SSR Institute of International Journal of Life Sciences
ISSN (O): 2581-8740 | ISSN (P): 2581-8732
Bhatta *et al*., 2025
doi: 10.21276/SSR-IIJLS.2025.11.6.19

Original Article

open access

Nutritional Status and Morbidity Profile among Adolescents Attending a Tertiary Care Hospital in Sundargarh District, Odisha: A Cross-Sectional Study

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Received: 20 Jun 2025/ Revised: 10 Aug 2025/ Accepted: 21 Oct 2025

ABSTRACT

Background: Adolescent malnutrition continues to pose a major public health concern in developing regions, particularly in rural India. Nutritional deficiencies during adolescence affect growth, learning, and long-term health outcomes. This study was conducted to determine the prevalence of underweight, stunting, and thinness among adolescents and to identify associated socio-demographic factors and morbidity patterns.

Methods: A hospital-based cross-sectional study was conducted between April and December 2022 in the Department of Pediatrics, Government Medical College and Hospital, Sundargarh, Odisha. A total of 450 adolescents aged 9–18 years attending the outpatient department were enrolled. Anthropometric parameters, including height, weight, and BMI, were measured according to WHO guidelines. Nutritional status was classified using weight-for-age, height-for-age, and BMI-for-age Z-scores.

Results: Of the 450 adolescents, 219 (48.7%) were boys and 231 (51.3%) were girls. The prevalence of underweight, stunting, and thinness was 31%, 22.3%, and 30.7%, respectively. Early adolescents (9–12 years) were most affected by underweight (53.6%) and thinness (36.9%). Stunting prevalence was comparable between boys (49.5%) and girls (50.5%). Malnutrition was more prevalent among adolescents from lower socio-economic classes (Class IV–V) and those with lower educational levels.

Conclusion: Poor nutritional status among adolescents, especially among girls and those belonging to lower socio-economic groups, indicates a significant public health concern. These findings highlight the urgent need to strengthen school-based nutrition programmes, improve health education, and implement targeted community-level interventions to support early identification of nutritional deficiencies and improve adolescent health.

Key-words: Adolescent health, Malnutrition, Underweight, Stunting, Thinness, Morbidity, Socio-economic status, Odisha

INTRODUCTION

Adequate nutrition during early life plays a vital role in ensuring normal growth, organ development, immune competence, and optimal cognitive and neurological function. A well-nourished population forms the foundation for sustained economic growth and social development, as healthy individuals are better able to acquire knowledge, think critically, and contribute meaningfully to society. Malnutrition during childhood not only affects physical growth but also impairs cognitive abilities and productivity, thereby perpetuating the cycle of poverty. Globally, undernutrition is estimated to contribute to more than one-third of all deaths among children under five years of age [1,2].

Nutritional support forms an essential part of the clinical care of hospitalized children [3]. Various studies have identified poverty, inadequate dietary intake, and chronic infections such as tuberculosis, malaria, and diarrhea as major factors contributing to malnutrition in

How to cite this article
Bhatta A, Patro GSP, Panda J. Nutritional Status and Morbidity Profile among Adolescents Attending a Tertiary Care Hospital in Sundargarh District, Odisha: A Cross-Sectional Study. SSR Inst Int J Life Sci., 2025; 11(6): 8739-8744.

Access this article online
https://iijls.com/

doi: 10.21276/SSR-IIJLS.2025.11.6.19

developing countries [4–6]. Malnutrition remains a fundamental cause of disease and death in these settings, accounting for nearly half of all child mortality [7–9]. According to the World Health Organization (WHO), malnutrition and child mortality exhibit wide global disparities, with the highest burden observed in low- and middle-income countries [10].

Malnutrition refers to a condition resulting from an imbalance—either deficiency or excess—of energy, protein, or micronutrients that leads to measurable adverse effects on body composition, function, and clinical outcomes. It can manifest as acute, chronic, or mixed forms. Acute malnutrition often occurs during episodes of illness, while chronic malnutrition develops gradually due to long-term nutritional inadequacies. Anthropometric indices are universally used to assess nutritional status, though classification criteria and cut-off points may vary. Historically, conditions such as kwashiorkor and marasmus were used to describe severe forms of protein-energy malnutrition among children in low-resource settings.

Various anthropometric measures are used to estimate the prevalence of malnutrition. For wasting (acute malnutrition), weight-for-height (WFH) standard deviation (SD) scores are used, whereas stunting (chronic malnutrition) is determined by height-for-age (HFA) SD scores. A Z-score below 2 SD from the median of the reference population indicates undernutrition. The Body Mass Index (BMI), a simple and reproducible measure reflecting body composition, is widely applied to assess nutritional status in both children and adults. Since the 1960s, BMI has served as an index of obesity in adults, and the World Health Organization (WHO) later adopted BMI-based standards for children and adolescents [11].

