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## Positive impact of concise health education on nutrition knowledge and sleep hygiene among preadolescents

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**Abstract**

This study assesses the baseline knowledge and impact of a short-term educational intervention on nutrition and sleep awareness among preadolescence aged 10-12 years in a semi-rural region of Uttar Pradesh, India. Utilizing a cross-sectional descriptive study design and a mixed-methods approach, we evaluated the anthropometric parameters and knowledge levels of 35 students from Public Primary and Junior School in Durgapur. A 30-minute interactive educational session was implemented focusing on balanced diets, key nutrients, hydration, and healthy sleep practices. Post-intervention evaluations demonstrated significant improvements in understanding across all domains. These findings highlight the efficacy of concise, targeted educational programs in resource-limited school settings.

**Keywords:** Nutrition education, sleep hygiene, rural schools, health awareness, school-based intervention, India

### 1. Introduction

Childhood represents a foundational stage of human development, marked by rapid physical growth, intense neurocognitive maturation, and the establishment of lifelong behavioral patterns. During this crucial period, the body and brain demand optimal nourishment and adequate rest to support healthy development trajectories. However, malnutrition and sleep deprivation—whether occurring independently or in tandem—pose significant threats to a child's physical health, academic achievements, emotional regulation, and psychological resilience (Chaput, 2014; Longo & Panda, 2016) <sup>[1], [8]</sup>. Globally, malnutrition continues to afflict more than 149 million children under the age of five, and chronic sleep deficits further compound the burden by impairing attention, learning capacity, and immune function (WHO, 2020).

In India, despite commendable government interventions such as the Mid-Day Meal Scheme and targeted nutritional programs, children in rural communities often remain vulnerable due to gaps in health literacy, socioeconomic disparities, and insufficient integration of holistic wellness education into school curricula. The intricate and reciprocal relationship between dietary habits and sleep quality is increasingly acknowledged in scientific literature. For instance, Godos *et al.* (2021) <sup>[6]</sup> demonstrated that nutrient-dense diets significantly improve sleep efficiency, while Córdova *et al.* (2018) <sup>[2]</sup> found that children experiencing inadequate sleep tend to crave high-calorie, low-nutrient foods, perpetuating a detrimental feedback loop. These behaviors are biologically mediated by hormonal shifts—particularly involving ghrelin and leptin—that regulate hunger and satiety and are notably disrupted by poor sleep (Francisca *et al.*, 2018) <sup>[4]</sup>. Moreover, the interplay of diet and rest exerts considerable influence on cortisol regulation and neurocognitive performance over time, as described by Pistollato *et al.* (2016) <sup>[15]</sup>.

Despite the growing evidence base, school-based education in rural India seldom incorporates the dynamic interconnection between nutrition and sleep into the curriculum. As a result, critical opportunities to instill preventive health practices in formative years are missed. This study aims to bridge that gap by assessing baseline awareness among students in Dankaur, Uttar Pradesh, and evaluating the effectiveness of a short yet impactful educational module designed to foster foundational understanding of both nutrition and sleep

hygiene in an engaging, age-appropriate format.

**2. Objectives**

1. To assess baseline knowledge of nutrition and sleep among preadolescences.
2. To deliver an educational intervention on healthy eating and sleep habits.
3. To evaluate the effectiveness of the intervention using pre- and post-assessment tools.
4. To identify demographic and dietary patterns among the participants.

**3. Methodology**

**3.1 Study Design**

A cross-sectional descriptive study with a mixed-methods approach was conducted to evaluate awareness levels and capture behavioural changes. Quantitative data were collected through questionnaires and anthropometric assessments; qualitative insights were drawn from classroom observations during the intervention.

**3.2 Study Setting**

The study took place at Public Primary and Junior School, Durgapur, Dankaur, in Gautam Budh Nagar, Uttar Pradesh. The community comprises semi-rural households with limited access to structured health education. The school management facilitated all research activities including classroom sessions and questionnaire distribution.

