



Eating Behavior: How Food Safety Knowledge and Attitude Influence Individual's Food Choices

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Abstract

Non-communicable diseases (NCDs) such as obesity are on the rise in Indonesia. This increase is suspected to be because individuals are unable to maintain healthy food choices. It is hypothesized that personal factors, such as knowledge and attitudes towards food safety, can influence individuals in selecting healthy foods. This study is designed to investigate the influence of knowledge and attitudes towards food safety on healthy food choices among individuals. The research design used is a quasi-experimental study in a laboratory setting using a Fake Food Buffet. The targeted number of participants is 146 university students. This study shows that knowledge and attitudes towards food safety significantly influence healthy food choices. Additionally, knowledge of food safety partially influences healthy food choices. However, attitudes towards food safety do not influence healthy food choices. These findings are important considerations in designing interventions to increase public knowledge about food safety issues, which can reduce the incidence of non-communicable diseases in the future.

Keywords: Knowledge; attitudes; food safety; food choices.

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Introduction

Food choices are one of the important factors affecting individual health levels. Currently, changes in food choices occurring in industrialized countries can increase Non-Communicable Diseases (NCDs) (Gallo et al., 2020; Willett et al., 2019). As a result of NCDs, 41 million individuals die each year, with 77% of deaths occurring in low- and middle-income countries (World Health Organization, 2023). In Indonesia, the prevalence of NCDs has increased from 2013 to 2018, such as the prevalence of high blood pressure increasing from 25.8% to 34.1%, and obesity increasing from 14.8% to 21.8% (Basic

Health Research, [2018](#)). Therefore, to minimize the risk of rising Non-Communicable Diseases (NCDs), it is recommended to choose healthier foods (Fadnes et al., [2022](#); Schulze et al., [2018](#)).

Healthy food choices involve selecting foods and beverages from various food groups rich in nutrients. Healthy food choices include a variety of fruits, fresh vegetables, whole grains, legumes, nuts, and lean meats (Cena & Calder, [2020](#)), and contain the micronutrients and macronutrients needed by the body as energy sources (FAO, [2021](#); Morris & Mohiuddin, [2022](#)), such as protein, carbohydrates, vitamins, and minerals (Chen et al., [2018](#); Morris & Mohiuddin, [2022](#)). Habitually choosing healthy foods and increasing physical activity can reduce the risk of diabetes by 58%, high blood pressure by 66%, and heart attack and stroke by 40-60% (Ministry of Health of the Republic of Indonesia, [2012](#)). Therefore, choosing healthy foods can reduce health risks and increase life expectancy in adulthood (Fadnes et al., [2022](#); Yip et al., [2019](#)). However, choosing healthy foods is complex due to various personal factors (Carruba et al., [2023](#)).

Personal factors, such as food safety knowledge, are suspected to influence healthy food choices. Previous research indicates that individuals aware of the dangers of bacteria in raw meat tend to be more cautious to avoid consuming undercooked meat (Parreiras et al., [2020](#)). Additionally, they also use primary information displayed on food labels to choose food products (Grujic et al., [2013](#)). Other studies have also stated that individuals with food safety knowledge are more likely to implement food safety practices when choosing foods in stores (Mihalache et al., [2021](#)). However, some research has found that individuals with healthy food knowledge tend to choose fast food, consume unhealthy foods, and have excessive salt intake (Brown et al., [2000](#); Croll et al., [2001](#); Kabir et al., [2016](#)). Therefore, it is predicted that other personal factors influence healthy food choices besides food safety knowledge.

Food safety attitudes are another personal factor suspected to influence individuals' healthy food choices. Previous research indicates that individuals' food safety attitudes affect healthy eating behaviors (Liu et al., [2021](#); Wongprawmas et al., [2021](#)). This is consistent with other studies where

food safety concerns influence individual eating patterns and thus affect their food choices preferences (Isanovic et al., 2023). Attitudes can be positive or negative depending on values, beliefs, and experiences (Lobb et al., 2007). People with positive attitudes tend to implement safety practices such as checking expiration dates when choosing products they buy. However, many people still disregard health and food safety regulations (Tanurahardja & Juanda, 2021). This may explain that food safety attitudes in choosing healthy foods are not yet fully consistent. Further research is needed to investigate the influence of food safety knowledge and attitudes on individuals' healthy food choices and to determine appropriate interventions to improve health through individuals' food selection habits.

