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The Association Between Food Safety Knowledge and Attitude with Optimistic Bias among Food Handlers in Senior High School Canteens in Magelang City, Indonesia

Hubungan Antara Pengetahuan dan Sikap Keamanan Pangan dengan Bias Optimis pada Penjamah Makanan di Kantin SMA Negeri di Kota Magelang, Indonesia

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ABSTRACT

Background: Foodborne diseases are a significant global concern, with food available in educational institutions being a common source of food poisoning in Indonesia. The lack of attention to hygiene and sanitation by food handlers is a key factor, often influenced by optimistic bias, resulting in insufficient focus on proper food processing and serving procedures.
Objectives: To examine the correlation between food safety knowledge and attitudes with optimistic bias in food handlers in five State High Schools canteens, Magelang City.
Methods: This cross sectional study included a total of 41 food handlers who work at the canteens of five State High School, Magelang City. The independent variables were food safety knowledge and attitudes, while the dependent variable was optimistic bias. The categories of food safety knowledge variable consist of good and poor food safety knowledge. Food safety attitudes was categorized as positive attitudes and negative attitudes. The categories of variable optimistic bias consist of high, possible, and low optimistic bias. The Spearman correlation test was conducted.
Results: The results of the correlation test between food safety knowledge and attitudes with optimistic bias among food handlers in five State High School canteens, Magelang City showed p-value= 0,704 and 0,498.
Conclusions: Food safety knowledge and attitudes are not significantly correlated with optimistic bias among food handlers in five State High School canteens, Magelang City. Food safety training supervised by public health office is needed to improve the quality of service.

INTRODUCTION

Food poisoning is the third most common cause of poisoning after animals and household chemicals. In 2016 and 2022, students in the Magelang area of Indonesia experienced food poisoning after consuming snacks sold at school[1,2]. Many foods favored by students are made from ingredients prone to contamination by pathogenic microorganisms. Foodborne diseases can be transmitted through food prepared in canteens via contaminated water, unclean eating utensils, and poor personal hygiene of food handlers[3]. Additionally, food poisoning can result from dangerous food additives or microbes. Research undertaken at elementary schools in Bantul Regency, DI Yogyakarta (Special Region of Yogyakarta) found that many foods contained dangerous substances, such as formaldehyde, borax, and rhodamine-B[4]. Furthermore, meat, poultry, fish, eggs, and milk can harbor pathogenic microorganisms if they are not processed properly[5].

Attitudes are formed by cognitive, affective, and behavioral components, with the cognitive component including beliefs, knowledge, and perception[6]. Basic knowledge forms the foundation of an individual's way of thinking and influences their perception. Perception, particularly optimistic perception or optimistic bias, is a cognitive factor that influences attitudes. Studies on food hygiene have shown that knowledge was significantly related to the attitudes of food handlers in the Taman Jajan culinary area of South Tangerang[7]. However, knowledge of food hygiene does always ensure a positive attitude[8]. Furthermore, previous research has indicated no significant relationship between optimistic bias and

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the knowledge, attitudes, and food safety practices of food handlers[9].

Food handlers can play a critical role in the spread of diseases through food[10]. Even those with good knowledge of food safety and positive attitudes may underestimate their likelihood of experiencing negative outcomes, a phenomenon known as optimistic bias[11]. Such bias may result in people neglecting preventive behavior essential for maintaining their health[12]. This may explain why some food processing and serving procedures in food service institutions are overlooked, thereby compromising food safety[13].

The most serious food poisoning case involved 2,185 high school students[14], suggesting the critical importance of food safety in school canteens. However, no research has explored the relationships between optimistic bias and food safety knowledge and attitude among food handlers at school canteens in Magelang City. This study addresses this gap by examining these relationships among food handlers in the canteens of state high schools in Magelang City.

