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## Empowering individuals through nutrition education: Fostering dietary and behavioral changes for enhanced nutritional well-being

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### Abstract

**Background:** By imparting nutrition education, individuals undergo transformative changes in their dietary habits and behaviors, leading to an overall improvement in their nutritional well-being.

**Methods/statistical analysis:** This study is an attempt to investigate the impact of nutrition education on knowledge level which bringing out change in the consumption pattern of the individuals on 420 rural adolescent girls of Deoria district UP. The data was collected before and after nutrition education intervention to assess the impact on the respondents.

**Findings:** Nutrition education emerges as a contemporary paradigm, exerting a substantial influence on elevating global nutritional standards. The incorporation of nutrition education initiates a positive transformation in the nutritional acumen of adolescent girls, precipitating discernible shifts in their dietary patterns and consequential modifications in nutrient intake profiles. This research underscores the pivotal role of nutrition education as a catalyst for profound positive changes in the understanding and application of nutrition principles among adolescent populations.

**Application:** Strategic Nutrition and Health Interventions as Catalysts for Transformative Dietary Habits: An Essential Framework for Inculcating Optimal Healthy Eating Practices among Populations. This study highlights the pivotal role of nutrition and health interventions as formidable tools in fostering enduring improvements in individuals' dietary habits. Recognized as a cornerstone for long-term enhancement, these interventions, particularly when integrated into school-based nutrition education, have the potential to be instrumental in preventing malnutrition in subsequent generations. A comprehensive approach addressing classroom, home, community, and school environments is imperative for the effectiveness of nutrition education. Sustaining healthy eating behaviors necessitates the synergistic support of educators, families, and a curriculum-driven focus on nutrition teaching.

**Keywords:** Nutrition, education, consumption pattern, malnutrition, dietary intake

### 1. Introduction

In the annals of human history, the contemporary adolescent cohort (Aged 10–19 years) stands as the largest ever, with a staggering 90% residing in low and middle-income countries (LMIC) <sup>[1]</sup>. Acknowledging the imperative to customize policies and programs, there is an increasing recognition of the necessity to address the distinctive needs of this demographic. In this context, health and nutrition interventions become pivotal, offering an opportune window to leverage the critical period of growth and development in adolescents. The overarching goal is to propel intergenerational health, emphasizing the strategic importance of tailoring interventions to the unique requirements of this substantial and influential population. <sup>[2, 3]</sup>. Safeguarding the health and well-being of adolescent girls is imperative, not only for their individual benefit but also to nurture a generation of healthy mothers capable of fostering the well-being of their children. With the unique dynamics of the adolescent growth spurt, there is a heightened demand for increased nutrient requirements during this crucial phase. Furthermore, emerging evidence indicates the potential for 'catch-up' growth during

adolescence, underscoring the significance of ensuring optimal nutrition to unlock the full growth potential and pave the way for a healthier future <sup>[3-5]</sup>. Adolescence is therefore a second window of opportunity to lay the foundation for health across the life course. The recently developed Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) conceptual framework makes explicit individual, household, community, and society-level determinants of adolescent nutritional status <sup>[6]</sup>. Immediate determinants of nutritional status include the individual's diet, physical activity, morbidity, and early pregnancy, which are shaped by the individual's access to and use of quality services; knowledge, attitudes, and practices; and other individual characteristics (e.g., physical and emotional health, school attendance, peer networks, and empowerment). Household factors, such as sociodemographic and economic status, also play a role, as do community factors including land availability and customs. Furthermore, societal-level forces such as the sociocultural, economic, geographic, and political contexts, and the macro food environment, underpin all these determinants.

In order to improve the nutritional status of girls, nutrition education has been characterised as instructional strategies for causing desired behavioural changes. In recent years, it has become clearer that how important nutrition education is for improving the health and nutrition of communities in underdeveloped nations. This age is particularly prone to nutritional risks due to the dual demands of growth and exercise. This study provides a detailed description of adolescent girls' exposure to information and services, knowledge and practices related to nutrition and the food consumption pattern they follow.

### Research methodology

"This study employed a quantitative research approach with a descriptive design, utilizing nonprobability purposive sampling to select 420 adolescent girls aged 13 to 19 years. A comprehensive evaluation, including sociodemographic analysis and physical examination, was conducted to establish the baseline clinical status. Primary data collection was undertaken, obtaining informed consent from study participants and securing permission from the school authorities. The questionnaire, organized into three sections, aimed to capture vital information:

**Section I:** Background Information - This proforma gathered details such as name, age, religion, family type, socio-economic status, parents' educational qualifications, and annual income.

