# Impact of nutrition education on nutrition knowledge, attitudes, and practices among adolescent girls in Bogor, Indonesia

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**Abstract.** Nutrition education is a potentially effective intervention for improving adolescent's nutritional status. This study aims to analyze the effects of nutrition education on the scores of nutrition knowledge, attitude, and practice of adolescent girls at SMAN 1 Dramaga, Bogor, Indonesia in 2024. This study employed a quasi-experimental research with purposive sampling on 41 adolescent girls. The intervention consisted of seven one-hour education sessions. The educational materials and methods were different in each meeting. A paired sample t-test indicates a significant difference in both knowledge and practice scores before and after the education intervention ($p < 0.001$), although no significant difference was found in attitude scores ($p$=0.513). These findings suggest that the existing nutrition education model could improve the nutrition knowledge and practices among adolescent girls.

## 1 Introduction

Adolescence is a transitional stage between childhood and adulthood, marked by rapid physical, biological, and hormonal changes that lead to psychosocial, behavioral, and sexual maturation. Often described as the second growth spurt, this phase presents different experiences for boys and girls [1]. For adolescent girls, this period is a critical phase in the nutritional life cycle, shaping the health of future generations. The rapid development of reproductive characteristics significantly increases nutritional requirements. In West Java, the prevalence of malnutrition and overnutrition among adolescents exceeds the national average. In Bogor regency, calorie consumption per capita is predominantly derived from processed foods and beverages [2].

Nutrition education may help achieve a healthy lifestyle and diet, as the sufficient knowledge will then be followed with improvement in anthropometric measures and food

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intake [3]. For adolescent girls, this stage is crucial for shaping a healthier future, as they will experience the phases of pregnancy and breastfeeding. Therefore, enhancing their nutritional knowledge is essential to ensure better health for individuals and the next generation [4]. Enhancing the population's understanding of health-related issues is a key factor in improving quality of life. Increased knowledge about non-communicable diseases (NCDs) and their risk factors can help in preventing these diseases and guide individuals in seeking treatment when they have clear information about existing condition [5]. Improving nutrition and health education interventions on knowledge, attitudes, and practices, especially among adolescents, is critical for reducing malnutrition and mitigating both immediate and long-term for themselves and their future offspring [6-7].

Healthy eating habits are influenced by multiple factors, with the knowledge–attitude–practice (KAP) model offers a structure for fostering positive changes in nutritional behavior. While a strong understanding of nutrition is associated with better nutritional health, the intention to eat healthily does not always lead to behavioural changes. Regular consumption of unhealthy foods on the other hand, can result in serious health complications. To effectively change health and nutrition behaviors, it is crucial to have sufficient knowledge, positive attitudes, effective practices, and confidence in one's abilities [8]. Enhancing students' understanding of healthy diets is a crucial initial step toward behavior change, as prior studies have demonstrated a positive correlation between knowledge of healthy foods and healthy eating behaviors [9].

There is sufficient evidence about the importance of nutrition education interventions and their impact on improving knowledge, attitude, and practice scores. This study differs from previous research by employing a multimodal approach, utilizing various educational media including nutrition disc, videos, posters, and hand fans to improve adolescents' knowledge. This study aims to analyze the effect of nutrition education on the scores of nutrition knowledge, attitude, and practice of adolescent girls.

## 2 Materials and methods

### 2.1 Design and participants

This study employed a quasi-experimental design with one group pre-post test, and subjects were selected by purposive sampling method. It was conducted from March until April 2024 at SMAN 1 Dramaga, Bogor, Indonesia, chosen due to its prevalence of malnutrition and overnutrition. The sample included 41 grade XI students who met the inclusion criteria: adolescent girl, grade XI, attended all meetings, and willingness to participate. Questionnaires were conducted directly in the classroom. Initial data collection was conducted before the intervention, and a WhatsApp Group was created to facilitate communication and share information during the research session.

### 2.2 Media development

The media materials developed for adolescent girls were designed to be easily understood. The materials are adopted from the Ministry of Health of the Republic of Indonesia and modified to suit the delivery of educational materials. To enhance engagement, various media types were incorporated into each session, including nutrition disc games, puzzles, power points, posters, hand fans, and videos.