The method used in Indonesia differs from those used in Western countries. Researchers have found weaknesses in previous studies in Indonesia, where data collection methods use false scenarios and are subjective (Dewanti et al., 2022; Dibb-Smith & Brindal, 2015; Risti et al., 2021). Few researchers use behavioral measurements to determine food choices. These shortcomings form the basis for improvement and development of this research. Therefore, this study will use behavioral measurement as an objective and accurate tool to investigate the impact of food safety knowledge and attitudes on individuals' healthy food choices.

This research aims to address limitations found in previous studies in Indonesia. In earlier research, data on food choices were often collected using fictional scenarios and relied on subjective responses (Dewanti et al., 2022; Dibb-Smith & Brindal, 2015; Risti et al., 2021), which may not fully capture real-life food choices. Very few studies have used direct behavioral measurements to understand food choices, which is a more objective and accurate approach. Therefore, the novelty and contribution of this study lie in using a quasi-experimental design with more precise tool to investigate how food safety knowledge and attitudes influence healthy food choices. The originality of this research is in its methodological approach, which is more measurable and accurate compared to past studies, aiming to provide deeper insights into the personal factors that affect healthy food choices, especially in Indonesia.



Method

Design

This study utilized a quasi-experimental design with a manipulation setup in a controlled environment. Participants chose their own food in a controlled setting, creating a "control condition" to observe natural food selection behaviors. The aim was to assess the impact of food safety knowledge and attitudes on healthy food choices in a realistic yet controlled scenario. The controlled setting ensured consistency in the environment, minimizing external factors that could influence food choice.

Participants

The participants in this study were undergraduate students aged 17-25 years. The required sample size was calculated using the G*Power 3.1.9.4 statistical software (Erdfelder et al., 2009), with parameters set at an effect size of $d = 0.15$, $\alpha = 0.05$, and power = 0.9, resulting in a minimum sample size of $N = 107$. A total of 146 students were recruited to account for potential incomplete data. Participants were selected through purposive sampling based on the following inclusion criteria: participants should not have a vegetarian or vegan lifestyle, should have no food or beverage allergies, and should not be on any special dietary regimen. Ethical approval was granted by the Health Research Ethics Committee of Semarang State University (Approval No. 409/KEPK/2023).

Measurements

Food choices were measured using the Fake Food Buffet (FFB) method (Bucher et al., 2012), which includes replica foods made from plastic to simulate a real food selection environment. The FFB has a validated accuracy score of 0.76 and a test-retest reliability score of 0.80. Participants were asked to choose from 24 food items across five categories: meat, carbohydrates, vegetables, desserts, and beverages. Healthy food options included items such as grilled chicken, rice, and mineral water, while unhealthy options included fried chicken, chips, and soda. This method was chosen to ensure ease of data collection and maintain cleanliness during the study.

Food safety knowledge and attitudes were measured using a scale adapted from Medeiros et al. (2004), based on five food safety behavior constructs: personal hygiene, thorough cooking, cross-contamination prevention, safe temperature storage, and avoiding unsafe food sources. For example, in the knowledge scale, respondents might be asked whether they know that hands should be washed with soap for at least 20 seconds before handling food (personal hygiene), that poultry should be cooked to an internal temperature of 75°C to ensure bacteria are killed (thorough cooking), and that food should be stored at temperatures below 4°C to prevent bacterial growth (safe temperature storage). Meanwhile, the attitude scale includes statements to gauge respondents' views on food safety practices, such as the importance of using separate cutting boards for raw meat and vegetables (cross-contamination prevention), preferring to store food in the refrigerator rather than at room temperature (safe temperature storage), and avoiding food purchased from places that may not meet cleanliness standards (avoiding unsafe food sources). These items collectively assess individuals' knowledge and attitudes about safe food handling and storage practices. The knowledge scale showed a validity index between 0.01 and 1.00, with a reliability score of 0.82. The attitude scale, consisting of 10 statements, had a validity range of 0.001 to 0.242 and a reliability score of 0.89.

