



Impact of documentary on knowledge levels regarding balanced diet among adolescent girls in school-setting

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Abstract

Objectives: To assess the effectiveness of a nutrition education intervention between the control and experimental groups of school-going girls.

Methods: Using multistage random sampling, a school-based pre-post quasi-experimental study was conducted among 472, 10-19-year-old adolescent girls in Lucknow, India. The respondents were divided into a control group (CG) and an experimental group (EG). EG was exposed to a self-designed documentary on topics related to a balanced diet, while CG was not.

Results: Most girls had inadequate knowledge pre-intervention ($t(471) = 10.8, p < .001$) in both CG and EG. Post-intervention scores improved significantly [$t(471) = 8.496, p = .00$]. The number of respondents with "inadequate" knowledge decreased from 130 to 79 in EG, while those with "adequate" knowledge increased from 34 to 86.

Conclusion: Overall, the findings underscore the effectiveness of audio-visual aid in filling the knowledge gap among adolescent girls in a school setting. It also emphasizes the need to implement customised and targeted nutrition education programmes for adolescent girls. The results show that knowledge levels of respondents were below average, which upon nutrition education intervention, improved. Hence, the same can effectively improve nutrition literacy among adolescents.

Keywords: Nutrition Education, Adolescent Girls, Health Literacy, Vulnerable Group, Knowledge.

Introduction

Two hundred forty-three million adolescents reside in India. Adolescence is a remarkable life stage when there is the development of skills that help in decision-making. Adolescence marks the developmental transition from childhood to adulthood when many important social, economic, biological, and demographic events set the stage for adult life.^[1] The nature and quality of young people's future lives and a country's future social and economic development depend primarily on how well adolescents navigate this transition. In India, myriad social, economic, and health factors may undermine the ability of adolescents to lead whole and productive lives. The 2030 Agenda for Sustainable Development and its Global Strategy for Women's, Children's, and Adolescents' Health provide a unique opportunity for accelerated action on the health of adolescents. Investment in adolescent health is

also essential to achieving the 17 Sustainable Development Goals relating to adolescent development, health, or well-being.^[2]

Adolescents have increased nutritional requirements. They need a diet rich in protein, vitamins, calcium, iodine, phosphorus, and iron due to their rapid growth spurt and increased physical activity. Nutritional requirements are higher among adolescents than in any other period of life (other than pregnancy). Inadequate dietary intake at this age leads to stunted growth and delayed sexual maturation.^[3]

The Global Strategy to Improve Women's, Children's, and Adolescents' Health is dedicated to speeding up efforts to promote teenage health.^[4] Adolescent girls have been the target of various health concerns such as anaemia,^[5] the double burden of malnutrition,^[6] and menstruation related issues,^[7] all of which have a multifactorial impact

on them. One aspect of conducting a health program is imparting education related to managing health. Using technology to improve public knowledge, has shown quick and significant results.^[8] Studies have also suggested a need for nutritional interventions focusing on nutrition and health education.^[9]

By 2022, India had set a national goal of reducing anemia prevalence to 40% in children, 36% in adolescent girls.^[10] However, data from the NFHS-5 factsheets shows India is halfway to meeting those goals.^[11]

Emerging from health, nutrition, and food literacy is a new concept. Food literacy (FL) is the foundation for individuals to build a healthy relationship with food.^[12] Adolescence is the ideal time to integrate an FL program to build lifelong healthy behaviors. Developing a technology-driven FL program is an innovative concept that may appeal to adolescents.^[13]

Use of mass media is higher among adolescents (male 88.2% and female 71.5%).^[1] It is essential in habit picking and deciding their lifestyle pattern. Its influence is clearly shown in a study reporting that 90% eat either food or snacks while watching television, 82% buy food products and snacks based on the advertisement, 59% skip outdoor activities for television, 42% follow diet, and 42% exercise to get the body like their favorite media personality.^[14]

Objectives

Hence this research aims to assess the knowledge gap and compare the efficacy of educational documentary on a balanced diet among the control (non-intervened) and experimental (intervened) adolescent girls.