### 2.3 Measurement tools

The first section of the questionnaire collects respondent identity information, including name, gender, date of birth (used to calculate adolescents' nutritional status), weight and height (measured directly), allowance, and sources of nutrition and health information. There are three parts of the questionnaire comprising i) knowledge, ii) attitude, and iii) practice. A total of 70 questions assess knowledge, 70 questions assess attitude, and 66 questions assess practice. The questions were given across seven different topic sessions, with each session consisting of 10 knowledge questions, 10 attitude questions, and 6-10 practice questions.

### 2.4 Intervention stage

Nutrition education interventions were conducted over seven sessions, each conducted once a week. The intervention was organized by the research team on dates mutually agreed upon with the school. Seven topics were presented, consisting of nutritional status, anemia, malnutrition in adolescences, nutrition labels, balanced diet, physical activity, and clean and healthy living behaviour (PHBS). The topics were delivered using various methods, such as lectures, practical demonstrations, and games. Each session lasted one hour. Nutrition education was provided both in-person at the school and online via Zoom. The activities included conceptual preparation, development of education media, creation of activity schedules, implementation of weekly nutrition education sessions, and ongoing monitoring and evaluation of these activities.

### 2.5 The reliability and validity of the questionnaire

The questionnaires were tested for validity and reliability before intervention, where the reliability test resulted in Cronbach's Alpha ($\alpha$) score of 0.70. The reliability of the three segments evaluating knowledge, attitudes, and practices related to nutrition in adolescent girls with Cronbach's alpha values of 0.69, 0.73, and 0.69, respectively.

### 2.6 Scoring of data

The indicators used to assess the nutritional status of adolescents comprise measurements of body weight and height, which are classified based on Z-scores values. Nutritional status categories are divided into: 1) undernutrition, including very thin and thin (<-2 SD); 2) normal (-2 SD to 1 SD); and 3) overnutrition, including overweight and obesity (>2 SD). Nutritional knowledge was conducted using the attribution method, where each question was assigned a score based on the correctness of the answer. Correct answers received one point, whereas incorrect answers received zero points. The knowledge questionnaire consisted of multiple-choice questions (four options). The attitude questionnaire uses a four-point Likert scale, ranging from (1) strongly agree to (4) strongly disagree. Meanwhile, the practice questionnaire used the following scale: (1) yes, every day, (2) often (4-5 times/week), (3) rarely (1-3 times/week), and (4) never. Nutrition knowledge, attitudes, and practices were assessed through a self-administered questionnaire. Each correct answer will receive one point and an incorrect answer will receive zero points. The knowledge score was classified into three categories: less (score < 60), moderate (60–80), and good (≥ 80) [10]. In contrast, attitudes and practices were classified into two categories: negative (score < 70) and positive (score ≥ 70) [10].

### 2.7 Statistical analysis

Statistical analyses were conducted utilizing IBM SPSS 25.0 software. The analysis conducted was a descriptive analysis and difference test. Descriptive statistics, such as quantity and percentage, were used to present basic information of nutritional status, sources of nutrition information, and daily allowance. The difference test was conducted using the Paired Samples T-Test after the Shapiro-Wilk test revealed that the data were normal. The test was conducted to determine the differences in knowledge, attitudes, and practices related to nutrition and health in adolescents before and after intervention, using pre-test and post-test data. A significance level of 0.05 was applied for all statistical tests.

### 2.8 Ethical approval

Ethical approval number 131/KE/02/2024 for this study was granted by the Ethics Commission of the Faculty of Nursing and Health Sciences, University of Muhammadiyah Semarang. Additionally, all participants provided written informed consent before the commencement of the research. To protect participants' privacy and confidentiality, no personally identifiable information was collected, and data were handled anonymously.

## 3 Results and discussion

Table 1 shows the characteristics of the adolescent girls in this study, with the majority exhibiting a normal nutritional status (68.3%). Prior to the intervention, they had already received nutritional and health information from various sources, with social media being the most common (73.2%).