METHODS

This study employed quantitative, analytical research of an observational nature using a cross-sectional method. The research population comprised all the food handlers working in the canteens of five state high schools in Magelang City. The inclusion criteria of the respondents were food handlers who: a) had direct contact with food, including its preparation, processing, and distribution; b) sold food that they had made; and c) were willing to participate in research and provide informed consent. The exclusion criteria were food handlers who: a) were unable to read and write; or b) did not fully complete the questionnaire. Non-probability sampling, specifically total or saturated sampling, was used to determine the number of respondents. This technique was employed because the entire population group also served as the sample in this study owing to its relatively small size[15].

The independent variables of this study were food safety knowledge and attitude, and the dependent variable was optimistic bias. Subject characteristics were recorded using a subject identification form. Food safety knowledge was classified as good or poor, and food safety attitude was categorized as positive or negative. Optimistic bias was categorized as high, possible, or low. The optimistic bias of the food handlers was assessed by face-to-face interviews using a questionnaire whose validity and reliability had been tested on 30 canteen food handlers with similar characteristics from outside the research area.

A validity test showed that all six questions of the optimistic bias questionnaire were valid (r count > 0.361). In addition, the food safety knowledge questionnaire, which contained 12 statements and was tested on the above-mentioned 30 food handlers (r count > 0.361), and the food safety attitude questionnaire, which contained 10 statements, were also confirmed to be valid. Moreover, Cronbach's alpha values for the questionnaires on optimistic bias, food safety knowledge, and food safety attitude were 0.61, 0.74, and 0.83, respectively, all exceeding 0.60, indicating their reliability and suitability for use.

Optimistic bias was assessed using four questions that asked respondents to separately indicate their own risk and that of their peers of causing foodborne illness[12]. Each question was answered on a scale ranging from 1 ("very unlikely to occur" to 7 ("very likely to happen"). Positive and significant results indicated optimistic bias, with higher scores reflecting greater bias. If any questionnaire responses were incomplete or unclear, the enumerator directly clarified them with the research respondents. The Spearman correlation test was used for statistical analysis.

RESULTS AND DISCUSSIONS

Table 1 shows that among the 41 respondents, 40 were female (97.6%). Over half of the respondents (56.1%) were in the pre-elderly category (45–59 years). The largest number of respondents (29.3%) were from State High School E Magelang, and the most common level of education was senior high school (61.0%). Over half of the respondents (61.0%) had received food safety information and had worked as food handlers for at least 6 years (58.5%).

Table 1. Characteristics of Research Respondents

Characteristics	Food Handlers (n=41)	
	n	%
Gender		
a. Male	1	2,4
b. Female	40	97,6
Age		
a. Adolescent (10-19 years old)	1	2,4
b. Adult (19-44 years old)	15	36,6
c. Pre Elderly(45-59 years old)	23	56,1
d. Elderly (≥ 60 years old)	2	4,9
Canteen Location		
a. State High School A Magelang	9	22,0
b. State High School B Magelang	4	9,8
c. State High School C Magelang	8	19,5
d. State High School D Magelang	8	19,5

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e. State High School E Magelang	12	29,3
Education Level		
Low		
a. Not attending school	1	2,4
b. Elementary School	7	17,1
c. Junior High School	6	14,6
Intermediate		
a. Senior High School	25	61,0
High		
a. Diploma (D1/D2/D3)	1	2,45
b. Diploma 4 (D4)/Bachelor (S1)	1	2,45
c. Master (S2)	0	0
d. Doctor (S3)	0	0
Food Safety Information		
a. Never	16	39,0
b. Ever been	25	61,0
Work Experience		
a. New (<6 years)	17	41,5
b. Old (≥ 6 years)	24	58,5
Grocery Shopping Period		
a. Daily	41	100
b. Weekly	0	0

Note: Data reproduced from Sekarsari (2024)[16] and Khoirunisa' (2024)[17]

Table 2 shows that the average score of the respondents' food safety knowledge is 71.54%, which is classified as good, with the majority of respondents obtaining a score of 75.00%. The range of scores was from 33.33% to 91.67% (4 to 11 of 12 questions answered correctly). Nearly all respondents (95.1%) had a positive attitude toward food safety, with a maximum score of 100% and an average score of 73.9% in the food safety attitude questionnaire, which is classified as having a positive attitude. The questions on food safety knowledge covered five aspects of food handling: personal hygiene, cross-contamination of ingredients, temperature regulation and food storage, health conditions of food handlers, and symptoms of food poisoning[18].

