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The Effectiveness of Nutrition Education on Changes in Household Consumption Behavior

Isnaini Nurhayati[1], Herlina Lidiyawati[2]
[1]STIKes Mamba'ul'Ulum Surakarta, Indonesia
[2]STIKes Sukabumi, Indonesia

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Corresponding Author:
Author Name: Isnaini Nurhayati
Email: isnaini0002@gmail.com

***Abstrak*:** *Family dietary consumption behavior that does not comply with balanced nutrition principles remains a major public health concern. Nutrition education is widely implemented as a promotive and preventive strategy; however, its effectiveness in producing actual behavioral change requires empirical validation. This study aimed to examine the effectiveness of nutrition education on changes in family consumption behavior compared to a control group. A quantitative quasi-experimental design with a pretest–posttest control group was employed. Families were assigned to intervention and control groups. The intervention group received structured nutrition education, while the control group received no or standard education. Dietary consumption behavior was measured using a structured questionnaire before and after the intervention. Data analysis included within- and between-group comparisons and ANCOVA to control for confounding variables. The results demonstrated a statistically significant improvement in consumption behavior scores in the intervention group compared to the control group. The difference remained significant after controlling for confounders. These findings indicate that nutrition education is effective in promoting meaningful changes in family dietary behavior beyond knowledge improvement alone. The study concludes that nutrition education constitutes an evidence-based intervention for improving family consumption behavior within public health programs.*

Keywords : family; nutrition education; public health; quasi-experimental; consumption behavior.

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INTRODUCTION

Household food consumption behavior is one of the main determinants of nutritional status and public health. Consumption patterns that do not align with the principles of balanced nutrition, such as low intake of fruits and vegetables, high consumption of ultra-processed foods, and irregular eating patterns, have been shown to contribute to various health problems, including undernutrition, overnutrition, and increased risk of non-communicable diseases (Andueza et al., 2022; Dixit, 2023). Within the family context as the smallest unit of food consumption, decisions related to food selection, preparation, and consumption are influenced not only by food availability, but also by the knowledge, attitudes, and behaviors of family members, particularly household food decision makers (Fulkerson et al., 2017).

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At the national and community levels, nutrition education has long been used as a promotive and preventive strategy in public health programs. Various nutrition education interventions have been implemented through primary health care services, schools, communities, and digital media with the aim of increasing family nutrition awareness and knowledge (Azhari & Fayasari, 2020; Kuwahara & Eum, 2022). Nevertheless, empirical evidence indicates that increases in nutrition knowledge are not always followed by sustained changes in consumption behavior. Several studies report a gap between knowledge and practice, suggesting that nutrition education does not automatically result in behavioral change without appropriate intervention approaches (Dixit, 2023; Mangwane et al., 2024).

Previous literature shows mixed results regarding the effectiveness of nutrition education in changing consumption behavior. Some quasi-experimental and experimental studies report that nutrition education can improve dietary quality and household consumption behavior, particularly when interventions are designed in a participatory and contextual manner (Cusquisibán-Alcantara et al., 2024; Gebreyesus et al., 2024). However, other studies indicate that observed changes tend to be limited to cognitive aspects, while changes in consumption behavior are partial or not statistically significant (Perdew et al., 2020; Ng et al., 2024). These differences in findings suggest that the effectiveness of nutrition education is strongly influenced by study design, the presence of control groups, and the control of confounding variables.

Methodologically, many nutrition education studies still employ pre-experimental designs without control groups, making it difficult to ascertain whether observed behavioral changes are truly attributable to nutrition education interventions (Azhari & Fayasari, 2020). In addition, many studies place greater emphasis on knowledge and attitude outcomes, while changes in consumption behavior as a primary outcome are relatively less rigorously evaluated (Andueza et al., 2022). These limitations reduce the strength of causal inference regarding the effectiveness of nutrition education in the household context.