**Table 1.** Subject characteristics.

| Characteristics | n | % |
|---|---|---|
| **Nutritional status** | | |
| Undernutrition | 12 | 29.3 |
| Normal | 28 | 68.3 |
| Overnutrition | 1 | 2.4 |
| **Sources nutrition information** | | |
| Social Media | 30 | 73.2 |
| Professional Healthcare Staff | 4 | 9.8 |
| Teacher | 7 | 17.1 |
| **Daily allowance** | | |
| 10,000 – 15,000 IDR | 16 | 39.0 |
| 15,001 – 20,000 IDR | 16 | 39.0 |
| >20,000 IDR | 9 | 22.0 |

The prevalence of social media use in Indonesia is notably high, with the largest user group falling within the 18-24 age range, indicating that adolescents are the most prolific users of social media [4]. Through these platforms, the adolescent girls in this study have acquired a considerable amount of nutritional and health information, contributing to their relatively adequate knowledge base.

Based on the baseline data, the adolescent girls had an average pre-intervention score of 70.71 (Table 2), which can be attributed to the ease of accessing social media. This accessibility has positively influenced the participants' knowledge levels. Similarly, the

assessment of attitudes revealed an average score of 77.68 (>70) [10]. This evidence supports the notion that a high level of knowledge is often associated with a positive attitude, even prior to any intervention [11].

After presenting the seven educational materials, both knowledge and practice scores increased significantly compared to the scores before interventions. However, the score for practice remained in the negative category (<70) [10]. Adolescent girls' attitude scores were positive both before and after intervention. In a state of agitation, poor attitudes can influence the practice of quantity and quality of diet. Additionally, further information, motivation, and behavioral skills are required to complement knowledge, attitude, and practice scores. Previous research indicates that positive attitude scores are significantly related to practice scores. Nevertheless, this research shows that positive attitude scores, when supported by knowledge, can lead to significant improvement in practice scores [8].

**Table 2.** Average and different test results of nutrition education

| Variable | Mean ± SD | | Δ | p-value |
|---|---|---|---|---|
| | Pre-Intervention | Post-Intervention | | |
| Knowledge | 70.71 ± 10.2 | 81.21 ± 8.6 | 10.63 | 0.001* |
| Attitude | 77.68 ± 5.7 | 77.29 ± 6.7 | -0.58 | 0.513 |
| Practice | 59.39 ± 5.2 | 65.15 ± 5.0 | 5.96 | 0.001* |

*Paired T-test, $p<0.05$

Knowledge, attitudes, and practices concerning nutrition are crucial in preventing nutritional problems. Education is an effective approach to enhance adolescents' knowledge, attitudes, and practices towards nutrition. Knowledge is noted to influence individuals' attitudes and practices in adopting a balanced diet [3]. Education can be delivered through various methods and media that facilitate the audience's understanding and reception of the material. Results of a paired sample t-test indicate a significant difference in both knowledge and practice scores before and after the education intervention ($p < 0.001$), although no significant difference was found in attitudes ($p = 0.513$). The average increase in knowledge scores was 10.63, while the average increase in practice scores was 5.96. These findings indicate that the education provided over seven sessions effectively improved the knowledge and practice scores of adolescent girls at SMAN 1 Dramaga, Bogor, Indonesia.

Attitude refers to an individual's internal response to a stimulus or object, reflecting feelings of liking or disliking towards an object. An attitude comprises three core components: beliefs, emotions, and behavioral tendencies. These components collectively form a complete attitude, which is influenced by knowledge, thoughts, and convictions [12]. The adolescent girls in this study exhibited a positive attitude prior to the intervention, likely due to their satisfactory level of existing knowledge. A good level of nutritional knowledge can foster a positive attitude, which in turn influences nutrition-related behaviours [11].

Healthy practices are the application of nutritional knowledge. Nutrition education empowers individuals to adopt lifestyle changes that positively impact their health [13]. Nutrition education programs can significantly improve not only the knowledge but also the practical behaviors of adolescents. Increased knowledge serves as a catalyst for improved practices, thereby contributing to a reduction in nutritional issues among adolescent girls [14]. While knowledge is a fundamental element, it alone is insufficient to bring about meaningful changes in the behaviors and mindsets of adolescent girls. A holistic approach, encompassing behavioral, physiological, and socioeconomic considerations, is essential [15].

## 4 Conclusion

Nutrition education significantly increased the knowledge and practice scores related to balanced nutrition. However, there was no statistically significant difference in attitude scores. Nevertheless, attitudes remained positive both before and after intervention. Nutrition education is essential to complement the adolescents' knowledge, attitude, and practice in preventing nutritional and health issues.

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