Table 2. Distribution of Respondents' Food Safety Knowledge Scores

	Food Handlers' Food Safety Knowledge Score	Food Handlers' Food Safety Attitude Score
Mean	71,54	73,90
Median	75,00	70
Standard Deviation	14,55	12,22
Minimum	33,33	40
Maximum	91,67	100

Note:
Good food safety knowledge : score ≥ 70
Poor food safety knowledge : score < 70
Positive food safety attitude : score ≥ 50%
Negative food safety attitude : score < 50%
Data reproduced from Sekarsari (2024)[16]

Table 3. Distribution of Food Safety Knowledge Questionnaire Answers for Each Statement

No.	Statement	Answer Key	Answer According to the Key	
			n	%
1.	Washing your hands needs to be done after going to the toilet/latrine, handling money and body parts, such as hair and skin	Yes	39	95,12
2.	Consuming meat that is not fully cooked can cause illness with symptoms of vomiting and diarrhea.	Yes	39	95,12
3.	Smoking can affect the safety of the food served.	Yes	38	92,68

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4.	Hot food should be served hot and cold food should be served cold.	Yes	37	90,24
5.	Clean the cutting board used for cutting meat and poultry using a cloth when using it for cutting vegetables.	No	36	87,80
6.	Food can be served in open containers.	No	29	70,73
7.	Hypertension conditions in food handlers can affect the safety of the food served	No	27	65,85
8.	The use of accessories, such as rings, earrings and watches can cause food contamination.	Yes	24	58,54
9.	Thawing frozen food (thawing) can be done in a bowl with or without water and then left on the sink, table or kitchen table.	No	22	53,66
10.	Clean hands can prevent contamination of food. The correct way to wash your hands is to only use running water and then dry using a tissue.	No	21	51,22
11.	Contact between raw and cooked food, such as using lettuce to garnish food, can cause contamination of the food.	Yes	21	51,22
12.	The kitchen table can simply be cleaned using sanitizer.	No	19	46,34

Note: Data reproduced from Sekarsari (2024)[16]

As shown in Table 3, nearly all respondents (95.1%) correctly answered the questions related to hand washing and symptoms of food poisoning, but only 46.3% correctly answered the question on how to clean kitchen tables, with over half considering that they can be cleaned only using sanitizer.

Table 4. Distribution of Answers to Food Safety Attitudes for Each Statement

No.	Statement	Agree/ Disagree	Answer According to Propensity Positive Attitude	
			n	%
1.	The food ingredients that I process are good food ingredients, including fresh, undamaged and not rotten.	Agree	41	100
2.	I must wash my hands as a procedure to prevent food contamination	Agree	40	97,6
3.	Before use, I clean all the cooking utensils first.	Agree	40	97,6
4.	I am allowed to use newspaper as a food base.	Disagree	38	92,7
5.	I am allowed to continue working when I am sick.	Disagree	37	90,2
6.	After going to the bathroom, I have to wash my hands but don't have to use soap.	Disagree	36	87,8
7.	I must wear non-slip footwear when cooking food.	Agree	30	73,2
8.	I am allowed to eat while cooking food.	Disagree	23	56,1
9.	I am allowed to chat while preparing food because it can relieve stress.	Disagree	10	24,4
10.	I don't need to wear a mask when preparing food if I'm not sick.	Disagree	8	19,5

Note: Data reproduced from Khoirunisa' (2024)[17]

In the questionnaire on food safety attitude, four statements (1, 2, 3, and 7) corresponded to a positive attitude and six statements (4, 5, 6, 8, 9, and 10) corresponded to a negative attitude (Table 4). The more statements indicating a positive attitude and the fewer statements indicating a negative attitude agreed with by the respondents, the more positive their attitude toward hygiene and sanitation was considered to be. All food handlers had a positive attitude toward statements on the choice of food ingredients. However, only 19.5% had

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a positive attitude toward statements regarding personal hygiene during food processing (such as the use of personal protective equipment/PPE). These results suggest that many food handlers pay insufficient attention to personal hygiene during food processing.