Cole *et al.* [12] proposed age- and sex-specific BMI cut-offs for defining thinness, corresponding to an adult BMI of 17 kg/m², which aligns closely with the wasting threshold of –2 SD. Globally, around 20 million children are estimated to suffer from severe acute malnutrition, most of whom live in South Asia and sub-Saharan Africa [13]. Currently, the WHO recommends using the Z-score (SD) classification to categorize nutritional status. Children whose anthropometric values fall more than 2 SD below the reference median are considered undernourished, while those below 3 SD are classified as severely undernourished [14].

MATERIALS AND METHODS

Study Design- The present study was a hospital-based cross-sectional study conducted to determine the prevalence of malnutrition and its associated factors among adolescents aged 9–18 years. The study was conducted between April and December 2022 at the Department of Pediatrics, Government Medical College and Hospital, Sundargarh, Odisha. A total of 450 adolescents attending the Outpatient Department (OPD) were examined by a trained team comprising physicians, social workers, and medical interns.

A pre-tested and structured schedule was used to collect demographic and clinical information. Anthropometric measurements were obtained following WHO guidelines:

- Weight was measured to the nearest 0.5 kg with participants standing erect and barefoot on a calibrated weighing scale.
- Height was recorded to the nearest 0.5 cm using a vertical scale, with participants standing upright and the head positioned so that the Frankfort plane was horizontal.

Nutritional status was classified as:

- Underweight: based on *weight-for-age*,
- Stunting: based on *height-for-age*, and
- Thinness: based on *BMI-for-age*, using WHO growth reference standards [15].

Socio-economic status was determined using the Modified Prasad's Scale [16]. A general health examination was conducted under adequate natural light. Prior approval from the Institutional Ethics Committee was obtained before initiating the study. Informed verbal consent was also taken from each participant or their guardian.

Inclusion Criteria- Adolescents aged 9–18 years attending the OPD at Government MCH.

Exclusion Criteria- Participants who were severely ill, uncooperative, or unwilling to undergo anthropometric measurements were excluded.

Exact age was verified using available documents such as birth certificates, school identity cards, or immunization records. In the absence of records, the recall method using local event calendars was applied. Clinical diagnoses were confirmed by qualified medical officers, pediatricians, or dermatologists as appropriate.

doi: 10.21276/SSR-IIJLS.2025.11.6.19

Statistical Analysis- All data were entered and analyzed using SPSS version 22.0. Descriptive statistics, such as frequencies and percentages, were computed for categorical variables. The Chi-square test was used to assess associations between nutritional status and categorical factors. A p-value<0.05 was considered statistically significant, and all tests were two-tailed.

RESULTS

A total of 450 adolescents aged 9–18 years were included in the study, comprising 48.7% boys and 51.3% girls. Early adolescents (9–12 years) had the highest proportion of underweight (53.6%) and thinness (36.9%). Stunting was most prevalent among mid-adolescents (46.5%), followed by early (28.7%) and late adolescents (24.8%). Stunting was nearly equal in boys (49.5%) and girls (50.5%). Higher rates of underweight and stunting were observed among adolescents with lower educational levels and those belonging to lower socio-economic classes (Class IV–V), whereas adolescents from higher socio-economic groups showed comparatively better nutritional status. Overall, normal nutritional status was approximately twice as common as underweight and four times more common than stunting (Table 1).

