classified as those aged 10 to 19 years. This phase embodies physical, cognitive and psychosocial development of student (Singh *et al.*, 2023). High-school adolescent students require essential micronutrients viz., zinc (Zn), vitamin D, iron (Fe), vitamin A and folate (Hong, 2025). Fe-rich meals prevent severe anemia hence adolescent girls need extra Fe (Masanja *et al.*, 2025).

Poor nutrition causes chronic fatigue in them which can make exams difficult (Steenbruggen *et al.*, 2015). Vitamin deficiencies weaken their immune system (Mora *et al.*, 2008) and thus sick students miss important classes. The balanced diets prevent frequent illnesses and good health supports consistent attendance (Cena & Calder, 2020). Therefore, proper meals guarantee better school performance. For instance, student eats a diet rich in Fe (e.g., leafy greens or fortified lentils) and Vitamin C (to absorb iron). Their brains receive adequate oxygen due to Fe- and Vitamin C-rich diet, which allows them to concentrate throughout a full school day without fatigue (Tardy *et al.*, 2020). But a toddler lacks sufficient daily protein and calories in case of malnutrition. Their bodies deprioritize vertical growth to conserve energy which leads to irreversible stunting and delayed cognitive development. Conversely, if student relies heavily on ultra-processed and high-sugar foods. They may appear physically overweight due to hyper-nutrition. Thereby, they are starving for micronutrients and will get prone to early-onset type 2 diabetes (Strati *et al.*, 2024). The malnourished adolescent students have been evaluated using standard anthropometric parameters, viz., Stunting, Wasting, Underweight, and BMI-for-Age (Pandurangi *et al.*, 2022;

Singh *et al.*, 2023). Stunting represents low height-for-age where as under weight measures low weight-for-age. Both of them are indicators of Chronic, long-term undernutrition and poor living conditions. Further, Wasting indicates illness or sudden food scarcity, characterized by weight loss relative to height. Body mass index (BMI)-for-Age represent overweight or obesity in adolescent students. Slowik *et al.* (2019) quoted BMI as popular indicator of nutritional status. The health guidelines outlined by ICMR (2020) mentioned that boys and girls (aged between 10-12 years) require 2060 kilocalories. The reference weight for young girls is 36.4 kilograms, whereas for boys it is 34.9 kilograms. Further, they quoted that older adolescents of both genders require 2,500 kilocalories daily. The boys reach body weight of 64.4 kilograms and girls attain weight of 55.7 kilograms at this stage. Later, they stated that adequate nutrition is essential to maintain physical health of growing adolescents. Government schools are responsible to provide awareness regarding the same under a variety of government ventures across India. According to National Family Health Survey (NFHS-5) and Press Information Bureau (PIB), approximately 35-37% of children aged under 5-years are stunted which indicate that over third of country's youth are not reaching their full physical or cognitive potential when they grow towards adolescent stage. They also reported that anaemia is considered as public health crisis that affects over 67% of children and majority of women. Chhattisgarh presents a distinctive action towards the same. PIB data indicate that stunting in Chhattisgarh has decreased to approximately 21.5% which is substantially below national average. However, anemia continues to be alarmingly prevalent in Bastar, Bijapur, and Dantewada tribal regions, with anemia rates among children and women reaching up to 70 to 80%. PM POSHAN guarantees (Mid-Day Meal scheme) have been started for classes 1 through 8 students with one hotcooked meal in a day to students to overcome classroom hunger which directly dictates a student's ability to learn. Likewise, Chadha & Khobragade (2015) reported that the Chhattisgarh Government implemented the weekly IFA supplementation (WIFS) program from July 2011 to May 2012 for adolescent girls in studying in classes 9-12 and under age group of 11-18. Singh *et al.* (2020) observed a notable reduction (54.7%) in the prevalence of anemia after implantation of WIFS among adolescents.

Therefore, the present research work was conducted to evaluate the nutritional status and health outcomes among adolescent students at Government Secondary School in Pali village, under Takhatpur Tehsil.

MATERIALS AND METHODS

The nutritional profiling of adolescent students at Government Secondary School in Pali village, under Takhatpur Tehsil. A total of 155 students (comprised of 56 boys and 99 girls) from 2024-25 session were assessed for nutritional profiling based on BMI as shown in Table 1. The 93 students were taken from class 9th standard and 62 were from 10th standard.