Table 5. Distribution of Each Question Optimistic Bias of Respondents' Food Handlers

Optimistic Bias Questions	Mean	Standard Deviation
Q-1 What is the possibility of consumers/students experiencing vomiting > 1 time and severe stomach ache after consuming dishes cooked by you?	1,268	0,501
Q-2 What is the possibility of consumers/students experiencing vomiting >1 time and severe stomach ache after consuming dishes cooked by employees/food handlers who work in the same canteen as you?	1,390	0,703
Q-3 What is the possibility of consumers/students experiencing vomiting >1 time and severe stomach ache after consuming dishes cooked by employees/food handlers who work in the canteen? different from you?	1,659	0,794
Q-4 If consumers/students experience vomiting > 1 time and severe stomach pain after consuming food prepared by you, will the symptoms get worse and can cause death?	1,171	0,381
Q-5 What are the chances of you experiencing vomiting > 1 time and severe stomach ache after consuming food cooked by yourself?	1,220	0,475
Q-6 How confident are you that the food you cook and sell is safe?	1,366	0,662

Note: Data reproduced from Sekarsari (2024)[16] and Khoirunisa' (2024)[17]

Table 5 gives the mean and standard deviation for each item of the optimistic bias questionnaire. For all items, the standard deviation was less than the mean value, indicating a narrow distribution and little variability in response. This suggests that the data for each item are reliable.

Table 6. Proportion of Respondents' Answers related to Optimistic Bias

	0%	5%	25%	50%	75%	85%	100%
Q1	31	9	1	0	0	0	0
Q2	29	9	2	1	0	0	0
Q3	21	14	5	1	0	0	0
Q4	34	7	0	0	0	0	0
Q5	33	7	1	0	0	0	0
Q6	29	10	1	1	0	0	0

Note:

n	: 41		
Q1	: Question 1	Q4	: Question 4
Q2	: Question 2	Q5	: Question 5
Q3	: Question 3	Q6	: Question 6
0%	: Score 1	75%	: Score 5
5%	: Score 2	85%	: Score 6
25%	: Score 3	100%	: Score 7
50%	: Score 4		

Note: Data reproduced from Sekarsari (2024)[16]

Table 6 shows the proportions of the respondents' answers to the six questions in the optimistic bias questionnaire. Smaller total scores indicated greater optimistic bias of the food handler, with a total score of less than 24 considered to indicate high optimistic bias. The results show that the food handlers in the Magelang City State high school canteens had high optimistic bias, with an average total score of 8.073 (Table 7), far below the maximum obtainable score of 42, and over half of the respondents obtained the minimum

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possible score of 6. The highest total score obtained was 13. Namely, all respondents had high optimistic bias (Table 8).

Table 7. Distribution of Respondents' Food Handlers' Optimistic Bias Scores

Optimistic Bias Scores of Respondents' Food Handlers	
Mean	8,073
Median	7,000
Mode	6,000
Standard Deviation	2,328
Minimum	6,000
Maximum	13,000

Note: Data reproduced from Sekarsari (2024)[16] and Khoirunisa' (2024)[17]

Table 8. Distribution of Respondents Based on Optimistic Bias

Optimistic Bias	Food Handlers	
	n	%
Low Optimistic Bias	0	0
Possible Optimistic Bias	0	0
High Optimistic Bias	41	100
Total	**41**	**100**

Note:
n : number of respondents
High Optimistic Bias : score<24
Possible Optimistic Bias : score=24
Low Optimistic Bias : score>24
Note: Data reproduced from Sekarsari (2024)[16] and Khoirunisa' (2024)[17]