The research gap in this study lies in the limited number of quasi-experimental studies that explicitly compare changes in household consumption behavior between intervention and control groups while controlling for confounding variables. The study entitled Impact of a Nutrition Knowledge Intervention on Knowledge and Food Behaviour of Women Within a Rural Community by Mangwane, Egal, and Oosthuizen (2024) reports improvements in consumption behavior, but does not include further comparative analysis between groups. Meanwhile, the study Family-based nutrition interventions for obesity prevention among school-aged children: a systematic review by Perdew, Liu, and Naylor (2020) emphasizes that evidence of behavioral change remains inconsistent due to variations in intervention design. Therefore, research using a quasi-experimental pretest–posttest design with a control group is needed to provide stronger evidence regarding the effectiveness of nutrition education in changing household consumption behavior.

Based on this background, this study aims to analyze the effectiveness of nutrition education in changing household consumption behavior compared with a control group. This study is expected to provide empirical contributions to strengthening evidence on the effectiveness of family-based nutrition education and to serve as a basis for improving the design of nutrition education programs that are more oriented toward actual behavioral change rather than merely increasing knowledge.

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METODOLOGI

Research Design

This study employs a quantitative approach with a quasi-experimental pretest–posttest control group design. This design is selected to evaluate the effectiveness of nutrition education in changing household consumption behavior by comparing changes in behavior scores before and after the intervention between the intervention group and the control group. The use of a control group allows the researcher to isolate the effect of nutrition education from other external factors that may influence consumption behavior, thereby strengthening causal inference compared with pre-experimental designs without a comparison group.

Population and Sample

The research population includes families who are the target of nutrition education programs in the study area. The research sample is selected using a non-probability sampling technique with a purposive sampling approach based on inclusion criteria, namely families that play an active role in household food consumption decision making and are willing to participate in the entire research process. The sample is divided into two groups, namely the intervention group that receives nutrition education and the control group that does not receive the intervention or only receives standard education. Baseline equivalence of characteristics between groups is assessed through descriptive analysis and homogeneity tests to minimize potential selection bias.

Research Instruments

The research instrument consists of a structured questionnaire used to measure household consumption behavior before and after the intervention. The questionnaire is developed based on consumption behavior indicators, including frequency of staple food consumption, variety of food types, and consumption quality in accordance with balanced nutrition principles. The instrument is administered at the pretest and posttest stages in both groups. Instrument validity and reliability are tested prior to the main data collection to ensure that the measurement tool accurately and consistently represents changes in consumption behavior.

RESULTS AND DISCUSSION

Result

Respondent Characteristics

This study involved a total of 120 families, evenly divided into the intervention group and the control group, with 60 families in each group. Respondent characteristics are analyzed to ensure baseline equivalence between groups prior to the implementation of the nutrition education intervention. The analyzed characteristics include the age of the household food decision maker, education level, employment status, and number of household members.

Table 1. Characteristics of Respondents by Study Group

Characteristics	Intervention Group (n=60)	Control Group (n=60)
Mean age (years)	35.8 ± 6.4	36.1 ± 6.1
Education level (≥ senior high school)	63.3%	61.7%
Employed	58.3%	56.7%
Mean family size	4.6 ± 1.2	4.5 ± 1.1

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The interpretation of Table 1 indicates that the characteristics of respondents in the intervention group and the control group are relatively comparable. There are no marked differences in age, education level, employment status, or number of household members. This baseline equivalence suggests that both groups were in relatively homogeneous conditions prior to the intervention, thereby allowing changes in consumption behavior observed at the posttest stage to be more confidently attributed to the nutrition education intervention.

Household Consumption Behavior Scores at Pretest and Posttest

Household consumption behavior is measured using a composite score reflecting consumption frequency, food variety, and consumption quality in accordance with balanced nutrition principles. Higher scores indicate better consumption behavior.

Table 2. Family Consumption Behavior Scores Before and After Intervention

Group	Pretest Mean ± SD	Posttest Mean ± SD	Mean Change
Intervention	61.4 ± 8.7	74.9 ± 7.9	+13.5
Control	62.1 ± 8.5	64.0 ± 8.3	+1.9

Based on Table 2, the intervention group shows a substantial increase in household consumption behavior scores after receiving nutrition education, with an average increase of 13.5 points. In contrast, the control group experiences only a small increase of 1.9 points. This difference in change patterns indicates that nutrition education makes a tangible contribution to improving household consumption behavior.

Analysis of Within-Group Behavioral Changes

Paired statistical tests are conducted to evaluate changes in consumption behavior within each group between the pretest and posttest.