Table 1: Nutritional Status of 450 Children by Selected Variables

Variables		Underweight (%) N=140	Normal (%) N=310	Stunting (%) N=101	Normal (%) N=349	Thinning (%) N=138	Normal (%) N=312
Sex	Boys (219)	60 (42.9)	159(51.3)	50 (49.5)	169 (48.4)	64 (46.4)	155 (49.7)
	Girls (231)	80 (57.1)	151 (48.7)	51 (50.5)	180(51.6)	74 (53.6)	157 (50.3)
Adolescent Stage	Early (239)	75 (53.6)	164 (52.9)	29 (28.7)	210 (60.2)	51 (36.9)	188 (60.3)
	Mid (140)	33 (23.6)	107 (34.5)	47 (46.5)	93 (26.6)	44 (31.9)	96 (30.8)
	Late (71)	32 (22.8)	39 (12.6)	25 (24.8)	46 (13.2)	43 (31.2)	28 (9.0)
Religion	Hindu (210)	64 (45.7)	146 (47.1)	41 (40.6)	169 (48.4)	54 (39.1)	156 (50.0)
	Muslim (240)	76 (54.3)	164 (52.9)	60 (59.4)	180 (51.6)	84 (60.9)	156(50.0)
Education	Illiterate (150)	60 (42.9)	90 (29.0)	36 (35.6)	114 (32.7)	47 (34.1)	103 (33.0)
	Primary school (128)	44 (31.4)	84 (27.1)	20 (19.8)	108 (31.0)	44 (31.9)	84 (26.9)
	Middle school (75)	15 (10.7)	60 (19.3)	13 (12.9)	62 (17.8)	13 (9.4)	62 (19.9)
	High school (45)	10 (7.1)	35 (11.3)	10 (9.9)	35 (10)	24 (17.4)	21 (6.7)
	Intermediate (15)	5 (3.6)	10 (3.2)	6 (5.9)	9 (2.6)	3 (2.2)	12 (3.8)
	Graduation (30)	8 (5.7)	22 (7.1)	10 (9.9)	20 (5.7)	8 (5.8)	22 (7.0)
	Post-graduation (8)	0 (0)	8 (2.6)	5 (5.0)	3 (0.9)	2 (1.4)	6 (1.9)
Socio-economic status	Class I (18)	5 (3.6)	13 (4.2)	7 (6.9)	11 (3.2)	6 (4.3)	12 (3.8)
	Class II (30)	6 (4.3)	24 (7.7)	3 (3.0)	27 (7.7)	3 (2.2)	27 (8.7)
	Class III (51)	15 (10.7)	36 (11.6)	10 (9.9)	41 (11.7)	12 (8.7)	39 (12.5)
	Class IV (165)	39 (27.9)	126 (40.6)	30 (29.7)	135 (38.7)	68 (49.3)	97 (31.1)
	Class V (186)	75 (53.6)	111 (35.8)	50 (49.5)	136 (38.9)	49 (35.5)	137 (43.9)

A wide range of morbidities were identified during the examination (Table 2). The most frequently observed condition was upper respiratory tract infection (URTI), affecting 34.0% of adolescents, with a higher prevalence among girls (39.0%) than among boys (28.8%). This was followed by diarrhea (16.9%) and carbuncle/furuncle (16.7%), both of which were slightly more common among boys (18.7% and 17.8%, respectively) than among girls (15.2% and 15.6%, respectively). Other commonly reported ailments included scabies (12.0%), abdominal pain (5.1%), and vitiligo (2.7%). Less frequent conditions were defective vision (2.4%), dental caries (2.2%), and otitis media (2.2%). A few adolescents also reported worm infestation (1.8%), vomiting (1.6%), and

doi: 10.21276/SSR-IIJLS.2025.11.6.19

tuberculosis (1.3%), while hernia (0.7%) and measles (0.7%) were relatively rare.

Overall, the findings indicate that infectious and hygiene-related illnesses, particularly respiratory and skin infections, were the predominant causes of morbidity among adolescents. These conditions were more frequently observed among adolescents from lower socio-economic backgrounds and those with limited educational attainment (Table 2).

Table 2: Gender-wise Morbidities among Adolescents (N = 450)

Common Diseases	Boys (N = 219)	Girls (N = 231)	Total (%) (N = 450)
Abdominal pain	6 (2.7)	17 (7.4)	23 (5.1)
Carbuncle / Furuncle	39 (17.8)	36 (15.6)	75 (16.7)
Defective vision	5 (2.3)	6 (2.6)	11 (2.4)
Dental caries	2 (0.9)	8 (3.5)	10 (2.2)
Diarrhea	41 (18.7)	35 (15.2)	76 (16.9)
Hernia	3 (1.4)	0 (0)	3 (0.7)
Measles	3 (1.4)	0 (0)	3 (0.7)
Otitis media	5 (2.3)	5 (2.2)	10 (2.2)
Scabies	39 (17.8)	15 (6.5)	54 (12)
Tuberculosis (TB)	3 (1.4)	3 (1.3)	6 (1.3)
Trauma	3 (1.4)	2 (0.9)	5 (1.1)
Upper respiratory tract infection (URTI)	63 (28.8)	90 (39)	153 (34)
Vitiligo	3 (1.4)	9 (3.9)	12 (2.7)
Vomiting	2 (0.9)	5 (2.2)	7 (1.6)
Worm infestation	5 (2.3)	3 (1.3)	8 (1.8)

DISCUSSION

The present study, conducted at the Government Medical College and Hospital, Sundargarh, Odisha, highlights a significant burden of malnutrition and morbidity among adolescents. Based on anthropometric assessment, the overall prevalence of underweight, stunting, and thinness was 31%, 22.3%, and 30.7%, respectively. These findings are comparable to the observations among Nepali refugee adolescents reported by Woodruff *et al.* [17].

