

Development of an Evaluation Tool for the Community-Based Safe Food Market Program and Analysis of Food Traders' Knowledge, Attitudes and Behavior

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To ensure food safety, the Indonesian government, through the Indonesian Food and Drug Authority, has implemented a food safety intervention program in traditional markets known as the "Program Pasar Pangan Aman Berbasis Komunitas" (Community-Based Safe Food Market Program). Knowledge, attitudes, and behaviors of traditional market communities are essential to assure the quality and safety of the food sold in traditional markets. This study aims to develop an evaluation instrument to measure the knowledge, attitudes, and behaviors of market communities and to apply it to collect information on aspects in locations where the food safety intervention program has been implemented. The questionnaire was developed through a discussion with the expert, validity and reliability testing of the questionnaire item, and final evaluation. Validity testing using data from 30 respondents across Indonesia and three market locations showed that 44 items of the officer questionnaire, 42 items of the vendor questionnaire, and 35 items of the visitor questionnaire were valid and had moderate to high reliability. The final questionnaire comprises 30 items in the officer questionnaire series, 30 in the vendor questionnaire series, and 20 in the visitor questionnaire series. The vendor questionnaire was administered via a survey, with total sampling used to select respondents. A survey on the food vendors in the market was conducted using the total sampling technique. The average food vendors show good knowledge ($8 \pm 1,04$, scale of 10), positive attitudes ($41,00 \pm 2,04$, scale of 50), and proper behavior ($42,64 \pm 3,25$, scale of 50). Correlation analysis indicates that only the selling period shows a significant correlation with food vendors' knowledge level. The developed instrument is adequate for use in measuring the impact of the ongoing national food safety program.

Pemerintah Indonesia melalui Badan Pengawas Obat dan Makanan telah melakukan intervensi keamanan pangan di pasar tradisional dalam bentuk Program Pasar Pangan Aman Berbasis Komunitas. Pengetahuan, sikap, dan perilaku komunitas pasar di lokasi yang sudah diintervensi program penting untuk diketahui dampaknya terhadap mutu dan keamanan pangan. Penelitian ini bertujuan untuk mengembangkan instrumen evaluasi yang dapat mengukur pengetahuan, sikap, dan perilaku komunitas pasar, serta memperoleh informasi mengenai aspek tersebut di lokasi yang telah diintervensi. Penelitian dilakukan dengan mengembangkan instrumen berbentuk kuesioner melalui diskusi bersama pakar, pengujian validitas dan reliabilitas kuesioner serta evaluasi akhir. Uji validitas menggunakan 30 data responden yang berasal dari berbagai lokasi di Indonesia dan tiga lokasi pasar yang berbeda menunjukkan bahwa terdapat 44 item kuesioner petugas, 42 item kuesioner pedagang, dan 35 item kuesioner pengunjung yang valid dengan reliabilitas moderat dan tinggi. Kuesioner final tersusun dari 30 item seri kuesioner petugas, 30 item seri kuesioner pedagang, dan 20 item seri kuesioner pengunjung. Kuesioner pedagang diaplikasikan dengan melakukan survei kepada pedagang menggunakan teknik total sampling untuk menentukan responden. Rata-rata pedagang menunjukkan pengetahuan yang baik

(8.00±1.04, skala 10), sikap positif (41.00±2.04, skala 50), dan perilaku baik (42.64±3.25, skala 50). Analisis korelasi menunjukkan hanya lama waktu berjualan yang memiliki hubungan signifikan dengan tingkat pengetahuan pedagang. Instrumen yang dikembangkan sudah memadai untuk digunakan dalam mengukur dampak program keamanan pangan nasional yang sedang dilaksanakan.

