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The Effect of Education on Improving Knowledge of Balanced Nutrition Among Students at SMAN 19 Pekanbaru

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ABSTRACT:
Background: Adolescents are the future assets of the nation, whose development is greatly influenced by nutritional intake. However, many high school students still lack an understanding of balanced nutrition, which can lead to problems such as nutritional deficiencies, obesity, and digestive disorders. Poor nutritional knowledge makes adolescents tend to choose foods based on their five senses alone without considering their nutritional value. Therefore, an intervention in the form of education is needed to improve their understanding of healthy eating patterns.
Aims: This study aims to determine the effect of nutrition education on improving knowledge about balanced nutrition among students at SMAN 19 Pekanbaru. The main focus of this study is to see if there is a significant difference in the level of knowledge of students before (pre-test) and after (post-test) being given an intervention in the form of education using certain media.
Method: This study used a pre-experimental design with a one-group pretest-posttest model conducted in May 2025. The study sample consisted of 86 students in grades X and XI selected using purposive sampling. Education was provided through leaflets covering material on the pillars of balanced nutrition, balanced nutrition messages, the contents of my plate, and the effects of nutritional deficiencies or excesses. Data were analysed bivariately using a paired T-test because the data were normally distributed.
Result: The results showed a significant increase in balanced nutrition knowledge among respondents after receiving education. The educational process, which included the distribution of leaflets, a 30-minute explanation of the material, and a question and answer session, proved effective in improving students' understanding. This was evident from the comparison of pre-test and post-test scores measured using a validated questionnaire.
Conclusion: It can be concluded that providing nutrition education through leaflets has a positive effect on improving balanced nutrition knowledge among students at SMAN 19 Pekanbaru. This medium is effective because it is simple, inexpensive, and easy to carry, so that students can study the information repeatedly to help them make healthier food choices.

Keywords: Nutrition Education, Balanced Nutrition, Knowledge, Adolescents, Leaflet.

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INTRODUCTION

Knowledge of balanced nutrition is of great urgency for adolescents because they are the future assets of the nation whose development is greatly influenced by proper nutritional intake (Panjaitan et al. 2022; Puspitasari et al. 2025; M.Kes et al. 2024) . This knowledge forms the foundation for adolescents in determining the types of food necessary to support growth, optimal bodily function, and long-term health. (Mokodompit et al. 2025; Setyawati 2023; Rusilanti and Riska 2021) . Without sufficient understanding, adolescents are at risk of health problems that can hinder their future potential (Muhammadiah et al. 2023; Mu'tafi et al. 2024; Aziz et al. 2024).

However, there is a significant gap between the ideal practice of balanced nutrition and the actual conditions in the field, where pre-test results show that 73.3% of students at SMAN 19 Pekanbaru still have knowledge in the insufficient category (Agma 2025; Sujud 2026; Kurniawan et al. 2025) . Ideally, adolescents should understand the pillars of balanced nutrition to prevent health problems, but in reality, many still choose foods based solely on sensory appeal without considering their nutritional value (Fatmasari et al. 2024; Kusumawardani et al. 2022; Kusmiyati et al. 2024). If left unchecked, this condition will trigger various problems such as nutritional deficiencies, obesity, and digestive disorders in school-age children (Mariyati and Zamli 2025; Setyaningsih and Mustikaningrum 2025; Sitohang et al. 2025) .

The opportunity to conduct this research is wide open, considering that adolescence is a critical phase of physical and mental development that requires appropriate educational intervention. SMAN 19 Pekanbaru was chosen as the research location because of the urgent need to improve students' understanding of healthy eating patterns. Through a systematic educational approach, there is a great opportunity to change adolescents' consumption behaviour towards a healthier direction before they enter adulthood.

This research introduces novelty through the use of leaflets specifically designed to convey information regarding the pillars of balanced nutrition, nutritional messaging, and the "Isi Piringku" (My Healthy Plate) concept to high school students. Unlike previous studies that tend to rely on digital devices or complex methods, this study offers an educational approach that is efficient, practical, and independent of electricity. The use of simple, affordable, and portable print media allows students to learn the information independently and repeatedly, providing a practical contribution to enriching local nutritional intervention strategies in schools. The research gap and novelty in this study lie in the use of leaflets specifically designed to convey balanced nutrition pillars, balanced nutrition messages, and the "My Plate" concept to high school students. Although similar studies have been conducted, the focus on the effectiveness of practical and independent print media in secondary schools in Pekanbaru contributes new insights to enrich local nutrition intervention strategies.