**Section II:** Nutritional Assessment Proforma - Comprising three parts, this section recorded anthropometric data (height, weight, waist, and hip ratio, with BMI calculation) alongside a standardized food frequency table and a 24-hour dietary recall proforma.

**Section III:** Knowledge-Based Questionnaire - Designed by the investigator, this proforma assessed participants' knowledge of various nutritional parameters, including general health and diet, the human digestive system, recommended dietary concepts, food-based knowledge, and nutritional deficiency disorders."

### Data collection method

Employing primary data sources, this study determined the appropriateness of employing the offline questionnaire survey method to accommodate responses from a substantial number of participants. The selected samples were provided with a meticulously designed questionnaire encompassing all three sections, comprehensively addressing the study objectives. The questionnaire's design featured closed-ended questions, ensuring simplicity and efficiency in completion. Each knowledge-based section presented respondents with four carefully curated options. Emphasizing inclusivity, the questionnaire was crafted in a bilingual format, facilitating comprehension based on individual preferences. All survey tools underwent a rigorous process, starting with drafting in English, followed by translation into Hindi, back translation, and pretesting on an 80-sample cohort to refine and optimize the instruments prior to formal data collection.

### Development of intervention package

Different materials were reviewed, these included various

publications related to the development and implementation of nutrition education programs, previous nutrition education packages and workshop documentations that have discussed or reviewed nutrition education programs<sup>[7-10]</sup>. The purpose of the review was to identify existing nutrition education materials and gaps. The information was intended to guide the drafting of nutrition education package including materials to be used. After reviewing the existing literature, the drafting of the package was done. A student friendly nutrition intervention package was developed and evaluated by the experts for the relevance of the content which included PowerPoint presentations on various topics, e folders and e- booklet to give them an insight of the nutritional knowledge.

### Statistical Analysis

Descriptive and inferential statistical analysis been carried out in the present study. Results on categorical measurements are presented in Number (%). Significance is assessed at 5% and 1% confidence limits into (No significance, significant and strongly significant) different levels of significance<sup>[11]</sup>. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