Keywords: attitudes, behavior, food safety, food vendor, knowledge

Kata Kunci: keamanan pangan, pedagang pangan, pengetahuan, perilaku, sikap

1. Introduction

Law No. 17 of 2023 on Health, in Article 4(1a), states that the right to a healthy life—physically, mentally, and socially—is guaranteed to every person by law. One measure that can help ensure this right is to guarantee that the food consumed by the public meets established standards and is based on health requirements. The food consumed must not only meet nutritional needs but also comply with the established food safety standards. The Government of Indonesia, through Law No. 18 of 2012 on Food, guarantees the availability of food that is safe, high-quality, and nutritious. Food safety must be assessed throughout the entire food chain. As defined by Government Regulation (PP) No. 86 of 2019 on Food Safety, the food chain comprises the production, processing, distribution, storage, and handling of food until it is ready for consumption. Traditional markets are a vital link in the food distribution chain, and their food safety must be safeguarded. According to data from the Central Statistics Agency (2019), there are 17,586 markets and trading centers across Indonesia, of which 15,657 are traditional markets. Ensuring food safety in these markets is crucial because this part of the food chain is so closely linked to the public; consequently, the impact would be significant should any food safety breaches occur. There are between 10 and 22 million cases of food poisoning in Indonesia, resulting in economic losses and costs of between Rp. 64.8 and 226.3 trillion (On & Rahayu, 2017).

As part of efforts to ensure food safety in traditional markets, the Indonesian government, through the Indonesian Food and Drug Authority (BPOM), has implemented a food safety intervention: the Community-Based Safe Food Market Program (PPABK). The PPABK program has proven effective in reducing the percentage of food products failing to meet food safety standards (TMS) from 15.57 percent in 2013 to just 1.87 percent in 2023, according to data released by the Directorate of Community and Enterprises Empowerment of Processed Food. Currently, food safety interventions in traditional markets are also being enhanced through education for market communities. The market communities in question, as defined by the Minister of Health Regulation No. 17 of 2020 on Guidelines for the Operation of Healthy Markets, consist of market officials or managers, traders, and visitors or consumers. Interventions within market communities are carried out by providing information on food safety regarding the distribution, collection, and testing of food samples suspected of containing hazardous substances, as well as information on balanced nutrition, which is disseminated to support the community movement for a healthy lifestyle and awareness of food safety (GERMAS SAPA). The impact of interventions carried out directly within market communities is not yet known; therefore, it is necessary to assess the market communities' knowledge, attitudes and behavior regarding food safety. Knowledge can

influence an individual's attitudes and behavior, although this relationship does not always indicate a causal link (Akabanda et al., 2017; Siahaan et al., 2017).

Assessments of traditional market traders' knowledge, attitudes, and behavior regarding food safety have been conducted in various developing countries. A systematic review conducted by Desye et al. (2023) of studies in low- and middle-income countries indicates that the knowledge, attitudes, and behavior of food traders in traditional markets still need to be improved, particularly about hygiene and safe food handling. Wallace et al. (2022) also emphasized that understanding traders' knowledge, attitudes, and behaviors is crucial for designing effective food safety intervention programs. Research on food safety among food vendors in Indonesia has also been carried out, including a study by Susanna and Putri (2021) that examined the knowledge, attitudes, and behaviors of food handlers in Jakarta. However, existing studies have not yet used standardized instruments developed specifically for food safety intervention programs in traditional markets in Indonesia.

The knowledge, attitudes, and behaviors of market communities cannot yet be measured because no standardized PPABK program questionnaire designed to assess these aspects is currently available. A questionnaire is one of the instruments that can be used to measure knowledge, attitudes, and behavior. Questionnaires can be developed to suit the circumstances of the respondents and can be designed for distribution in either printed or online formats (Fang et al., 2021). Structured questionnaires are a commonly used type of questionnaire because the data they generate are easy to interpret and tend to be consistent in their measurements (Taherdoost, 2022). A good questionnaire is one that is developed based on systematic steps (Aithal & Aithal, 2020). This research was conducted with the aim of developing a standardized questionnaire that can be used by the Indonesian Food and Drug Authority (BPOM) to measure the impact of the PPABK program on knowledge, attitudes, and behavior within each market community, as well as to obtain information on the knowledge, attitudes, and behavior of food traders in markets that have been targeted by the PPABK program.

2. Methodology

2.1. Materials

The research utilized awareness-raising materials compiled by the PPABK team, comprising information on food safety, food safety in the distribution chain, the 'KLIK' check (Packaging, Labelling, Marketing Authorization, Expiry Date), balanced nutrition, the sampling of food suspected of containing hazardous substances, rapid testing of food suspected of containing hazardous substances, and monitoring, evaluation and the PPABK program in general.