Methods

A school-based pre-post quasi-experimental study was carried out to conduct a nutrition education intervention and assess its efficacy among adolescent females aged 10 to 19. The study area, Lucknow, a northern Indian state of Uttar Pradesh, was chosen for logistical reasons. Firstly, 4 schools were selected from 4 directions of the city through a multistage random sampling procedure. Secondly, through simple random sampling, one school was selected from each direction of the city. In the third stage, 1 school was randomly assigned to either Control Group (CG) or Experimental Group (EG). The sample size was calculated using the Fisher's formula ($n = Z^2 * P * Q / E^2$)^[15] Where N stands for Sample size, P stands for construct based on previous studies (70%), q= 1-P (30%), e= margin of error (5%), z= Z score for 5% significance level. The required sample size was calculated as 323 in total. After adding a contingency @ 25%, the sample size becomes 236 (EG) +

236 (CG) = 472.^[16]

The EG was subjected to an educational documentary prepared following Dietary Guidelines for Indians- A Manual.^[24] It covered topics related to a balanced diet, food groups, nutrient-rich food sources, the harmful effects of junk foods, a general diet plan to follow throughout the day, handy tips to eat healthily, and the functions of macro- and micronutrients. A Knowledge Assessment Questionnaire consisting of 21 multiple-choice questions was administered to 472 respondents before and after exposure to the educational documentary among EG. The questionnaire consisted of two sections: "Sociodemographic Profile" and "Knowledge Questions.". The first section assessed the age group, gender, income status, and education of the mother and father of the respondent. In contrast, the second section assessed knowledge levels related to a balanced diet. One point was awarded for correct answers and zero for incorrect or unknown answers. The ratings were inadequate for ≤ 6 marks, Marginally Adequate for 7–11 marks, and Adequate for 12–16 marks. The questionnaire showed good internal consistency reliability^[17] (Cronbach alpha=0.83) and was evaluated by a team of educators in Food Nutrition and Public Health.

Statistical analysis

Statistical Package for Social Sciences (SPSS), Version 22.0, Inc., Chicago, IL, 2013 was used to conduct all statistical analyses. The Mean and Standard Deviation were used to report the different knowledge categories in which respondents fell. Paired Sample t-Test was used to test within the EG and CG data, while an independent sample t-test was used to test between the EG and CG data. The level of significance was set as $P \leq 0.05$.^[18]

Ethical considerations

The objectives of the study were explained to teachers and respondents. Written consent and assent to participate were obtained from teachers and adolescents, respectively, before conducting the study. The study was conducted in accordance with the Declaration of Helsinki. The study was approved by the ethics board committee of Sam Higginbottom University of Agriculture, Technology & Sciences, registration number: IEC/SHUATS/2020.

Results

Data was collected from 472 adolescent girls residing in Lucknow district of Uttar Pradesh. The mean age of the respondents was recorded as 14.5 years. Other details are in Table 1. In one sample t-test, it was found that

knowledge scores were statistically significantly lower by 2.004 (95%CI, 2.37 to 1.64) than an average knowledge score of 8, ($t(471) = 10.8, p < .001$) in both CG and EG. These results imply below average KL among respondents. The results in EG show a statistically significant difference in Knowledge Scores (KS) before intervention ($M=6.03, SD=3.90$) and after intervention ($M=9.06, SD=3.85$); [$t(235) = 18.08, p=0.000$]. The 95% confidence interval (CI) of the difference between the means ranged from 3.36 to 2.70, indicating a difference between the means of the samples. Hence, the results indicate that the intervention affected the KS of the respondents. The number of respondents having "inadequate" knowledge decreased from 130 to 79 in EG, while the number of respondents having "adequate" knowledge increased from 34 to 86

post-intervention [Table 2]. Inspection of plots revealed that KS was normally distributed for both groups, as there was homogeneity of variance as assessed by Levine's Test for Equality of Variances. Therefore, an independent t-test was run on the data with a 95% confidence interval (CI) for the mean difference. It was found that the pre-test scores of CG (5.96 ± 4.15) were not statistically different from the pre-test scores of EG (6.03 ± 3.90) [$t(470) = 0.183, p=0.855$]. Post-intervention, the experimental group had a statistically higher KS than the control group [$t(470)=8.496, p=.00$] (Table 3). The experimental group showed a significant increase in the KS, [$t(235)=18.08, p=.000$] from the pre-test to the post-test. While the control group showed no significant increase in the KS, [$t(235)=1.80, p=.07$] from the pre-test to the post-test [Table 4].

Table 1. Sociodemographic Profile of CG and EG (n=472)