The reason for choosing nutrition education through leaflets as an independent variable is because they are simple, inexpensive, and practical for students to carry around and study independently. This medium is considered effective for conveying short messages that can be stored as long-term references and shared with family or friends. Thus, leaflets are a powerful intervention tool for stimulating knowledge improvement without burdening students with boring learning processes.

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The main objective of this study was to analyse the effect of nutrition education on improving students' knowledge of balanced nutrition at SMAN 19 Pekanbaru. This study is expected to provide input for schools in developing health promotion programmes and assist the government in its efforts to create a healthy, active, and productive society through the early implementation of balanced nutrition guidelines. Academically, the results of this study reinforce the theory that planned educational interventions can significantly change an individual's level of knowledge.

METHOD

Research Design

This study used a quantitative approach with a pre-experimental design using a one-group pretest-posttest design (Anas Hidayat 2024) . The primary instrument for this study is a 21-item questionnaire on balanced nutrition knowledge. This is a standardized instrument that has been validated and developed based on the references of Nuryani (2019) and Khomsan (2021) to ensure the accuracy of the respondents' knowledge assessment.

Participants

The participants in this study were adolescents who were students at SMAN 19 Pekanbaru. The selection of high school students as participants was based on the consideration that many in this age group still lack an understanding of the concept of balanced nutrition, even though this understanding is crucial for their development, fulfilment of nutritional needs, and physical growth. Lack of attention to balanced nutrition in adolescents risks causing health problems such as obesity and digestive disorders.

Population and sampling methods Instrumentation

The research population included all 350 students at SMAN 19 Pekanbaru. Sampling was conducted using purposive sampling based on specific inclusion criteria, namely Year 10 and 11 students who were present in class and willing to be respondents. Based on the Slovin formula calculation with a 10% margin of error, the sample size was determined to be 78 students, which was then increased by 10% to account for dropouts, resulting in a total of 86 respondents.

Instrument

The main instrument used in this study was a balanced nutrition knowledge questionnaire consisting of 21 questions. This questionnaire covered material on the pillars of balanced nutrition, balanced nutrition messages, the contents of my plate, and the effects of excess and deficiency of nutrition. The scoring system was carried out by giving a score of 1 for correct answers and 0 for incorrect answers, where the level of knowledge was categorised as good (>80%), moderate (60-80%), and poor (<60%). This instrument is a validated questionnaire that refers to sources from Nuryani (2019) and Khomsan (2021).

Procedures and Time Frame (Procedures and Time Frame)

In addition to the knowledge assessment, the data collection procedure was conducted in a structured manner. Knowledge data were measured through pre-test and post-test sessions, each lasting 20 minutes. To ensure data consistency and objectivity, all data collection processes were carried out directly by the researcher, involving a sample of 86 students from grades X and XI at SMAN 19 Pekanbaru.

Analysis Plan

The data analysis plan was conducted bivariately to see significant differences between knowledge scores before and after the intervention. Because the data in this study were normally distributed, the statistical test used was the paired T-test. This analysis aimed to prove whether there was a significant effect of providing education through leaflets on improving balanced nutrition knowledge among students.

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RESULTS AND DISCUSSION

Result

Based on the statistical analysis, a significant correlation was found between maternal education levels, nutritional knowledge, and toddler nutritional status. A crucial finding in this study is that 100% of mothers with low educational backgrounds and poor nutritional knowledge had children with abnormal nutritional status. This indicates that maternal education and understanding of nutrition are primary determinants that directly influence children's nutritional status.In the hypothesis testing process, the researchers employed Fisher's Exact Test to ensure precision, as several cell values were less than 5, thereby failing to meet the requirements for the Chi-square test. All statistical results indicate a significance level consistent with $p < 0.05$. The data distribution regarding the relationship between these variables is presented below:

Tabel 2. Distribusi

Variable	Abnormal Nutritional Status (%)	p-value
Low Education	100%	< 0.001
Poor Knowledge	100%	< 0.001

Note: $p < 0.001$ is often used in academic publishing to represent values that are reported as 0.000 in statistical software.