### Findings and discussion

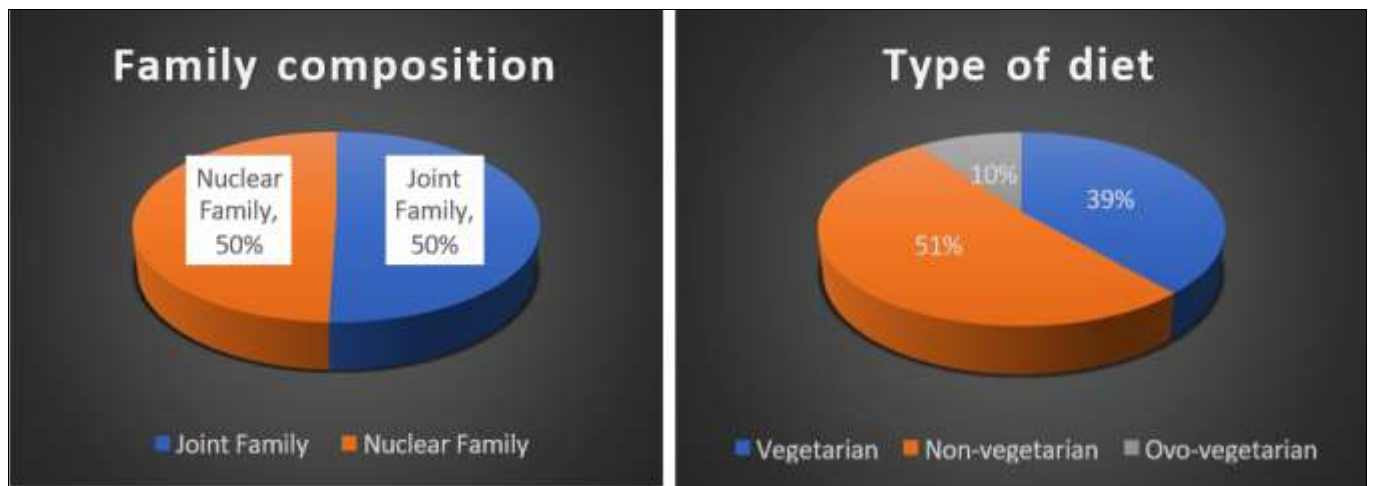
#### Socio-economic profile

"The comprehensive socio-economic status of the study sample is detailed in Table 1, revealing noteworthy findings. A significant majority, exceeding 90%, identified with the Hindu religion. In the baseline survey, encompassing 420 rural adolescent girls prior to the nutrition education intervention, all participants were successfully re-evaluated during the post-intervention phase in the end-line survey, achieving a remarkable 100% reach within the target population for nutrition knowledge assessment. The study population exhibited a diverse family structure, with 50.47% residing in joint families and 49.52% in nuclear families. Economic stratification unveiled that the majority (64.28%) belonged to the low-income group, with an additional 32.14% falling within the middle-income bracket. A mere 3.57% represented high-income families, characterized by a monthly income surpassing one lakh. Geographically, 74.28% hailed from rural areas, while 25.71% inhabited urban locales. Dietary preferences revealed that 51.46% identified as non-vegetarian, 38.57% as vegetarians, and 10% as ovo-vegetarians.

Educational attainment of parents emerged as a significant factor, with 51.42% of fathers and 32.38% of mothers having completed their graduation. Contrastingly, 42.38% of mothers and 11.19% of fathers fell into the illiterate category. This underscores the influential role of family education levels and socio-economic status in shaping children's lifestyles and dietary habits. An intriguing insight into the correlation between family income and food expenditure was elucidated, reinforcing the premise that financial resources play a pivotal role in determining dietary patterns. The Body Mass Index (BMI) surfaced as an invaluable proxy for direct body fat measurement, offering a cost-effective and easily deployable screening method for identifying weight categories associated with potential health risks. Tailored for age and sex specificity among children and teens, BMI-for-age stands out as an indispensable tool in health assessments.

**Table 1:** Socio-economic profile

Variable	Description	Percentage	
Religion	Hindu	92.85	
	Muslim	7.14	
Type of family	Joint family	50.47	
	Nuclear family	49.52	
Locality	Rural	74.28	
	Urban	25.71	
Family income	Low Income Group (>₹25000)	64.28	
	Middle Income Group (₹ 25001- ₹1 lakh)	32.14	
	High Income Group (< ₹ 1 lakh)	3.57	
Type of diet	Vegetarian	38.57	
	Non-vegetarian	51.42	
	Ovo-vegetarian	10.00	
Educational Qualification		Father	Mother
	Up to 8 <sup>th</sup>	3.33	4.52
	High school	8.09	4.28
	Intermediate	17.14	14.28
	Graduation	51.42	32.38
	Post-graduation	8.80	2.14
	Illiterate	11.19	42.38
Occupation	Government	14.04	4.28
	Private	37.85	10.23
	Self Employed	36.90	5.23
	Unemployed	11.19	-
	Housewife	-	80.23



**Fig 1:** Family composition and type of diet

"The American Dietetic Association (ADA, 2011) defines nutrition education as personalized instruction or training designed to facilitate the acquisition of knowledge and/or skills pertaining to nutrition. According to Gil (2010), nutrition education comprises a targeted set of planned educational activities aimed at promoting healthy eating behaviors within a specific demographic group. These interventions are often implemented in environments tailored for young children and adolescents, as it is believed that their learning experiences during these formative years significantly influence their adult behavior and dietary preferences (Eat well, 2011).

In the current investigation, a meticulous approach to nutrition education was adopted, employing visually engaging and informative PowerPoint slides as a dynamic teaching tool for all selected adolescent girls. The educational initiative sought to comprehensively cover fundamental aspects of nutrition. A discerning series of questions, spanning various facets of nutritional knowledge, was employed to assess the participants' grasp of nutrition-related concepts. Detailed findings are meticulously presented in Table 2, providing a nuanced insight into the impact of the nutrition education intervention on the respondents' knowledge levels.