Group	CG (%)	EG (%)	Total	P value
Age (years)				
10-13	78 (33.1)	78 (33.1)	156 (33.1)	-
14-16	79 (33.5)	79 (33.5)	158 (33.5)	
17-19	79 (33.5)	79 (33.5)	158 (33.5)	
Type of family				
Nuclear Family	116 (46.8)	132 (53.2)	248 (52.5)	0.14
Joint Family	120 (53.6)	104 (46.4)	224 (47.5)	
Education of Father				
Illiterate	61 (25.8)	7 (3)	68 (14.4)	0.00*
Primary school	65 (27.5)	2 (0.8)	67 (14.2)	
High school	26 (11)	55 (23.3)	81 (17.2)	
Intermediate	40 (16.9)	37 (15.7)	77 (16.3)	
Graduate	30 (12.7)	71 (30.1)	101 (21.4)	
Postgraduate	14 (5.9)	64 (27.1)	78 (16.5)	
Education of Mother				
Illiterate	61 (25.8)	7 (3)	68 (14.4)	0.00*
Primary school	69 (29.2)	2 (0.8)	71 (15)	
High school	23 (9.7)	58 (24.6)	81 (17.2)	
Intermediate	41 (17.4)	34 (14.4)	75 (15.9)	
Graduate	29 (12.3)	71 (30.1)	100 (21.2)	
Postgraduate	13 (5.5)	64 (27.1)	77 (16.3)	
Dietary Habit				
Vegetarian	115 (48.7)	65 (27.5)	180 (38.1)	0.00*
Non-Vegetarian	56 (23.7)	82 (34.7)	138 (29.2)	
Ovo-lacto vegetarian	65 (27.5)	89 (37.7)	154 (32.6)	
Annual family income in Rs.				
Below Poverty Line-Rs. 1000/- to 33,000/Annum	74 (31.4)	23 (9.7)	97 (20.6)	0.00*
Above Urban Poverty Line- Rs. 33,001/- to 55,000/-Annum	79 (33.5)	30 (12.7)	109 (23.1)	
Middle Class -Rs. 55,001/- to 88,800/-Annum	39 (16.5)	78 (33.1)	117 (24.8)	
Upper Middle Class - Rs. 88,801/ -to 1,50,000/-Annum	31 (13.1)	41 (17.4)	72 (15.3)	
High Class- Above Rs. 1,50,000/ -Annum	13 (5.5)	64 (27.1)	77 (16.3)	

*Significant

Table 2. Assessment of the impact of an educational documentary on the knowledge level of respondents (n=472)

Knowledge Categories	Control Group (CG)				Experimental Group (EG)			
	Pre-test (n=236)		Post-test (n=236)		Pre-Intervention (n=236)		Post Intervention (n=236)	
	N (%)	Mean±SD	N (%)	Mean±SD	N (%)	Mean±SD	N (%)	Mean±SD
Inadequate (≤6 marks)	146	3.21±2.01	146	3.15±2.00	130	2.95±1.72	79	4.48±1.48
Marginally Adequate (7-11 marks)	55	8.73±1.38	55	8.71±1.39	72	8.58±1.30	71	9.27±1.383
Adequate (12 – 16 marks)	35	13.11±1.05	35	13.11±1.05	34	12.38±0.65	86	13.10±1.16
Total		5.96±4.15		5.92±4.17		6.03± 3.90		9.06± 3.85

SD: Standard Deviation.

Table 3. Independent sample t-test between experimental and control groups pre- and post-educational intervention (n=472)

Groups	Mean Knowledge Scores ±SD		t	df	Mean Difference ± SE	P Value
	Before	After				
Control (n=236)	5.96 ± 4.15	5.92 ± 4.17	0.183	470	0.59 ± 0.15	.855
Experimental (n=236)	6.03 ± 3.90	9.06 ± 3.85	8.496	470	3.03 ± 0.05	.00*S

SD: Standard Deviation, *S, Significant.

Table 4. Paired sample t-test within the experimental and control groups pre- and post-educational intervention (n=472)

Pretest-Posttest	t	df	P	Mean Difference	SD
Experimental	18.08	235	.000*S	3.03	2.57
Control	1.809	235	.072	0.03	0.32

SD: Standard Deviation, *S, Significant.

Discussion

This study, like previous studies,^[19] found that respondents needed more knowledge. Following previous studies, the same was tackled with an educational documentary that improved knowledge levels post-intervention.^[20]

Paired sample t-tests within the experimental and control groups showed a significant increase in Knowledge Scores. Specifically, only 31.8% of respondents answered correctly about the definition of a balanced diet, which increased to 73.3% post-intervention in EG in this study. The reason for asking the same was because a nutritionally adequate and balanced diet is essential for optimal growth and development,^[21] and adequate knowledge about it can translate into healthy food habits.^[22] Poor knowledge pre-intervention (18.2%) was seen regarding ideal servings of fruits and vegetables. Although 26.2% of participants answered correctly to a similar question in another study.^[23] This study showed an increased percentage (56.4%) of respondents giving correct answers post-intervention regarding consumption of fruits and vegetables. Similar results were seen in a similar study where more than 80% of children intended to eat more fruits and vegetables and get more physical activity.^[24] Knowledge of the distribution of whole cereals and protein-rich foods on a plate for a day was lesser among respondents of this study compared to another study,