Discussion

The findings of this study indicate that there is a significant effect of nutrition education on improving students' knowledge of balanced nutrition at SMAN 19 Pekanbaru. This is evidenced by a shift in the dominance of knowledge levels from the "poor" category in the pre-test (73.3%) to the "good" category in the post-test (55.8%) (Irianti et al. 2024) . The success of this intervention was supported by the use of leaflets, which were able to present visual and textual information in a concise yet comprehensive manner, making it easier for students to absorb complex material such as the pillars of balanced nutrition and the "My Plate" concept (Hutasoit et al. 2025; Devi 2024; Rahayu et al. 2025) . Additionally, interactive educational methods through question-and-answer sessions provide students with the opportunity to clarify misconceptions, which ultimately effectively improves their collective knowledge scores.

In addition to maternal education, economic factors must be considered as a confounding variable influencing family dietary patterns. Even with high maternal education and adequate nutritional knowledge, limited purchasing power for nutritious food remains a significant barrier that restricts the implementation of a healthy diet at the household level. Therefore, education must be complemented by practical strategies, such as cooking demonstrations using affordable yet high-nutrient local food ingredients. This represents a tangible effort for health centers to improve the nutritional status of the community.

Regarding the research methodology, it is important to acknowledge certain limitations. The use of self-reported questionnaires is susceptible to normative bias, where respondents may provide answers deemed 'correct' or socially desirable, rather than reflecting their actual daily consumption behaviors.

This study makes an important contribution to the development of school health promotion programmes (UKS) by providing empirical evidence on the effectiveness of local nutrition education media. Theoretically, the results of this study reinforce the learning theory that appropriate cognitive interventions can trigger changes in understanding among adolescent groups. Practically, the material compiled in the leaflet can be reused by SMAN 19 Pekanbaru as additional teaching material in educating students about the principles of

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balanced nutrition and the concept of "Isi Piringku" (My Plate).

Although showing positive results, this study has limitations, including the use of a one-group pretest-posttest design without a control group, so that changes in knowledge cannot be fully compared with groups that did not receive the intervention. Furthermore, this study only measured knowledge levels in the short term (immediately after education), so it was un m to determine whether this knowledge would last or be implemented in real changes in eating behaviour in daily life.

Based on the results of the study, it is recommended that SMAN 19 Pekanbaru regularly hold nutrition education sessions in collaboration with the Community Health Centre or nutrition experts in order to maintain continuity of information for students. For future researchers, it is recommended to use a stronger research design such as a quasi-experiment with a control group and conduct a long-term evaluation (follow-up) to observe changes in eating behaviour. In addition, the development of educational media can be combined between print and digital media to better attract the interest of today's youth.

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CONCLUSION

The conclusion of this study shows that there is a significant effect of providing nutrition education through leaflets on increasing balanced nutrition knowledge among students at SMAN 19 Pekanbaru. This is statistically proven through a paired T-test, which shows a significant difference in scores before and after the intervention, where the respondents' knowledge level increased dramatically from the poor category to the good category. This success indicates that the use of practical and informative educational media is very effective in conveying health messages such as the pillars of balanced nutrition and the "My Plate" concept to adolescents. Thus, providing planned nutrition education can be a strategic solution in efforts to improve students' understanding of nutrition in order to support a healthy lifestyle and prevent health problems in the future.

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AUTHOR CONTRIBUTION STATEMENT

The author, Y.S, was fully responsible for the entire research process, from formulating ideas, collecting primary data at SMAN 19 Pekanbaru, analysing data using statistical tests, to compiling the final manuscript. Supervisor I, T.A, contributed by providing substantive guidance, methodological guidance, and conducting critical reviews and corrections of the thesis draft to ensure its scientific validity. Supervisor II, Y.E, provided technical guidance on balanced nutrition, offered motivation, and reviewed the research instruments and data analysis results.

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