2.2. Development of the questionnaire

The questionnaire was developed between September and December 2024 at the Office of the Directorate for Community Empowerment and Processed Food Business Operators, BPOM RI. The questionnaire development process involved several steps. The initial step in developing the questionnaire was to identify the concepts to be translated into items or questions (Taherdoost, 2022). The items in the questionnaire series for officials focused on identifying hazardous substances in food, testing, and reporting their findings. In the questionnaire series for traders, the items developed focused more on good and safe food

distribution and sales practices. Meanwhile, the visitor questionnaire series focused on checking the condition of food at the point of purchase and maintaining a balanced diet.

The next step was to formulate questionnaire items based on the identified concepts. The items in the knowledge questionnaire were developed using a Guttman scale with true-false options, whilst the items in the attitude and behavior questionnaires were developed using a Likert scale ranging from 1 to 5. During the questionnaire development stage, discussions were held with experts to assess the relevance of the questions to the identified concepts and their suitability for the target market community (Emilia, 2008; Taherdoost, 2022). Discussions were also held with the internal PPABK program team to assess the suitability of the developed questions for the PPABK program and the needs of the program's internal team. The experts assessed the relevance of the items by evaluating each item's suitability for the concepts being measured and the language's readability for the target respondents. The experts rated each item and provided suggestions for improvement where necessary. This process aligns with the questionnaire development stages recommended in the literature, in which expert assessment is conducted to ensure the instrument's content validity prior to statistical testing (Abdulsalam & Alnomani, 2024; Taherdoost, 2022).

The next step was to test the validity and reliability of the questionnaire items. Validity and reliability were assessed statistically at a 95 percent confidence level, using biserial correlation analysis to test the validity of the knowledge questionnaire items and Pearson product-moment correlation analysis to test the validity of the attitude and behavior questionnaire items. An item is considered valid if its correlation coefficient is > 0.3 and the significance level is < 0.05 (Tenggana et al., 2020). Meanwhile, reliability was assessed using the Kuder-Richardson 20 for the knowledge questionnaire and Cronbach's alpha for the attitude and behavior questionnaire. Reliability values were interpreted using Table 1.

Table 1. Degree of questionnaire reliability based on reliability scores (Aithal & Aithal, 2020; Koo & Li, 2016)

Reliability Score	Degree of Reliability
$\alpha < 0.5$	Low reliability
$0.5 < \alpha < 0.7$	Moderate reliability
$\alpha > 0.7$	High reliability

The selection of methods for testing validity and measuring reliability was based on the objective of developing a practical, limited-scope questionnaire to measure the program's impact on the market community. Statistical analysis was conducted using IBM SPSS 26.0 software for Windows. The data used to test validity and measure reliability comprised 30 data points per questionnaire series. Testing validity and measuring reliability using this amount of data ensures a normal distribution at a 95% confidence level (Tenggana et al., 2020). Data for the market staff questionnaire series were collected online via Google Forms from market staff across Indonesia. Meanwhile, data for the vendor and visitor questionnaire series were collected from three markets: Gunungbatu Market in Bogor, Tomang Barat Market and Ganefo Market in West Jakarta.

The final step in developing the questionnaire was to evaluate the validity and reliability test results with experts and the program's internal team. The number of items selected for each aspect was limited to 10 or fewer, given the time required to complete the questionnaire when administered at the markets. Based on the final evaluation, a decision can be made on

whether the questionnaire needs to be revised and retested or is deemed sufficient to measure the impact of the PPABK program on market communities.

The final step in developing the questionnaire is to evaluate the results of the validity and reliability tests together with experts and the program's internal team. The number of items selected for each aspect was limited to 10 or fewer, considering the time required to complete the questionnaire when administered at the market. Based on this final evaluation, a decision can be made on whether the questionnaire needs to be revised and retested or is deemed sufficient to measure the impact of the PPABK program on the market community.