**3.3 Participants**

Thirty-five students aged 10-12 years from Classes 5 and 6 participated. Participants were selected through convenient sampling. Ethical compliance was ensured through informed parental consent and student assent.

**3.4 Data Collection Procedures**

- **Anthropometric Measures:** Height and weight were recorded to calculate BMI, following WHO guidelines.
- **Structured Questionnaires:** Administered before and after the intervention to assess knowledge.
- **Educational Intervention:** A 30-minute session using visual aids, posters, and interactive Q&A, covering diet diversity, nutrient roles, hydration, and sleep.

**3.5 Study Timeline**

Day	Activity
1	Baseline measurements and pre-test
2-3	Intervention sessions in small groups
4	Post-test administration
5	Informal feedback and discussions

**4. Results and Comparative Discussion with Previous Studies**

This section presents a detailed examination of the dietary, anthropometric, and health awareness profiles of the students, supported by comparative findings from recent scholarly literature.

**4.1 Demographic and Dietary Profile**

**Table 1: Dietary Preferences Among Participants**

Category	Count	Percentage
Vegetarian	20	57%
Eggetarian	10	29%
Non-Vegetarian	5	14%

**Table 1:** showed that the majority of students followed a vegetarian diet, largely consisting of rice, dal, and potatoes, with minimal inclusion of fruits and dairy products. This lack of dietary diversity aligns with findings from Bangladesh where 33.8% of adolescent girls had poor dietary diversity and many suffered from undernutrition due to limited food variety (Razzak *et al.*, 2020)<sup>[19]</sup>. Similarly, a study in Nagpur, India, identified undernutrition among adolescents attributed to fast food consumption and skipping breakfast (Khan *et al.*, 2022)<sup>[7]</sup>.

**4.2 Anthropometric Profile**

**Table 2: Anthropometric Measurements by Age Group**

Age	Height Range (cm)	Weight Range (kg)	Average BMI
10	122-138	25-32	17.5
11	132-144	30-39	18.6
12	135-152	34-48	19.2

The table 2 Anthropometric Measurements by Age Group presents growth-related physical parameters height, weight, and average Body Mass Index (BMI) for children aged 10 to 12 years. At age 10, children exhibit a height range of 122-138 cm and a weight range of 25-32 kg, resulting in an average BMI of 17.5, indicative of typical growth within healthy parameters for that age. By age 11, both height and weight increase to 132-144 cm and 30-39 kg, respectively, with a corresponding rise in average BMI to 18.6, reflecting natural progression in growth and body composition. At age 12, these measurements further expand, with height ranging from 135-152 cm and weight from 34-48 kg. The average BMI at this age reaches 19.2, suggesting a steady trend in physiological development. The data illustrates a consistent increase in all three metrics—height, weight, and BMI—with age, capturing the typical growth trajectory during late childhood and the onset of adolescence. This trend is essential for monitoring pediatric health, identifying deviations from normal growth patterns, and informing interventions related to nutrition and physical activity. About 20% of students were classified as underweight using WHO BMI-for-age standards. This aligns with a study in Lahore, Pakistan, which found anthropometric failure in 27.2% of school children aged 7-13 years, with maternal education significantly linked to nutritional outcomes (Raza *et al.*, 2024)<sup>[18]</sup>. Likewise, in Patna, boys showed higher underweight prevalence, though girls were more severely stunted, reflecting gender disparities in malnutrition (Rajak *et al.*, 2018)<sup>[16]</sup>.

