

## International Journal of Agriculture Extension and Social Development

Volume 7; Issue 9; September 2024; Page No. 939-941

Received: 26-06-2024  
Accepted: 28-07-2024

Indexed Journal  
Peer Reviewed Journal

### Impact of a school-based nutrition education program on adolescents' nutrition knowledge in district Udham Singh Nagar of Uttarakhand

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DOI: <https://doi.org/10.33545/26180723.2024.v7.i9m.1171>

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#### Abstract

Adolescence is a time of rapid personal development and growth. Adolescents should eat a well-balanced diet to support healthy physical and mental development and make up for any dietary deficiencies. Throughout this phase, it's imperative to establish healthy eating practices to prevent future health issues including obesity and nutritional deficiencies. The present study was conducted on 2452 adolescents of 13 to 17 years of age studying in government schools of Udham Singh Nagar and Nainital districts of Uttarakhand in the years 2022 and 2023. Information on existing nutrition knowledge was collected using a detailed questionnaire consisting of 20 multiple choice questions related to nutrition and health. Each correct answer was given one mark and wrong answer was marked as zero. Nutrition education was imparted to the students for 6 days using a booklet consisting of Nutrition Health Modules, flash cards and educational videos and on the last day, post assessment of nutrition knowledge was done using the same questionnaire. The finding showed an increase of 91.13% in the nutritional knowledge of adolescents. It can be concluded that nutrition education can be a good strategy to raise public awareness of nutrition issues and contribute to the development of a healthy population.

**Keywords:** Adolescence, knowledge increment, nutrition education, nutrition knowledge

#### Introduction

"Adolescence" is a period of rapid growth and development between 10-19 years of age bringing physical, emotional, psychosocial and behavioral transformation, thus, a child develops into an adult. According to UNICEF (2022), 1.3 billion of the world's population belongs to the age group of 10-19 years constituting 16% of the world's population.

The transitional period from childhood to adulthood requires a lot of essential macro and micronutrients to keep up with the rapid growth spurt <sup>[1]</sup>. Failure to eat well-balanced and sufficient food during adolescence period delays physical growth, intellectual aptitude and sexual maturation. Right nutrition is essential to cover up the deficiencies that occur in childhood and should include a well-balanced diet for healthy physical and cognitive development, appropriate energy reserves for illness and pregnancy and the prevention of nutrition related disorders that develop in adulthood <sup>[2]</sup>.

During adolescence, food habits are significantly influenced by peer pressure, media and social norms. This period marks the transition from childhood to adulthood, where experimentation and autonomy in food choices are common. Adolescents may develop healthy or unhealthy eating habits that can impact their long-term health <sup>[3]</sup>. Factors such as convenience, taste preferences and availability play crucial roles in shaping these habits. Establishing nutritious eating habits during this phase is crucial for preventing future

adult-onset diet related diseases like CVD, osteoporosis, cancer, obesity and other nutritional deficiencies. Parents, educators and healthcare providers may play an important role in guiding adolescents toward making informed and balanced food choices for optimal health and well-being. Adolescents can benefit greatly from education when it comes to learning about nutrition <sup>[4]</sup>. Therefore, the present study was carried out to assess pre-existing knowledge, conducting nutrition and health-based teaching sessions and administering a post-test to assess the impact of nutrition education intervention on improving nutrition knowledge of adolescents.

#### Materials and Methods

The present study was conducted in the years 2022 and 2023 with 2452 adolescents (age 13-17 years) studying in government schools of Udham Singh Nagar and Nainital districts of Uttarakhand. The students were divided into batches, with each batch comprising of 45-50 students and were imparted nutrition and health education for 6 consecutive days. In each batch, total 6 days session of 2 hours duration was organized. During the first teaching session, pre-test was conducted with the help of structured questionnaire followed by distribution of booklets among students and discussion of the first module. Nutrition education was imparted to the adolescents through lecture-

cum-discussion method with the use of a pre-designed health modules, flash cards and educational videos. The booklet comprised of 6 nutrition-health based modules having information related to basic nutrition, micronutrients, food group system, cooking methods, sanitation and hygiene and common lifestyle diseases.