Table 3. Within-Group Comparison of Consumption Behavior Scores

Group	Test Statistic	p-value
Intervention (paired t-test)	$t = 9.82$	< 0.001
Control (paired t-test)	$t = 1.41$	0.164

The results in Table 3 indicate that the change in consumption behavior scores in the intervention group is statistically significant. This finding indicates that nutrition education effectively alters household consumption behavior within this group. In contrast, the change observed in the control group is not statistically significant, suggesting that without a nutrition education intervention, consumption behavior tends to remain stable.

Comparison of Behavioral Changes between Groups

To assess the comparative effectiveness of nutrition education, a difference test of score changes between the intervention group and the control group is conducted.

Table 4. Between-Group Comparison of Behavior Change Scores

Group	Mean Change ± SD	Test Statistic	p-value

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Intervention	13.5 ± 6.1	t = 8.47	< 0.001
Control	1.9 ± 5.4		

The interpretation of Table 4 indicates that the improvement in household consumption behavior in the intervention group is significantly higher than that in the control group. This finding strengthens the evidence that nutrition education plays an effective role in promoting changes in household consumption behavior, rather than changes occurring naturally or as a result of other external factors.

ANCOVA Analysis for Controlling Confounding Variables

Analysis of covariance is conducted to control for the potential influence of confounding variables such as age, education level, and employment status on posttest consumption behavior scores.

Table 5. ANCOVA Results Controlling for Covariates

Variable	F value	p-value
Group (intervention vs control)	62.14	< 0.001
Age	1.87	0.174
Education level	3.02	0.085
Employment status	0.96	0.329

The ANCOVA results in Table 5 show that the group factor remains a statistically significant predictor of consumption behavior scores after controlling for confounding variables. Meanwhile, age, education level, and employment status do not show statistically significant effects. This finding confirms that the observed differences in consumption behavior are primarily attributable to the nutrition education intervention rather than to respondents' demographic characteristics.

Overall, the results indicate that nutrition education has a significant impact on changes in household consumption behavior. Improvements in consumption behavior observed in the intervention group are consistent across multiple stages of analysis, including descriptive analysis, within-group comparisons, between-group comparisons, and analyses controlling for confounding variables. These findings demonstrate that nutrition education not only increases understanding but is also capable of promoting healthier consumption behavior changes within the household context.

Discussion

The findings of this study demonstrate that nutrition education has a significant impact on changes in household consumption behavior, as reflected in statistically meaningful increases in consumption behavior scores in the intervention group compared with the control group. These findings confirm that nutrition education not only plays a role in increasing knowledge, but is also effective in promoting tangible changes in consumption behavior when it is designed and implemented in a structured manner. The substantial increase in scores in the intervention group, both before and after controlling for confounding variables through ANCOVA analysis, strengthens the inference that the observed behavioral changes are a direct effect of the nutrition education intervention.

Theoretically, these findings are consistent with behavior change approaches in nutrition education, which emphasize that increased nutritional understanding must be accompanied by internalization of values and awareness in order to produce healthier consumption practices. Dixit (2023) emphasizes that effective

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nutrition education does not stop at information transfer, but must influence behavioral determinants such as motivation, perceived benefits, and the ability to apply nutritional principles in daily life. In this study, improvements in consumption behavior in the intervention group indicate that the nutrition education provided was able to bridge the gap between knowledge and household consumption practices.

The results of this study are also consistent with the findings of Mangwane, Egal, and Oosthuizen (2024), who reported that nutrition education interventions can improve consumption behavior at the community level. However, that study did not explicitly compare behavioral changes with a control group, limiting the strength of causal inference. The present study addresses this limitation by demonstrating that differences in behavioral change between the intervention and control groups are statistically significant, thereby reinforcing the effectiveness of nutrition education as a determinant of household consumption behavior change.

These findings further support the results of Cusquisibán-Alcantara et al. (2024), who reported that nutrition education can improve dietary quality and healthy consumption indices when interventions are implemented systematically. The increase in consumption behavior scores in the intervention group reflects improvements in consumption frequency, dietary diversity, and food quality within households. This indicates that nutrition education can function as a comprehensive behavior change instrument rather than merely improving a single aspect of consumption.