**Table 2:** Impact of nutrition intervention on nutritional knowledge

Sr No	Items	Pre-intervention (%)	Post intervention (%)
1.	Significance of health	53.80	90.47
2	Measures to determine healthy weight	36.19	71.90
3.	Period of exercise per day	3.09	65.23
4.	Major health problem of adolescent girls	25.71	79.52
5.	My plate concept:	16.90	82.85
6.	Skipping breakfast	19.04	41.42
7.	Weekly outside eating pattern	12.61	26.19
8.	Food preferences while eating outside:	66.19	13.33
9.	Food selection influencers	73.57	73.57
10.	Food factor preference	21.19	58.33
11.	Carbohydrate requirement per day	15.71	49.52
12.	Protein intake	32.38	60.47
13.	Healthy fat intake per day:	17.61	46.66
14.	Iron needs per day:	24.76	66.66
15.	Calcium intake to function effectively	19.52	63.33
16.	Required haemoglobin level:	17.61	65.00
17.	Vitamin A(retinol) consumption per day:	16.66	52.85
18.	Body requirement of vitamin C per day:	16.42	74.28
19.	Dietary fibre consumed:	26.90	69.04
20.	Zinc recommendation for adolescent girls:	17.61	64.28
21.	Total cholesterol level in the body:	19.76	59.04
22.	Recommended vitamin D level:	9.76	55.95
23.	Iodine needs per day:	27.61	66.66
24.	Daily water intake:	13.57	55.00
25.	Balanced diet provides:	50.71	91.19
26.	Importance of balanced diet	21.66	71.67
27.	Non-Nutrient among them:	42.85	71.43
28.	Carbohydrate rich food	25.71	73.09
29.	Best source of energy:	14.28	73.57
30.	Eggs, pulses, and meat are good source:	38.57	76.19
31.	Fruits and vegetables are good source:	35.23	70.95
32.	Fat-soluble vitamins:	24.76	73.33
33.	Common sources of vitamin A:	20.23	68.33
34.	Citrus fruits are a rich source:	38.57	73.33
35.	Vitamin from sunlight	40.00	65.71
36.	Vitamin lost during cooking:	32.61	74.52
37.	Red fruits and vegetable provide nutrients:	13.33	51.19
38.	Milk and milk products provide:	21.19	75.47
39.	Rich sources of iron:	20.00	70.24
40.	Contains folic acid:	23.80	64.05
41.	Food group contains fibre:	30.23	66.67
42.	Meat supplement for vegetarians:	24.04	60.48
43.	Immunity providers:	28.57	71.90
44.	Fast/junk food contains:	21.90	52.85

Table 2 revealed that the nutrition knowledge changes post intervention. It was found that majority of the respondents were not aware about the basics of food. They were not aware about the food sources and the recommended dietary intake they should take in order to maintain their body

health and efficiency. Post nutritional knowledge represent a significant increase in the knowledge level of the respondents. The post intervention result revealed that a positive change was observed.

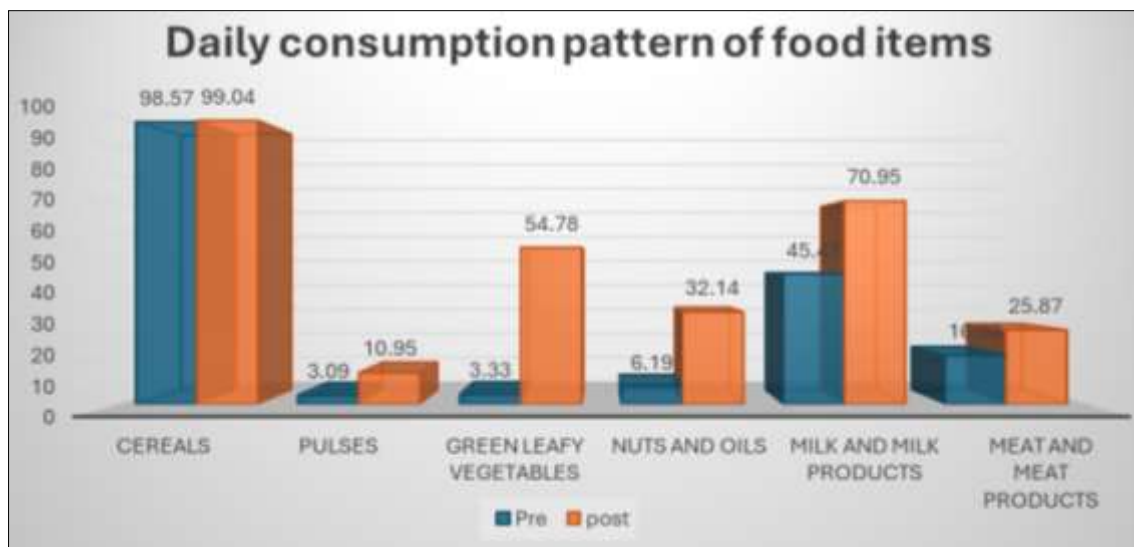
**Table 3:** Food consumption pattern

Food	Daily		Weekly	
	Pre	Post	Pre	Post
Cereals	98.57	99.04	-	-
Pulses	3.09	10.95	11.42	26.66
Green leafy vegetables	3.33	54.78	13.67	43.32
Nuts and oils	6.19	32.14	17.38	32.14
Milk and milk products	45.47	70.95	6.90	20.23
Meat and meat products	16.98	25.87	24.21	54.89