A structured questionnaire was used for assessing the pre-existing knowledge of the students, which included 20 multiple choice questions related to health and nutrition. For each correct answer, one mark was allotted and for the wrong answer as well as unanswered questions, no mark was given. After conducting sixth day closing session, post-test was conducted using the same questionnaire as in pre-test assessment. The gathered data was compiled and analyzed statistically. Knowledge increment percent was calculated for each student to see the overall impact of the program on the knowledge levels of students pertaining to nutrition and health. Gain in knowledge or knowledge increment was calculated using the below given formula:

The average knowledge increment of students in each class was calculated using the formula given below:

$$KI \% = \frac{(\text{Post-test score} - \text{Pretest score})}{\text{Pre-test score}} \times 100$$

$$\text{Average Knowledge Increment} = \frac{\text{Sum of knowledge increment (\% ) of all students}}{\text{Number of students}}$$

## Results and Discussion

The present study aimed to inculcate nutrition knowledge in the students at a young age of adolescence to help them understand the importance of right nutrition in health. After completion of the programme, based on the marks obtained in pre and post tests, students were divided into three categories of nutritional knowledge i.e. 'Low', 'Medium' and 'High'. Out of a 20 (maximum marks), 0-6 score was categorized as 'low', 7-12 score as 'medium' and a score of 13-20 was categorized under 'high' nutritional knowledge. The number of students who obtained 'low', 'medium' and 'high' scores in pre and post-evaluation tests are presented in Table 1.

**Table 1:** Distribution of students based on pre and post-test scores

Class	No. of students	Pre-test score			Post-test score		
		Low n (%)	Medium n (%)	High n (%)	Low n (%)	Medium n (%)	High n (%)
6 <sup>th</sup>	592	382 (64.53)	202 (34.12)	8 (1.35)	80 (13.51)	353 (59.63)	159 (26.86)
7 <sup>th</sup>	473	214(45.24)	239(50.53)	20(4.23)	37(7.82)	229(48.41)	207(43.76)
8 <sup>th</sup>	449	131(29.18)	274(61.02)	44(9.8)	28(6.24)	216(48.1)	205(45.66)
9 <sup>th</sup>	711	227 (31.93)	451 (63.43)	33 (4.64)	51 (7.17)	333 (46.84)	327 (45.99)
10 <sup>th</sup>	161	54 (33.54)	104 (64.6)	3 (1.86)	2 (1.24)	73 (45.34)	86 (53.42)
11 <sup>th</sup>	66	23 (34.85)	42 (63.64)	1 (1.51)	1 (1.51)	39 (59.09)	26 (39.39)
Total	2452	1031 (42.05)	1312 (53.51)	109 (4.44)	199 (8.12)	1243 (50.69)	1010 (41.91)
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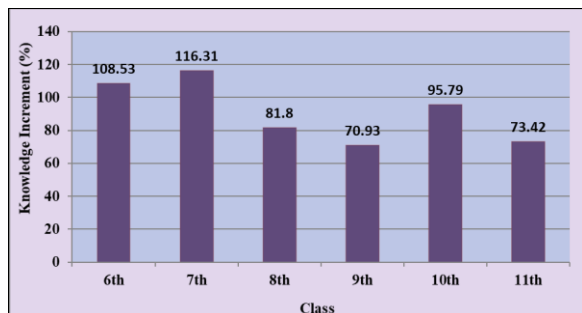
The findings of present study showed that in class 6<sup>th</sup>, only 1.35% students scored 'high' in pre-test which increased to 26.86% in post-evaluation test. In class 7<sup>th</sup>, only 4.23% students scored 'high' in pre-test whereas 43.76% students gained knowledge through the programme and scored 'high', i.e. between 13-20 marks in post-test. Similarly, only 9.8, 4.64, 1.86 and 1.51% students of class 8<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup> and 11<sup>th</sup> scored 'high' in pre-test which increased to 45.66, 45.99, 53.42 and 39.39%, respectively, after imparting nutrition education. Overall, a total of 41.91% students scored 'high' marks in post-tests in contrast to 4.44% students who scored 'high' in pre test.