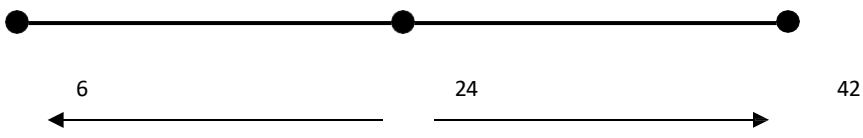

Figure 1. Food Handlers' Optimistic Bias Assessment Model

For the individual questions in the optimistic bias questionnaire, the average score increased in the order of question 1 (1.268) < question 2 (1.390) < question 3 (1.659). This means that the respondents had greatest optimistic bias toward themselves, followed by optimistic bias toward coworkers in the same canteen, then toward food handlers in other canteens. Namely, food handlers considered themselves to be less likely than their coworkers and even less likely than food handlers in other canteens to experience and cause food poisoning. These findings align with previous research conducted by da Cunha et al. (2015)[9], Rossi et al. (2017)[11], and de Andrade et al. (2019)[19].

Table 9. Relationship between Characteristics and Food Safety Knowledge and Attitudes among Respondents

	Food Safety Knowledge		Food Safety Attitude	
	r	*p-value*	r	*p-value*
Age	-0,099	0,539	-0,078	0,629
Education Level	0,252	0,113	0,058	0,720
Food Safety Information	0,295	0,061	-0,173	0,278
Work Experience	-0,148	0,357	-0,126	0,433

Note:
n : number of respondents
r : correlation coefficient
p-value : significance value
* : significant relationship
Note: Data reproduced from Sekarsari (2024)[16] and Khoirunisa' (2024)[17]

According to Table 9, there was no relationship between age and food safety knowledge among the food handlers in the Magelang City public high school canteens (p-value = 0.539 > 0.05). This finding is consistent with that of Rossi et al. (2017)[11], who observed no significant relationship between age and food safety knowledge among institutional food handlers in Sao Paulo, Brazil. In addition, Ahmed et al. (2021)[20] found no significant

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relationship between age and food safety knowledge among food handlers in Lahore, Pakistan. Although a person's knowledge is likely to increase with age, the food handlers in this study were mostly in the pre-elderly category, an age at which their level of knowledge may start to decrease[21].

No significant relationship was observed between education level and knowledge of food safety (p-value = 0.113). Webb et al. (2015)[22] also found a weak relationship between education level and food safety knowledge. No significance was also observed for the relationships of food safety information and length of work experience with food safety knowledge (p-value = 0.061 and 0.357, respectively).

In addition, a significant relationship was not observed between age, education, length of work experience, and information and food safety attitude (p-value = 0.629, 0.720, 0.278, and 0.433, respectively). While age is often associated with work productivity and can influence the formation of attitudes[23], cultural norms and practices may override age differences, making age a less decisive factor in influencing attitude[24]. Similarly, education provides opportunities to acquire knowledge, which can help foster positive attitudes[25]. However, knowledge, whether obtained through formal education or elsewhere, does not ensure a positive attitude[26]. Work experience also plays a role in forming attitudes[25], but entrenched attitudes often persist regardless of work experience[27]. Attitude formation begins with an awareness or willingness to respond to a stimulus[28]. In this study, the stimulus could include policies or cases of food poisoning[29]. If there is no awareness or stimulus at work, then the attitude of food handlers will not be positively influenced. Information, which is now widely accessible through various media, has the potential to broaden perspectives and foster positive attitudes[30]. However, cultural beliefs, economic constraints, and limited facilities can be obstacles to implementing measures to improve attitude[31].

Table 10. Relationship between Characteristics and Respondents' Optimistic Bias

	Optimistic Bias	
	r	***p-value***
Age	-0,317	0,043*
Education Level	0,219	0,169
Food Safety Information	-0,050	0,755
Work Experience	-0,089	0,579

Note:
n : number of respondents
r : correlation coefficient
p-value : significance value
* : significant relationship
Data reproduced from Sekarsari (2024)[16] and Khoirunisa' (2024)[17]

A significant relationship was observed between age and optimistic bias (p-value = 0.043), with a correlation coefficient of −0.317, suggesting that age was inversely related to optimistic bias in respondents. However, no significant relationship was observed between education level and optimistic bias (p-value = 0.169), between food safety information and optimistic bias (p-value = 0.755), or between length of work experience and optimistic bias (p-value = 0.579).