"The adoption of dietary pattern analysis has gained prominence in characterizing the holistic dietary profile, as it captures the intricate interplay and potentially synergistic or antagonistic effects among nutrients that may influence health outcomes. The data presented in Table 3 underscores the prevalence of daily cereal consumption among adolescents, revealing a notable increase from 98.57% pre-intervention to 99.04% post-intervention. These findings align with the observations made by Chacko and Begum (2017), emphasizing the frequent consumption of cereal and cereal products among adolescents from middle-income families. Examining the frequency of whole pulse consumption, the data indicates a relatively uniform percent consumption of pulses such as Rajmah, Bengal gram, and

black gram dhal on both a daily (3.09%) and weekly (11.42%) basis. The nutrition education intervention yielded positive outcomes, with daily consumption rising to 10.95% and weekly consumption increasing to 26.66%.

Furthermore, the study revealed insights into the consumption patterns of vegetables, including green leafy vegetables, roots, and tubers. Initially, only 3.33% reported daily consumption, a figure that significantly surged to 54.78% post-intervention. Similarly, weekly consumption experienced a notable increase, rising from 13.67% to 43.32% (Table 3). These results collectively highlight the transformative impact of nutrition education on enhancing the dietary habits of the adolescent population.



**Fig 2:** Daily consumption pattern of food items

Abudayya *et al.* (2019) when assessing the food consumption pattern of adolescents also observed that the mean frequency of consumption of green vegetables was 8.5 per week, that is, adolescents consumed two or three servings per day. Milk is the product that is considered as a complete food. The study highlighted that 45.47% took milk daily and only 6.90% took milk on weekly basis. Post intervention consumption increased. About 16.98% consumed nonvegetarian food. Items such as fish and mutton were consumed weekly only.

### Discussion

"The investigation brought to light the profound impact of family educational levels and socioeconomic status on shaping the lifestyles and dietary habits of children. The study identified a lack of awareness about nutritious foods and healthy habits as a contributing factor to underweight conditions. UNICEF's (2016) assertion that general under-nutrition, manifested by underweight conditions in children, is more prevalent among those with rural backgrounds and illiterate mothers aligns with the study's findings [15]. Significantly, the mean height-for-age and weight-for-age indicated deficits, echoing the findings of comparable studies by Pai and Naik [16], which reported that all children were notably below the ICMR standard in both height and weight. Moreover, the frequency of milk product, fruit, and vegetable consumption fell below the ICMR-recommended

standards, underscoring nutritional inadequacies. The study shed light on the disparity in food availability between low-income and more affluent neighbourhoods. Foods in low-income neighbourhoods were observed to be of lower quality, costlier, and displayed less variety compared to their counterparts in wealthier areas, as larger suppliers often cater to higher-income consumers [17]. Crucially, the research established a discernible association between nutritional education intervention and the food consumption patterns of adolescents, emphasizing the pivotal role of education in influencing dietary choices among this demographic.

### Conclusion

"The study's findings underscore a concerning trend in the unhealthy eating habits prevalent among adolescents, particularly in India. Cultural norms emphasizing reduced food intake and a lower priority given to the dietary needs of adolescents contribute to a lack of dietary diversity among this demographic. Furthermore, evolving market dynamics have witnessed a surge in the promotion of unhealthy junk foods, leading to an increasing number of adolescents adopting nutritionally inadequate diets. Alarming, a minimal proportion of adolescents incorporate protein-rich foods such as chicken, meat, fish, or eggs into their daily dietary routines, with only about a third consuming these foods on a weekly basis. The survey outcomes compellingly



demonstrate the impact of nutrition education on the food consumption patterns of adolescents, hinting at the potential role of targeted educational interventions in steering dietary choices toward healthier options. In light of these findings, the study advocates for future research endeavours focused on nutritional interventions aimed at enhancing the health status of adolescents, a pivotal demographic segment. Recognizing the importance of this age group in the overall population, the study underscores the need for strategic interventions to promote healthier eating behaviours and improve the overall well-being of adolescents.

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