Procedure

The study was conducted on 1 November 2023 during regular mealtimes (breakfast and lunch). Participants were recruited through various channels, including WhatsApp, Instagram, printed brochures, and class visits. After consenting to participate, participants completed the food safety knowledge and attitude scales, followed by the FFB selection, where they chose foods as if preparing a meal for themselves. The study was conducted during regular mealtimes, specifically breakfast and lunch, to capture realistic food selection behavior. Participants were recruited through various channels such as WhatsApp, Instagram, printed brochures, and direct class visits. After agreeing to participate, they first completed the food safety knowledge and attitude scales. Once this initial assessment was complete, participants moved on to the Food Frequency Behavior (FFB) selection task. In this step, they were presented with a range of food options and instructed to select items as if

preparing a meal for themselves. This task aimed to simulate a real-life meal preparation scenario, where participants would choose foods based on their preferences and knowledge of food safety. After completing the FFB selection, participants were thanked, debriefed about the study's purpose, and given a small souvenir as a token of appreciation.

Data Analysis

Data entry and analysis were performed using IBM SPSS Statistics version 25.0 (SPSS Inc., USA). Descriptive statistics were used to evaluate participants' food safety knowledge, attitudes, and food choices. Multiple linear regression analysis was conducted to assess the influence of food safety knowledge and attitudes on healthy food choices, with a significance level of 0.05.

Result

All participants completed the data collection in this experiment, and the obtained data were included in the analysis. [Table 1](#) shows that there is a significant influence of food safety knowledge and attitudes on healthy food choices (p -value = 0.045). This indicates that individuals tend to choose healthy foods when they have knowledge and attitudes towards food safety.

Table 1

The Simultaneous Influence of Food Safety Knowledge and Attitudes on Healthy Food Choices

	Model	Sum of Squares	Df	M	F	p -value
I	Regression	3828,997	2	1914,498	3,181	0,045
	Residual	86072,053	143	601,902		
	Total	89901,050	145			

Based on the data shown in [Table 2](#), it is evident that this study has a small effect size, $R^2 = .043$. This means that food safety knowledge and attitudes collectively contribute 4.3% to individuals' healthy food choices.

Table 2
Pearson Correlation Test Results

Model	R	R ²	Adjusted R Square	Std. Error of the Estimate
1	.206 ^a	.043	.029	24.53370

The findings in [Table 3](#) show that knowledge has a significant influence on healthy food choices (p-value = 0.016). However, food safety attitudes do not affect healthy food choices (p-value = 0.337). The regression equation obtained in [Table 3](#) is $Y = 65.23 + 2.162 X_1 - 0.700 X_2$, where Y represents the variable of healthy food choices, X₁ represents food safety knowledge, and X₂ represents food safety attitudes. The constant value of 65.23 indicates the initial value in the regression equation. From this equation, it can be concluded that with other variables considered constant, the value of Y can change by the constant value of 65.23. Additionally, for each unit increase in X₁, the value of Y will increase by 2.162, while X₂ does not cause any change in Y.

Table 3
Partial Influence of Food Safety Knowledge and Attitudes on Healthy Food Choices

Model	Unstandardized Coefficients		Standardized Coefficients	p-value
	B	Std. Error	β	
1				
(Constant)	65.232	20.561		.002
Knowledge	2.162	.883	.203	.016
Attitude	-.700	.728	-.080	.337

Discussion

The results of this study confirm the hypothesis that there is an influence of the interaction effect between food safety knowledge and attitudes on healthy food choices. This means that individuals who

have food safety knowledge and attitudes tend to choose healthier foods. Partially, food safety knowledge has a significant positive influence on healthy food choices. Unlike knowledge, food safety attitudes do not significantly influence healthy food choices.