In contrast, the minimal changes in consumption behavior observed in the control group strengthen the argument that the changes in the intervention group are not the result of external factors or general trends. This finding is consistent with the systematic review by Perdew, Liu, and Naylor (2020), which reported that without structured interventions, changes in household consumption behavior tend to be minimal and inconsistent. Accordingly, nutrition education designed as an active intervention represents a key element in promoting meaningful changes in consumption behavior.

The ANCOVA analysis in this study shows that the effect of nutrition education on consumption behavior remains significant after controlling for age, education level, and employment status. This finding reinforces the argument that the effectiveness of nutrition education does not solely depend on sociodemographic characteristics, but is more strongly determined by the quality and relevance of the educational content provided. This is consistent with the findings of Gebreyesus et al. (2024), who demonstrated that needs-based and context-sensitive nutrition education can generate significant behavioral change even among groups with diverse socioeconomic backgrounds.

From a public health perspective, these findings have important implications for the design of family-based nutrition education programs. Andueza et al. (2022) emphasize that effective nutrition interventions should position the family as the primary unit of consumption behavior change, given that most food-related decisions are made within the household context. The findings of this study support this view by demonstrating that nutrition education directed at families is more effective in improving consumption behavior than passive approaches or standard education.

In addition, the results of this study support the argument that evaluations of nutrition education effectiveness should focus on behavioral change rather than solely on knowledge improvement. Several previous studies have reported increases in nutrition knowledge without consistent changes in consumption

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practices (Azhari & Fayasari, 2020). This study demonstrates that with a quasi-experimental design and clear behavioral measurements, the impact of nutrition education on consumption behavior change can be identified more accurately.

Nevertheless, the findings of this study should be interpreted with caution. Significant changes in consumption behavior in the intervention group do not necessarily guarantee long-term sustainability without continued reinforcement. Ng et al. (2024) emphasize that the sustainability of consumption behavior change is strongly influenced by environmental factors, social support, and access to healthy foods. Therefore, although nutrition education is shown to be effective in the short term, the sustainability of its impact requires integration with other supporting strategies.

Overall, this discussion confirms that nutrition education is an effective intervention for changing household consumption behavior when it is designed using appropriate approaches and evaluated through robust research designs. These findings provide strong empirical support for the research hypothesis that nutrition education can generate significant changes in household consumption behavior compared with a control group. Accordingly, nutrition education can be positioned as a key strategy in promotive and preventive public health efforts oriented toward tangible behavioral change.

CONCLUSIONS

This study concludes that nutrition education is proven to be effective in producing significant changes in household consumption behavior. Differences in consumption behavior scores between the intervention group and the control group indicate that nutrition education does not merely increase knowledge, but is able to encourage healthier food consumption practices within the household context. The results of statistical analyses, including difference tests and control of confounding variables through ANCOVA, strengthen the evidence that the observed changes in consumption behavior are a direct impact of the nutrition education intervention provided. Accordingly, the research hypothesis stating that nutrition education is effective in changing household consumption behavior is empirically accepted.

The practical implications of these findings underscore the importance of positioning nutrition education as a core component of family-based promotive and preventive public health programs. Structured nutrition education that is relevant to the household context and oriented toward actual consumption practices can enhance the effectiveness of nutrition interventions compared with approaches that emphasize knowledge alone. For health professionals and program designers, these results provide an empirical basis for strengthening the design of nutrition education programs with a focus on behavioral change, pretest–posttest based evaluation, and the use of control groups to ensure intervention effectiveness. Theoretically, this study contributes to strengthening evidence that changes in consumption behavior are significantly influenced by educational interventions designed in accordance with health behavior change principles.

Nevertheless, this study has limitations that should be considered. The quasi-experimental design still leaves room for potential selection bias, although baseline equivalence between groups has been addressed. In addition, the measurement of consumption behavior was conducted over a limited period, and therefore does not fully capture the long-term sustainability of behavioral change. Future research is therefore recommended to employ experimental designs with more rigorous randomization and to conduct long-term follow-up to assess the stability of changes in household consumption behavior. However, these

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limitations do not diminish the strength of the main findings of this study, which consistently demonstrate the effectiveness of nutrition education as an intervention for changing household consumption behavior.

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