Assessment of BMI of Students: The assessment of BMI of students was conducted using standardized anthropometric techniques. Students were instructed to remove their shoes, heavy outerwear and any items from their pockets to ensure accurate readings prior to measurement. All measurements were performed by trained personnel to maintain consistency and minimize errors. Calibrated digital balance was used for weight measurements. Standardized stadiometer was used to record height. Stature was measured using a vertically mounted stadiometer. Students were instructed to stand upright on a flat surface with their backs against stadiometer and remove their shoes. The students' heads were aligned in the proper horizontal plane and any hair accessories or hairstyles that could interfere with the measurement were removed. The horizontal headpiece was then lowered to rest firmly on crown of head and height was recorded.

Calculation of BMI was done using standard metric formula: $BMI = \text{Weight (kg)} / \text{Height (m)}^2$

All BMI values were correlated by Healthy Weight ranges from 18.5 to 24.9.

RESULT AND DISCUSSION

A total of 155 adolescent students (56 Boys and 99 girls) of Pali Village under Takhatpur Block were evaluated for their nutritional

Table 1. Sample for nutritional assessment of adolescent students at Government Secondary School in Pali village (2024-25)

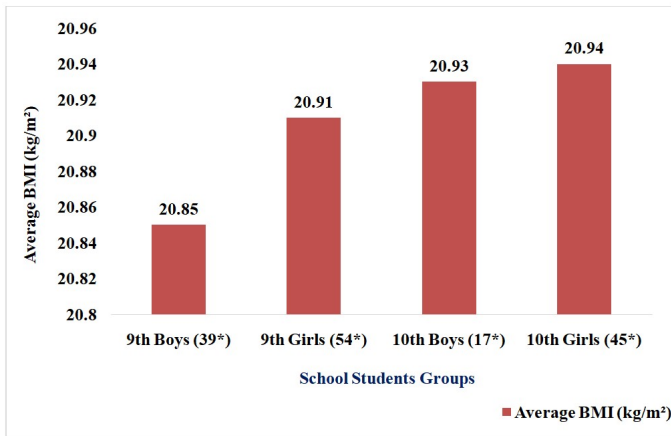
Class	Boys (Count)	Boys (% of Class)	Boys (% of Total Boys)	Girls (Count)	Girls (% of Class)	Girls (% of Total Girls)	Total Students
9 th	39	41.9	69.6	54	58.1	54.5	93
10 th	17	27.4	30.4	45	72.6	45.5	62
Overall	56	36.1	100	99	63.9	100	155

Table 2. BMI of adolescent students at Government Secondary School in Pali village

S.No	Class	Gender	Height (cm)	Weight (kg)	BMI (kg/m ²)	No. of Students
1	9 th	Boys	148	38	17.35	8
2			157	43	17.44	8
3			153	41	17.51	7
4			160	66	25.78	6
5			151	59	25.88	5
6			149	57	25.67	5
7	10 th	Boys	154	41	17.29	4
8			144	36	17.36	3
9			165	48	17.63	3
10			158	65	26.04	3
11			161	67	25.85	2
12			152	60	25.97	2
13	9 th	Girls	156	43	17.67	11
14			163	46	17.31	11
15			147	38	17.59	10
16			166	71	25.77	8
17			159	65	25.71	7
18			164	70	26.03	7
19	10 th	Girls	167	50	17.93	9
20			146	38	17.83	9
21			150	39	17.33	9
22			155	62	25.81	6
23			162	68	25.91	6
24			145	54	25.68	6
Total						155

profiling using BMI matrix. Among them, 33 boys were observed with Slightly Low BMI, which accounts for 59% of total boys (Table 2). Rest, 23 boys have Slightly High BMI (25.67 to 26.04). Among girls 59 girls have observed with Slightly Low BMI and 40 girls with Slightly High BMI (Table 2). The girls made up majority at 58.1% while boys accounted for 41.9% in 9th grade. This gap widens significantly with girls representation of 72.6% of the class and boys with only 27.4% in the 10th grade. The majority of the boys (69.6%) are in 9th grade with less than a third (30.4%) in 10th grade. The girls are more evenly split across two years with 54.5% in the 9th grade and 45.5% in the 10th grade.