2.3 Survey and Analysis of Market Vendors' Knowledge, Attitudes, and Behaviors

The survey was conducted on December 23, 2024, at one of the markets that had received intervention from the PPABK program in 2023, namely Parungkuda Market in Sukabumi Regency. Sampling was conducted using total sampling from the population of food vendors who received food safety intervention through the PPABK program. Through this sampling, data were collected from 11 food vendors at Parungkuda Market. The analysis examined responses to questionnaire items to identify concepts that were not yet understood or reflected in food safety attitudes and behaviors. The average response for each questionnaire was calculated by summing the weighted values of each item and dividing by the number of respondents. The average score was then used to calculate the standard deviation for respondents on each item. The scores obtained by the average vendor were interpreted and categorized based on the scoring standards in Table 2, which is a modification of the scoring standards from a study conducted by Handayani (2022). The modification involved raising the threshold for the attitude and behavior assessment categories from 50% to 75% to reduce positive bias.

Table 2. Levels of knowledge, attitudes, and behaviors based on questionnaire scores

Assessment Category	Standard Score (%)
Knowledge	
Good	> 75
Fair	55 – 75
Poor	55
Attitude	
Positive	≥ 75
Negative	< 75
Behavior	
Good	≥ 75
Poor	< 75

The percentage score is calculated based on the total possible score (knowledge = 10; attitude = 50; behavior = 50)

A correlation analysis was conducted to determine the relationship between food vendors' characteristics and their knowledge, attitudes, and behaviors regarding food safety. A correlation analysis was also conducted to determine the relationships among these aspects. The correlation analysis was performed using Kendall's tau at the 95% confidence level. Kendall's tau was chosen because this method is suitable for the characteristics of the available data, namely a small sample size and non-normal distribution (Damayanti & Sofyan, 2022). The correlation values range from -1 to 1 (minus one to one), where -1 indicates a negative correlation, while 1 indicates a positive correlation. The closer the value

is to zero, the weaker the correlation. A correlation is considered significant if its p-value is < 0.05 at the 95% confidence level, which is commonly used in research. Statistical analysis was performed using IBM SPSS 26.0 software for Windows.

3. Results and Discussion

3.1 Development of a Standard Questionnaire

3.1.1 Concepts in Questionnaire Development

The analysis of the materials disseminated through the PPABK program yielded seven concepts that served as the basis for developing the questionnaire. The concepts identified in each community are shown in Table 3. Although the use of these concepts was tailored to the target market communities, as explained earlier, all concepts were ultimately incorporated into the questionnaire because they are important and form part of the PPABK food safety intervention program materials.

Table 3. Basic concepts of questionnaire item development

No	Concept	Community		
		Staff	Vendors	Visitors
1	Food Safety	√	√	√
2	Food Safety in the Distribution Chain	√	√	√
3	Cek KLIK (Packaging, Labeling, Distribution Permit, Expiration Date)	√	√	√
4	Balanced Nutrition	√	√	√
5	Food Sampling	√	-	-
6	Rapid Testing for Hazardous Substances	√	-	-
7	PPABK and Monitoring and Evaluation	√	√	√

√ = developed into a questionnaire item: - = not developed into a questionnaire item

3.1.2 Question items in the questionnaire

Three sets of item pools were generated during development: one for staff, one for vendors, and one for visitors, each comprising knowledge, attitude, and behavior components. Following expert discussions, the number of items in all three sets was reduced because some items were deemed irrelevant or covered the same basic concepts as other items, so they were discarded. Items that were imperfect or contained spelling and grammatical errors were corrected and retained.

During the development stage, reducing the number of items through discussions with experts is a standard practice, as it is part of the questionnaire development process to ensure that questions align with the measurement objectives and that language is used correctly and appropriately—since this can influence respondents' perceptions and understanding when reading the questionnaire items (Krosnick, 2017; Taherdoost, 2022). As a comparison, item reduction in previous studies was also conducted by (Moghaddam et al., 2014) in the development of a questionnaire on food safety attitudes and practices for consumers in Iran, resulting in the reduction of 45 items out of a total of 99 items, and a study conducted by (da Silva et al., 2021) on the development of a questionnaire on food consumption knowledge and practices for children in Brazil resulted in the reduction of 49 items from a total of 85 items. Item reduction in the questionnaire development process has also been carried out in

more recent studies. Abdulsalam and Alnomani (2024), in developing a food safety questionnaire for hospital food service staff in Saudi Arabia, reported that the expert review and pilot testing processes resulted in significant adjustments to the number of items before the final version of the questionnaire was finalized.