**4.3 Knowledge Improvement**

**Table 3: Nutrition Awareness Pre- and Post-Intervention**

Topic	Pre (%)	Post (%)
Macronutrients vs Micronutrients	18	83
Role of Vitamin C	14	89
Daily Water Intake	9	91
Carbohydrates as Energy Source	25	91
Nutrient-Rich Fruits/Veggies	17	88

The data in Table 3 illustrates a marked improvement in participants' nutritional knowledge following an educational intervention, with awareness levels increasing significantly across all assessed topics. Initially, only 18% of individuals could differentiate between macronutrients and micronutrients, which rose to 83% post-intervention, reflecting a 65-point improvement. Understanding of Vitamin C's role saw a substantial rise from a mere 14% to 89%, highlighting effective content delivery about this essential micronutrient. Awareness of recommended daily water intake surged from 9% pre-intervention to 91% post-intervention, indicating one of the highest gains and emphasizing the impact of hydration-focused education. Similarly, recognition of carbohydrates as a primary energy source increased from 25% to 91%, while knowledge about nutrient-rich fruits and vegetables expanded from 17% to 88%. These shifts suggest the intervention was highly successful in enhancing nutrition literacy, equipping participants with essential knowledge for informed dietary choices. The intervention significantly improved nutritional knowledge. This mirrors outcomes from the Nestlé Healthy Kids Program in Kenya, where children in intervention schools showed significantly higher nutrition awareness than peers in control groups (Wambo & Otieno, 2019) [22]. Similarly, a Lebanese study found that school health campaigns substantially increased health knowledge among 5- to 11-year-olds (Moussi *et al.*, 2024) [11].

#### 4.4 Sleep Hygiene

**Table 4:** Sleep Awareness Metrics

Topic	Pre (%)	Post (%)
Sleep Enhances Brain Function	24	77
Ideal Sleep Duration (8-10 h)	28	86
Screen Avoidance at Bedtime	17	61

The data in Table 4: *Sleep Awareness Metrics* highlights significant improvements in students' understanding of critical sleep hygiene concepts following an educational intervention. Prior to the intervention, only 24% of participants recognized that sleep enhances brain function, a figure that rose markedly to 77% post-intervention. Awareness of the recommended sleep duration for adolescents (8-10 hours) also saw a considerable increase, from 28% to 86%. Additionally, knowledge regarding the importance of avoiding screens at bedtime improved from a low baseline of 17% to 61% post-intervention. These findings indicate that the intervention was highly effective in enhancing participants' sleep hygiene awareness across all measured topics, with the most substantial gains observed in understanding sleep's cognitive benefits and ideal sleep duration. The consistent rise across metrics reflects not only increased awareness but also suggests potential for improved sleep behaviors if knowledge translates into practice. Many students used screens late at night, leading to irregular sleep—a behavior correlated with poor dietary adherence and cognitive function. A Turkish study confirmed that poor sleep hygiene was linked to increased BMI and parasomnia among preadolescence (Uysal & Calisir, 2024) [21]. Similarly, Chilean students with poor sleep routines had significantly lower adherence to healthy diets (Zapata-Lamana *et al.*, 2023) [25].

#### 4.5 Risk and Hygiene Awareness

**Table 5:** Risk Awareness and Hygiene Practices

Topic	Pre (%)	Post (%)
Malnutrition Impact	20	80
Role of Iron and Calcium	17	85
Hand Washing Importance	66	94

The data from Table 5 reveals a substantial improvement in risk awareness and hygiene practices among participants following an educational or health-based intervention. Prior to the intervention, only 20% of individuals were aware of the impact of malnutrition, but this figure surged to 80% post-intervention, indicating a fourfold increase in understanding of nutritional health. Similarly, awareness of the role of essential micronutrients like iron and calcium rose dramatically from 17% to 85%, highlighting a significant enhancement in knowledge likely linked to targeted health education. The already relatively high awareness regarding the importance of hand washing increased from 66% to 94%, suggesting not only an improvement in hygiene practices but also the success of reinforcing pre-existing knowledge. These shifts demonstrate the effectiveness of interventions aimed at boosting health literacy, especially regarding nutrition and preventive hygiene, which are critical for disease prevention and overall well-being. A marked increase in awareness of malnutrition and hygiene was observed. Similar patterns were reported in Bangladesh, where only 80.2% of girls practiced handwashing before meals, and poor hygiene was linked to nutritional deficits (Razzak *et al.*, 2020) [19]. In Shimla, India, a school-based intervention reduced junk food consumption and improved hygiene and nutritional behaviors (Mahajan *et al.*, 2021) [9]. The observed improvements in nutritional knowledge, hygiene practices, and health behaviors among students post-intervention are consistent with trends reported in global studies. This underscores the importance of structured, school-based interventions in fostering healthy habits and mitigating the risks associated with undernutrition and lifestyle disorders in children.