From the present analysis, it was observed that the prevalence of stunting was almost equal among boys and girls—49.5% and 50.5%, respectively. This pattern is consistent with the WHO Regional Consultation Report on adolescent nutritional status [18]. However, studies by Anand *et al.* [19] have reported a relatively lower prevalence of stunting in similar age groups. Stunting reflects the long-term effects of inadequate nutrition and recurrent infections during early childhood, which hinder linear growth and development. As highlighted by Measham and Chatterjee [20], one of the persistent causes of undernutrition in India is inadequate access to sufficient and nutritious food, compounded by poor socio-environmental conditions.

In this study, BMI-for-age was used to assess thinness among adolescents, which is considered the most appropriate indicator for identifying undernutrition in this age group, as recommended by the WHO Expert Committee [2]. Several Indian studies have reported similar trends in thinness using BMI-for-age as a parameter [18,21–23]. In our study, the prevalence of thinness was slightly higher among girls (53.3%) than among boys (46.7%), suggesting a potential gender disparity in nutritional intake and health-seeking behavior.

The trend also showed that early adolescents were more affected by thinness (36.9%) compared to mid (31.9%) and late adolescents (31.2%), suggesting that nutritional

doi: 10.21276/SSR-IIJLS.2025.11.6.19

deficiencies manifest more prominently during the early growth spurt phase. Similar findings have been documented by Sahabuddin *et al*. [24] and in WHO reports, indicating that thinness tends to decrease with age as nutritional requirements stabilize. Studies from Northern India have also reported comparable results, with thinness among adolescent girls at 30–31%, closely aligning with our observations [16]. Addressing this issue requires school-based health programs, nutritional education, and fortified dietary interventions targeting both boys and girls during early adolescence.

In the present study, adolescents belonging to the Muslim community (53.8%) outnumbered those from the Hindu community (46.2%). The prevalence of malnutrition was notably higher among Muslim adolescents (50%–59.4%) compared to Hindus (39%–46.2%). This difference may reflect variations in socio-economic status, dietary habits, and access to health services. An inverse relationship between educational level and malnutrition was evident; adolescents with lower educational attainment demonstrated higher levels of undernutrition and stunting.

The impact of socio-economic status on nutritional outcomes was also evident. Most undernourished adolescents belonged to Class IV (27.9%) and Class V (53.6%) socio-economic categories, whereas those from Class I and II demonstrated better nutritional profiles. This aligns with the findings of Van de Poel *et al.* [10], who highlighted the strong association between poverty and nutritional inequality in developing nations.

The morbidity pattern observed in this study revealed that upper respiratory tract infections (34%) were the most common ailment among adolescents, followed by diarrhea (16.9%), carbuncle/furuncle (16.7%), and scabies (12%). These findings suggest that infectious and hygiene-related conditions remain major health concerns among adolescents in rural Odisha. Such morbidities may be linked to overcrowded living conditions, poor sanitation, inadequate personal hygiene, and limited access to preventive health services. Similar patterns of common illnesses were also reported among adolescents in other regional studies from India.

Preventive measures, including health and hygiene education, regular deworming, prompt infection management, and promotion of safe water and sanitation practices, can play a vital role in reducing the disease burden among this age group. Strengthening school health programs and routine adolescent health screening in primary healthcare facilities will also improve adolescent well-being and nutritional outcomes [24].

CONCLUSIONS

The present study, conducted at the Government Medical College and Hospital, Sundargarh, Odisha, highlights a substantial prevalence of malnutrition among adolescents, as evidenced by high rates of underweight, stunting, and thinness. Both boys and girls were found to be affected, with a slightly higher burden observed among female adolescents. The poor nutritional status of adolescents—particularly among girls—has profound implications for their physical growth, learning ability, future reproductive health, and overall well-being. These findings emphasize the need for early detection and timely nutritional interventions to prevent long-term health consequences. The results of this study can serve as a valuable input for health planners and policymakers to strengthen adolescent health and nutrition initiatives. Integration of school-based nutrition education, community awareness programmes, and supplementary nutrition schemes is essential to address the existing gaps. Targeted interventions focused on girls, early adolescents, and lower socio-economic groups.

CONTRIBUTION OF AUTHORS

Research concept- Ajaya Bhatta, Girija Shankar Prasad Patro, Jagnyaseni Panda

Research design- Ajaya Bhatta, Jagnyaseni Panda

Supervision- Ajaya Bhatta, Girija Shankar Prasad Patro, Jagnyaseni Panda

Materials- Girija Shankar Prasad Patro, Jagnyaseni Panda

Data collection- Ajaya Bhatta, Jagnyaseni Panda

Data analysis and interpretation- Ajaya Bhatta, Girija Shankar Prasad Patro

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Writing article- Girija Shankar Prasad Patro, Jagnyaseni Panda

Critical review- Ajaya Bhatta, Jagnyaseni Panda

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doi: 10.21276/SSR-IIJLS.2025.11.6.19

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