3.1.3 Validity and reliability of the questionnaire

The validity test results indicated that 44 items in the market staff questionnaire, 42 in the vendor questionnaire, and 35 in the visitor questionnaire were valid and could be used to measure the knowledge, attitudes, and behaviors of the market community. Items that did not receive varied responses or received consistent responses were classified as valid (Tenggana et al., 2020). This indicates that all respondents shared a common understanding of these items. It was decided that invalid items would be eliminated and not used. No revisions were made to the invalid items because the number of valid items already exceeded the measurement requirements—namely, no more than 10 questions for each aspect.

The reliability coefficient for the staff questionnaire on the knowledge aspect indicated moderate reliability (>0.5), while the vendor questionnaire on the knowledge aspect showed high reliability (>0.7). The visitor questionnaire on the knowledge aspect showed low reliability (0.220). The low reliability of the visitor questionnaire on the knowledge aspect was unacceptable; therefore, the reliability coefficient was improved by removing items that lacked consistency with other items measuring knowledge, resulting in a moderate reliability coefficient (0.534). Removing inconsistent items is generally done to improve questionnaire reliability. Improving questionnaire reliability was also done in a study on the development of a household food safety questionnaire by (Maestro et al., 2019) As a result, reliability was improved from 0.552 to 0.714 by removing three items. The results of the internal reliability test indicate that the questionnaires for staff, vendors, and visitors on attitudes and behaviors have high reliability, as their reliability coefficients are > 0.7 . The reliability values for each community and aspect are presented in Table 4.

Table 4. Reliability coefficients of the developed questionnaire

Community	Aspect	Reliability Score
Staff	Knowledge	0.687
	Attitude	0.968
	Behavior	0.962
Vendors	Knowledge	0.772
	Attitude	0.960
	Behavior	0.869
Visitors	Knowledge	0.534*
	Attitude	0.906
	Behavior	0.833

*The reliability coefficient was increased from 0.220

3.1.4 Final Questionnaire

The assessment of the questions' suitability for the target respondents was conducted again through discussions with experts and the program's internal team during the final evaluation stage. Items were added to the questionnaire on staff knowledge and to the questionnaire on vendors' knowledge and attitudes from the item pool. The added items were deemed important for measuring the community's knowledge and attitudes toward the PPABK program. Two items re-added to the staff knowledge questionnaire were those

containing the KLIK check concept. Meanwhile, in the vendor questionnaire, the item re-added to the knowledge section concerned the identification of hazardous substances in food, and the item re-added to the attitude section concerned the KLIK check concept.

The visitor questionnaire included an item added from outside the item pool. This item addressed food safety and was added to the knowledge section. This item contains a question about safe food free from three types of contaminants. It was added to measure visitors' understanding of the definition of safe food. This item, which was added from outside the item pool, was not originally a concept prioritized for inclusion in the visitor questionnaire series; however, during the finalization and validation stage with experts, it was determined that visitors, like staff and vendors, also needed to understand these three types of contaminants. Items that were not prioritized during the final evaluation stage were also removed, ensuring that the number of items in each questionnaire series did not exceed the predetermined target. The final evaluation stage resulted in 30 items for both the staff and vendor questionnaires, while the visitor questionnaire contained 20 items. The questionnaire development process is presented in Table 5.

Table 5. The questionnaire item development process

Stage	Number of Items			Total
	Knowledge	Attitude	Behavior	
Staff				
Item development	27	21	19	67
Discussions with experts	21	16	15	52
Validity and reliability testing	14	16	14	44
Final evaluation	10*	10	10	30
Merchants				
Item development	23	21	22	66
Discussions with experts	18	17	15	50
Validity and reliability testing	12	17	13	42
Final evaluation	10*	10*	10	30
Visitors				
Item development	27	20	20	67
Discussions with experts	15	13	12	40
Validity and reliability testing	11	13	11	35
Final evaluation	5**	10	5	20

*Items have been added from the item pool

**Items have been added from outside the item pool

3.2 Information on the Knowledge, Attitudes, and Behaviors of Market Vendors Who Participated in the Intervention

3.2.1 Characteristics and Levels of Knowledge, Attitudes, and Behaviors of Food Vendors Who Participated in the Intervention

The sample of vendors consisted of 10 men and 1 woman with varying levels of education. The characteristics of the vendors are shown in Figures 1 and 2. A total of 72.7% of vendors who participated in the intervention at Parungkuda Market had a good level of knowledge, while 27.3% had a sufficient level. Most of the vendors who participated in the intervention—90.9%—already demonstrated positive attitudes and good behavior. The levels of knowledge, attitudes, and behavior among the food vendors who participated in the intervention are presented in Table 6. The percentage of food vendors classified as having good knowledge, positive attitudes, and good behavior is also comparable to the average scores and achievements obtained by the vendors, as presented in Table 7.