An average BMI of 20.85 (height 153.10 cm and weight 49.00 kg) was recorded for 39 (9th grade) boys. The 9th grade girls had an average BMI of 20.91 (height 158.67 cm and weight 53.19 kg). 10th-grade boys had average BMI of 20.93 (height 155.47 cm and weight 50.88 kg) and girls had an average BMI of 20.94 (height 154.20 cm and weight 49.93 kg) in 10th grade (Shown in Figure 1).



* Sample taken for BMI Assessment

Figure 1. Average BMI of Four Groups

Table 3. BMI categories distributed among adolescent students at Government Secondary School in Pali village

Gender	No. of Students	Respective Gender (%)	Total (%) against total sample size 155
Boys	33	58.9	21.3
Boys	23	41.1	14.8
Girls	59	59.6	38.1
Girls	40	40.4	25.8

The data represented a total sample of 155 students. Girls comprised a larger share of the overall sample compared to boys. 59.6% of girls had a slightly low BMI. 58.9% of boys also had a slightly low BMI. 40.4% of girls fell into the slightly high BMI category. 41.1% of boys fell into the slightly high BMI category. Both genders have shown a nearly identical proportional split between the two categories. Cumulatively, slightly low BMI classification was more prevalent than the slightly high classification among all students. Similar to the present study, Puntambekar *et al.* (2024) evaluated BMI of adolescents aged 12-14, along with one parent, between 2019 and 2020 using a random sampling technique. Their research covered 843 adolescent-parent pairs in Mumbai and 913 pairs in Kolkata. Their results revealed that 15.7% and 21.1% of adolescents were classified as overweight in the study area. They were further identified approximately 80% of mothers as either overweight or obese. Likewise, Chung (2015) performed BMI profiling of overweight children's (ranged from 85th to 94th percentile BMI matrix) and revealed that 50% of them had moderate level of fatness and 20% had raised fatness. Likewise, slightly high BMI category was observed in 40.4% of girls and 41.1% of boys during our study. This is an indicator of obesity and related to this Kansra *et al.* (2021) mentioned that obesity among adolescents is closely linked with Type 2 diabetes mellitus, metabolic dysfunction, neurological disorders, dyslipidemia, hypertension, obstructive sleep apnea and non-alcoholic

fatty liver diseases. Later, our observation also showed 59.6% of girls and 58.9% of boys have slightly low BMI in Pali Village under Takhatpur Block. This might be happened due to limited and less nutritional food intake in rural areas. The nutritional deficiency could result in decreased absorption of nutrients which may contribute to the observed slightly low BMI (Kiani *et al.*, 2022). However, slightly low BMI does not necessarily considered as immediate concern. Nonetheless, a necessary awareness program could help prevent further health complications associated with low BMI. Ahmed *et al.* (2022) divulged that fatigue, weakened immunity, and delayed wound healing, as well as more severe conditions such as osteoporosis, fertility issues, and an increased susceptibility to infections could be caused by low BMI. These health conditions could potentially be overcome by taking essential calories, protein and micronutrients.

CONCLUSION

Adolescent health is need to be monitor consistently to prevent health complications and to ensure uninterrupted optimal brain development. This would be important for learning abilities during school days. The present study was conducted as preliminary attempt for nutrient profiling of 155 adolescent students from a government secondary school in Pali Village, Takhatpur Tehsil, who were enrolled in grades 9 and 10. The nutritional profiling was carried out using BMI matrix. The observation revealed that slightly low BMI was found as dominant health status across both genders (59.6% girls and 58.9% boys). The current research could endorse routine adolescent student health monitoring system based on BMI matrices in rural areas to ensure healthier student lifestyles. However, present study is limited by its relatively small sample size and integration of more scientific way of nutritional profiling beyond only inclusion of BMI matrix. Practically, present research outcome can assist government schools to promote balanced diets among students. Prospectively, this baseline data will support peer researchers for the investigation of socioeconomic profile and interlinked dietary factors for more comprehensive adolescent health monitoring.

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