The contribution of the interaction between food safety knowledge and attitudes to food choices can be explained through the Knowledge-Attitude-Behavior (KAB) theory, developed by Bettinghaus (1986). This theory asserts that behavior change is influenced by an individual's knowledge and attitude. The pursuit of knowledge by individuals will result in positive or negative attitudes towards the targeted behavior (Kallgren & Wood, 1986). If individuals are provided with accurate information about health promotion and they change their attitudes, they will stop engaging in unhealthy behaviors and adopt healthier ones (Bettinghaus, 1986). The results of this study explain that the more individuals have good knowledge related to food safety, the more their attitudes towards food safety can change, thereby influencing healthy food choice behavior. Research conducted by Pratama et al. (2023) also showed positive results, indicating that high school students with food safety knowledge and attitudes are more likely to buy healthy snacks online.

The influence of an individual's food safety knowledge on healthy food choices demonstrates the strong role of knowledge on individual behavior. The better an individual's knowledge about the importance of health, the more likely they are to choose healthy foods (Barrett et al., 2020). This is because individuals can evaluate various food alternatives thoroughly to encourage the selection of healthy foods (Vettori et al., 2019). Knowledge about the dangers associated with the consumption of unsafe foods, such as food poisoning, can increase individual awareness of the potential risks they face. Psychologically, this response can trigger a "fight-or-flight" response, where individuals are motivated to avoid those risks. As a result, they tend to choose foods they consider safer and healthier. This aligns with previous findings that an international figure with knowledge of healthy foods prefers fortified staple foods to maintain health (Moxley et al., 2011). However, not all knowledge has behavioral consequences, for example, individuals with knowledge of healthy foods may still choose fast food



(Brown et al., 2000), consume unhealthy foods (Croll et al., 2001), and consume excessive salt (Kabir et al., 2016).

Unlike knowledge, food safety attitudes do not significantly influence healthy food choices. This may be due to limited food availability (Hafiz et al., 2023; Lazaroiu et al., 2019). When individuals face limited food availability, it can influence their attitudes and impact healthy food choice behavior (Rana & Paul, 2017). For example, when the available food choices are unhealthy and have poor safety standards, individuals may be forced to choose those foods even if their attitudes towards safety are good. Inadequate availability of healthy foods makes it easier for individuals to consume unhealthy foods, such as low-nutrition and high-fat foods (Story et al., 2006; Willett et al., 2019). This finding is also supported by Larson & Story (2009), who stated that the type, quantity, and storage of food available at home have a positive or negative impact on individual food choices, for example, households that provide more fruits and vegetables will consume more fruits and vegetables than households that do not provide them (Kratt et al., 2000). In this study, participants may have needed more variety in food choices.

The benefits of this study contribute both theoretically and practically. Theoretically, this study provides evidence that personal factors such as knowledge and individual attitudes, specifically food safety, influence healthy food choices. Practically, professionals in the health field can use education to develop attitudes towards food safety as an intervention strategy to improve healthy eating behavior. However, this study has limitations. The sampling was limited to the student category, so the implementation of the study results is limited to that category. Future research should expand the sample category with diverse social, economic, and status backgrounds.

Conclusion

This study investigates the influence of food safety knowledge and attitudes on healthy food choices. Through food safety knowledge and attitudes, individual food choices become much healthier.



Additionally, this study concludes that, partially, food safety knowledge affects healthy food choices. However, food safety attitudes do not affect healthy food choices. This means that when both knowledge and attitude factors interact, individual food choices become healthier. The study found that food safety knowledge and attitudes can influence healthy food choices. Personal factors such as knowledge and attitudes can be important considerations in designing interventions to increase public knowledge about food safety issues. It is hoped that by providing interventions, this can encourage the selection of healthier food choices. Furthermore, investigating the impact of other personal variables can provide a more comprehensive understanding of the complexity of factors influencing individual food choices.

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Author Contribution Statement

The author was responsible for proposing the research idea and design, designing the study, creating the module, writing the initial draft of the publication manuscript, coordinating the research implementation, and revising the publication manuscript. The academic advisor assisted in developing the research idea, guided the module creation, guided the drafting of the publication manuscript, and coordinated the research implementation.

Conflict of Interest

The researchers declare that this paper has no conflicts of interest.

Data Availability

Data can be provided upon request to the author.

Declarations Ethical Statement

The study followed the guidelines of the Declaration of Helsinki.

Informed Consent Statement

Informed consent was obtained from all persons involved in the study.

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Appendix