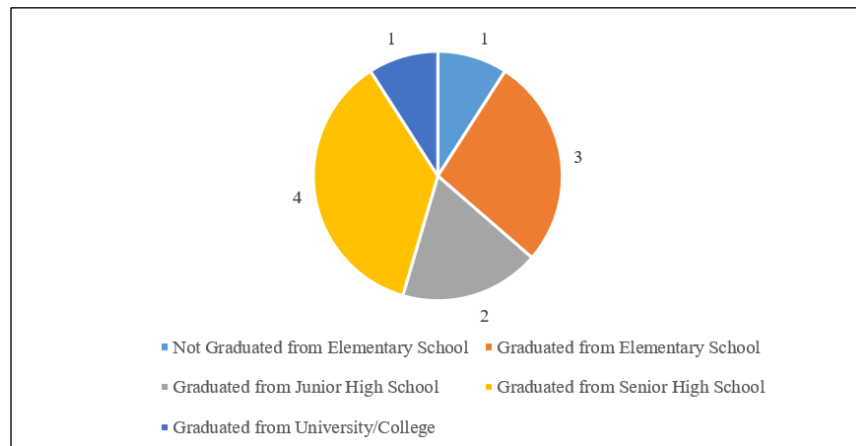


Figure 1. Educational levels of food vendors in the intervention group

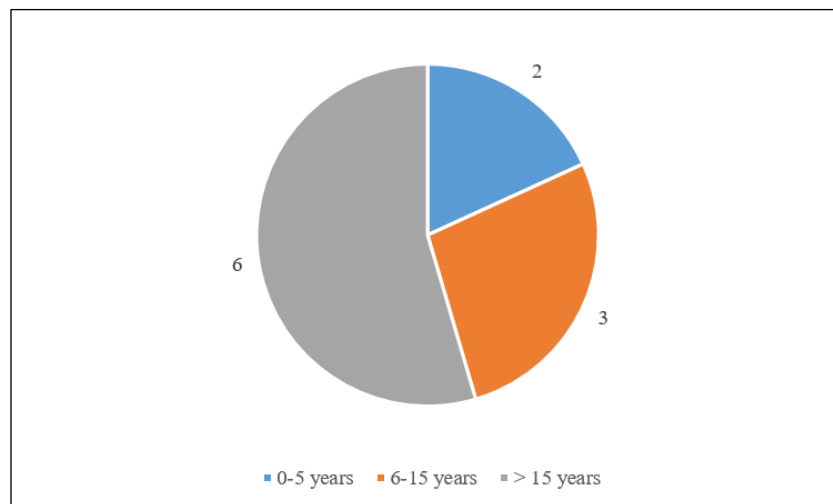


Figure 2. Length of time vendors in the intervention group have been selling

Table 6. Levels of knowledge, attitudes, and behaviors among vendors who participated in the intervention

Assessment Categories	Vendors (N = 11)	
	Total (n)	Percentage (%)
Knowledge		
Good	8	72.70
Fair	3	27.30
Poor	0	0.00
Attitude		
Positive	10	90.90
Negative	1	9.10
Behavior		
Good	10	90.90
Poor	1	9.10

N = total population

Table 7. Knowledge, Attitude, and Behavior Scores of Vendors Who Participated in the Intervention

Aspect	Score (Mean $\pm$ SD)	Standard Score	Achievement (%)
Knowledge	8.00 $\pm$ 1.04	10	80.00
Attitude	41.00 $\pm$ 2.04	50	82.00
Behavior	42.64 $\pm$ 3.25	50	85.30

Standard = total possible score; achievement = (score obtained / standard score) * 100%