where 45.8% and 39.9% gave the correct answer to a question regarding grains and proteins, respectively.^[23] Proteins are proposed to prevent brittleness and hair loss,^[25] hence this topic holds great significance. In this study, most respondents did not know about healthy fat. Research shows that the dietary guidelines of Canada, "replacing saturated fats with unsaturated fat," has not been successfully translated into the practices of people.^[26] Complete awareness about the detrimental effects of junk foods was found in fewer respondents. The results of this study were similar to another study where around half (45.2%) of the respondents had a poor level of knowledge, and only 19.1% of respondents had adequate knowledge regarding the harmful effects of junk food consumption.^[27] According to most respondents in this study, junk foods are not part of a balanced diet. This is an essential question because high intake of processed foods and high-fat diets contributes to the rise in obesity among teenagers.^[28] This data showing low nutrition knowledge pre-intervention highlights that despite large-scale education programs in the country, the adolescents cannot access them or are ineffective in enhancing their knowledge. Respondents of this study showed good knowledge levels (53%) on rich sources of healthy fats, which improved (69.1%) even further post-intervention. Fats are a primary macronutrient, an essential component of the cell membrane, and are required for the functioning of the

vascular, immune, nervous, and renal systems and early human development; hence, knowledge about its rich sources is essential. Another school-based study showed improved post-test scores for questions concerning fat-rich foods.^[29]

Additionally, most (45.8%) knew about the nutrients in milk and milk products and the rich sources of vitamin C (54.7%). On the contrary, in a study, 66.6 percent of students needed to know which foods contain the most calcium.^[30] While comparable results have been reported in a study where respondents had to identify local foods rich in vitamin C.^[31] An almost equal percentage of respondents gave the correct answer regarding fruits, vegetables, and cereals being a good source of fiber in the human diet. The results were consistent with similar studies.^[32] Milk contains the most nutrients necessary for growth and development; it possesses a high biological value. It is a rich source of bioavailable calcium, which helps build strong bones. Vitamin C is another essential nutrient required for healthy bones and teeth. It also promotes iron absorption. Hence, adequate knowledge of these topics is necessary for adolescents. Symptoms of anemia were also asked, and most respondents (41.5%) gave a correct answer. Test scores further improved (45.8%) post-intervention. A Delhi-based study regarding symptoms and causes of anemia supported our results.^[29]

The researchers hypothesized improved knowledge levels regarding a balanced diet among adolescent girls post-intervention. This hypothesis was supported by the fact that the experimental group showed improved test scores post-intervention compared to the control group. Various studies have strongly suggested the improvement of nutrition literacy,^[33] e-Health literacy,^[34] and knowledge levels^[35] via the implementation of audio-visual aids.^[36] Earlier studies have shown that conducting a nutrition education program improves the knowledge levels of adolescents, even if it is of short duration.^[37]

Conclusions

This study shows that adolescent girls studying in private schools in Lucknow had inadequate knowledge levels regarding a balanced diet, healthy fats, protein-rich foods, and their importance, an ideal serving of fruits and vegetables per day, distribution of whole cereals and protein-rich foods on a plate for a day, nutrients present in milk and milk products, the nutrient responsible for building the heme part of hemoglobin, vitamin D, good sources of fiber; and symptoms of anemia, all of which could alter food habits negatively.

However, post-intervention with a self-designed documentary, respondents showed improved scores. Malnutrition and low nutrition literacy prevail in India. Nutritional literacy needs to be improved, and nutrition education interventions are an effective method. More efforts should be made to make nutritional information available to adolescents, particularly at the school level, to improve their eating habits and health status. These findings have vital messages for the education system and curriculum designers to have more consideration for food and nutrition-related knowledge and skills in schools. Overall, the findings underscore the effectiveness of audio-visual aid in filling the knowledge gap among adolescent girls in a school setting. It also emphasizes implementing customized and targeted nutrition education programs for adolescent girls.

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Competing interests

The authors declare that they have no competing interests.

Abbreviations

Control group: CG; Experimental group: EG; Food literacy: FL; Statistical Package for Social Sciences: SPSS; Knowledge Scores: KS; Standard Deviation: SD.

Authors' contributions

All authors read and approved the final manuscript. All authors take responsibility for the integrity of the data and the accuracy of the data analysis.

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Availability of data and materials

The data used in this study are available from the corresponding author on request.

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki. The study was approved by the ethics board committee of Sam Higginbottom University of Agriculture, Technology & Sciences, registration number: IEC/SHUATS/2020.

Consent for publication

By submitting this document, the authors declare their consent for the final accepted version of the manuscript to be considered for publication.

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