Increasing age is often associated with greater maturity and wisdom[6]. However, this is not always the case, because advancing age may lead to overconfidence or excessive optimism, with individuals believing that their past practices have been inherently correct. Such overconfidence can lead to greater optimistic bias[19].

Table 11. Relationship between Food Safety Knowledge and Attitudes with Respondents' Optimistic Bias

	Optimistic Bias									
	Low		**Possible**		**High**		**Total**		**r**	***p-value***
Knowledge	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**		
Poor	0	0	0	0	16	39	16	39	0,061	0,704
Good	0	0	0	0	25	61	25	61		
Total	0	0	0	0	41	100	41	100		
Attitude										
Negative	0	0	0	0	2	4,9	2	4,9		
Positive	0	0	0	0	39	95,1	39	95,1	-0,109	0,498
Total	0	0	0	0	41	100	41	100		

Note:
n : number of respondents
r : correlation coefficient
p-value : significance value
* : significant relationship
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Table 11 shows that of the 41 respondents, 16 (39.0%) had poor food safety knowledge and 2 (4.9%) had a negative attitude. In addition, 25 (61.0%) of respondents had good food safety knowledge and 39 (95.1%) had a positive attitude, but all respondents had high optimistic bias. The significance values obtained from the correlation tests of food safety knowledge and attitude with optimistic bias were 0.704 and 0.498, respectively, indicating that food safety knowledge and attitude were not significantly related to optimistic bias. These findings are consistent with those of research conducted in Brazil (da Cunha et al., 2015)[9], where no significant relationship was found between optimistic bias and the attitudes and practices of food handlers in food service institutions. Perception, including optimistic bias, is complex and multifaceted, which may explain why it was not significantly related to food safety knowledge and attitude in this study. More in-depth measurement tools and research methods are needed to explore these relationships in greater depth[32].

A strength of this research is that there has been little previous study of optimistic bias in food handlers in Indonesia, including in school canteens. This study can be followed up by further investigation of the psychological aspects of food handlers when planning food safety training. In addition, the use of a total sampling technique in the data collection ensured that all respondents were food handlers working in state high schools in three subdistricts of Magelang City. However, this study had some limitations. First, despite using a total sampling technique method, the small number of respondents and the uneven distribution of the characteristics of the food handlers limited the ability to fully represent the phenomenon of optimistic bias and attitudes to sanitation hygiene. Second, the respondents had difficulty explaining their perceptions regarding potential negative risks to themselves and consumers, meaning that the answers tended to be retrospective. This is thought to be caused by the optimistic bias questionnaire, which people can have multiple perceptions to fill it out even though it was verified to be valid and reliable. However, this problem was minimized by efforts by the researchers to clarify the participants' responses related to optimistic bias during the administration of the questionnaire.

CONCLUSIONS

No significant correlations were found between food safety knowledge and attitude and optimistic bias among the respondents in this study. The food handlers tended to be overly optimistic that they were unlikely to cause foodborne illnesses, despite their important role in providing safe and healthy food. This study can be used as a valuable reference for schools in developing and evaluating hygiene and sanitation policies for food handlers to improve canteen management and ensure the health and safety of school communities. It is recommended that educational activities be implemented in collaboration with Magelang City Health Service to increase the awareness, knowledge, and vigilance of food handlers, with a focus on the psychological aspect of optimistic bias to prevent cases of food poisoning at schools.

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CONFLICT OF INTEREST AND FUNDING DISCLOSURE

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AUTHOR CONTRIBUTIONS

DB, YP, JP: conceptualization, research design; KAS, AK: data collection; DB, YP, JP, KAS, AK: data analysis and interpretation, editing and finalization of manuscript.

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