The results of present study showed that about 42% of the adolescents were having "low" nutrition knowledge before nutrition education intervention which significantly reduced to 8.12% after the nutrition education programme. It can be inferred from the data that nutrition education led to the positive change in knowledge level of adolescents. A study carried out in Nepal also concluded that school-age adolescents' nutritional knowledge increased as a

consequence of nutrition education<sup>5</sup>. The finding of present study is in line to the findings of study conducted in rural parts of China, where nutrition education improved nutritional knowledge, attitude and healthy practices among 7<sup>th</sup> class adolescents. The adolescents gained knowledge about dairy products, fruits and vegetables and started having their breakfast every day<sup>[6]</sup>.

Nutrition education led to an average nutrition knowledge increment of 91.13% among adolescents in the present study. The class-wise average knowledge increment was found to be 108.53, 116.31, 81.8, 70.93, 95.79 and 73.42% for the students of class 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup> and 11<sup>th</sup> respectively (Fig 1), which shows the positive impact of nutrition education on the nutrition knowledge of adolescents. A study conducted by Barman et al. (2023) reported similar results where nutritional education resulted in knowledge increment of 33.3 and 24.4% in urban and rural adolescents' respectively<sup>[7]</sup>. A study conducted by Lua and Elena (2012) concluded that nutrition education is the best method for enhancing knowledge, improving eating

habits and promoting healthy diets and lifestyle [8]. Pratibha and colleagues have also reported the average increment of 41.03-96.2% in the level of nutrition knowledge of adolescents when imparted the nutrition education [9].



**Fig 1:** Average knowledge increment of students of different classes

The present study observed a positive relationship between the number of teaching sessions attended by the students and percent knowledge increment acquired by them (Table 2).

**Table 2:** Percent knowledge increment vs. number of teaching sessions attended

No. of sessions attended	1	2	3	4	5
Average KI%	28.02	44.82	67.23	76.02	76.41

The students who attended only 1 or 2 sessions showed knowledge increment of 28.02 and 44.82%, respectively, while the students who attended 3, 4 or all the 5 sessions of the week-long nutrition education program showed a knowledge increment of 67.23, 76.02 and 76.41%, respectively. The higher the number of teaching sessions attended by the students, greater was the resulting knowledge increment among them. The finding of present study is supported by the study of Singh *et al.* [10]

## Conclusion

The crucial stage of adolescence involves many physical, social and physiological changes. Adolescence is a time of transition when habits are formed that persist into adult life. Nutrient needs are greater during adolescence than at any other stage in the life cycle. Inappropriate nutritional intake during adolescence may have several consequences like malnutrition, anemia, obesity, stunting, wasting, etc. This may also affect the school performance, intellectual ability, sexual maturation and physical growth. Good habits, such as exercise and a healthy diet, are likely to bring many benefits, including improved performance in school. Good nutrition promotes not only the better physical health and reduced susceptibility to disease but has also been demonstrated to contribute to cognitive development and academic success. In order to improve public awareness and eventually the societal health, nutrition education is one of the most practical applications of nutrition science. Adolescents can better grasp the needs of this age group if they are provided with nutrition knowledge.

The goal of the present study was to increase the nutrition knowledge among adolescents through nutrition education. The study showed that adolescents' knowledge increased by

91.13% as a result of the nutrition education program. A positive correlation was observed between the nutrition knowledge increment and number of sessions attended by the students during the programme. It was concluded from this study that nutrition education significantly improved the nutrition knowledge status and health related behaviour of the adolescents. Overall it can be concluded that there was a positive impact of nutrition education on adolescents. It can be concluded that nutrition education can be a good strategy to raise public awareness of nutrition issues and contribute to the development of a healthy population.

## Acknowledgement

Nestle India Limited, New Delhi is highly acknowledged for funding the present study.

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