#### 5. Discussion

The outcomes of this study resonate strongly with the global discourse surrounding school-based health interventions. Initial assessments revealed substantial gaps in student knowledge regarding fundamental health behaviours. This aligns with findings by Rathi *et al.* (2017) [17], who noted that students in low-resource settings often have limited exposure to structured health education. The observed dietary monotony—predominantly cereal-based meals lacking fruits and dairy—is consistent with nutritional trends identified across rural India, as discussed by Nair and Augustine (2020) [12]. This dietary limitation contributes to suboptimal growth outcomes, reflected here by underweight BMI readings among 20% of students. Comparative studies, such as the Healthy Kids Program in South Africa (Nzama *et al.*, 2020) [13], provide a parallel perspective. There, a single-session intervention improved dietary literacy by over 50%, comparable to the increases observed in this study. Similarly, our results corroborate Sharma and Arora (2015) [20], who emphasized the efficacy of short, interactive health sessions in boosting children's understanding of nutrient sources and dietary practices. Post-intervention gains in water intake awareness (from 9% to 91%) and nutrient functions affirm WHO's assertion on

the critical role of diet diversity in non-communicable disease prevention (WHO, 2020).

The study's findings on sleep are particularly pertinent in the current digital age. The baseline figure of 17% awareness regarding screen avoidance before sleep mirrors the concerns raised by Owens *et al.* (2014)<sup>[14]</sup>, who documented rising screen addiction and its interference with sleep quality among preadolescents. Notably, post-intervention awareness increased to 61%, underscoring the potential for behavioral change through targeted education. Garmy *et al.* (2012)<sup>[5]</sup> similarly observed improved sleep practices following classroom-based interventions.

Furthermore, improved hygiene knowledge post-intervention aligns with Curtis and Cairncross (2003)<sup>[3]</sup>, who found that handwashing education was among the most cost-effective public health interventions in schools. The increase from 66% to 94% awareness in our cohort suggests that even brief educational inputs can yield significant behavioral shifts.

Overall, the positive shift across nutritional, sleep, and hygiene domains validates the integrated approach adopted in this study. The educational model not only corrected misconceptions but also instilled foundational knowledge, contributing to long-term health resilience among children. These findings advocate for the formal inclusion of health education within school curricula, tailored to local contexts and reinforced through periodic assessments.

## 6. Conclusion

This study underscores the critical role of structured health education in shaping the nutritional and sleep-related awareness of primary school students in semi-rural India. The findings reveal a significant knowledge gap among students aged 10-12 regarding essential nutrients, hydration needs, and the importance of adequate sleep. Prior to the intervention, children demonstrated limited understanding of food groups, the function of vitamins like Vitamin C, and the recommended daily water intake, as well as poor sleep hygiene practices such as excessive screen time before bed. Following a concise, interactive 30-minute educational session, marked improvements were observed across all assessed parameters—knowledge of macronutrients and micronutrients rose from 18% to 83%, understanding of hydration needs jumped from 9% to 91%, and awareness of the role of sleep in brain function increased from 24% to 77%. These results not only mirror but also reinforce findings from similar interventions worldwide, demonstrating the feasibility and impact of short-term health education in low-resource settings. Notably, the integration of visual aids and hands-on activities significantly enhanced student engagement and retention of key health messages. The study advocates for the systematic incorporation of nutrition and sleep education into primary school curricula, particularly in underserved communities. Additionally, it emphasizes the necessity of continuous evaluation and reinforcement through community engagement and parental involvement. Addressing these knowledge deficits early can foster healthier choices, reduce the risk of lifestyle-related diseases, and improve academic outcomes—thereby contributing to the broader goal of public health and educational equity.

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