Based on the analysis of vendors' knowledge responses, as shown in Table 8, there is still a small proportion (9.1%) of vendors who participated in the intervention who were unaware of the "KLIK" check concept and how to properly sell food based on its expiration date. A total of 18.2% of vendors who participated in the intervention were unaware that the expiration date marks the final date by which food can be safely consumed. A total of 63.6% of the vendors who received the intervention were unaware that food products should not be stored or displayed in contact with walls or floors. A total of 63.6% of the vendors who received the intervention were unaware that raw and cooked food products should not be stored in close proximity to prevent cross-contamination. Most of the vendors who participated in the intervention (63.6%) were aware that methanyl yellow is not a hazardous substance commonly used in red kolang-kaling. All vendors who participated in the intervention were aware of the types of product distribution permits, the layout between food and non-food products, proper packaging requirements, and the PPABK program in general.

Table 8. Vendors' Knowledge Responses (N=11)

Response categories Question	True %	False %	Mean $\pm$ SD
"Cek KLIK" stands for checking the packaging, label, distribution permit, and expiration date.	90.9	9.1	0.91 $\pm$ 0.29
Distribution permits for processed food products may include BPOM RI MD, ML, and PIRT permits.	100	0	1.00 $\pm$ 0.00
The Community-Based Safe Food Market Program involves the government, market managers, vendors, and consumers at the market to create a safe market free from the circulation of hazardous substances.	100	0	1.00 $\pm$ 0.00
Proper packaging is undamaged and clean.	100	0	1.00 $\pm$ 0.00
Food and non-food products must be separated when displayed.	100	0	1.00 $\pm$ 0.00
Storage and display areas for products may be placed against walls and floors*.	63.6	36.4	0.64 $\pm$ 0.48
When selling, packaged processed foods (nuggets, instant noodles, canned foods, etc.) with shorter expiration dates must be sold first.	90.9	9.1	0.91 $\pm$ 0.29
Raw and cooked products must be stored close together to prevent cross-contamination*	63.6	36.4	0.64 $\pm$ 0.48
The expiration date indicates the last date the food product can be consumed	81.8	18.2	0.82 $\pm$ 0.38
Kolang-kaling and crackers with a striking red color may be suspected of containing methanyl yellow*	36.4	63.6	0.36 $\pm$ 0.48

*Negative-scored questions

Score for each choice = 1 for correct, 0 for incorrect

In the attitude questionnaire, on average, vendors responded positively to every question. There were 27.3% of vendors who gave negative responses to questions related to supplier

selection. These vendors agreed that it was not necessary to be selective about suppliers for the food products they sell. 18.2% of vendors disagreed that eating and drinking should be prohibited while serving customers. The vendors' attitude responses are shown in Table 9.

Table 9. Attitude Responses of Vendors (N=11)

Response category	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean $\pm$ SD
Questions	%	%	%	%	%	
The cekbpom.pom.go.id website and the BPOM Mobile app make it easier for market vendors to check food products	0	0	0	81.8	18.2	4.18 $\pm$ 0.38
Wash your hands with running water and soap before and after touching food products	0	0	0	54.5	45.5	4.45 $\pm$ 0.50
Vendors must sell packaged processed food products that have BPOM RI distribution permits numbered MD, ML, and PIRT	0	0	0	54.5	45.5	4.45 $\pm$ 0.50
Vendors are responsible for food safety in the market	0	0	18.2	81.8	0	3.82 $\pm$ 0.38
Vendors do not need to select suppliers for the food products they sell*	9.1	54.5	9.1	27.3	0	3.45 $\pm$ 0.99
Cross-contamination is prevented by separating raw foods from ready-to-eat foods	0	0	0	100	0	4 $\pm$ 0.00
Frozen food products such as nuggets, sausages, and meatballs must always be stored in the freezer according to storage instructions	0	0	0	63.6	36.4	4.36 $\pm$ 0.48
Eating and drinking are not permitted while serving customers	0	18.2	0	63.6	18.2	3.82 $\pm$ 0.94
Vendors must understand how to check packaging, labels, distribution permits, and expiration dates	0	0	0	63.6	36.4	4.36 $\pm$ 0.48
Food products must be rotated in storage and on display based on their receipt dates and expiration dates	0	0	0	90.9	9.1	4.09 $\pm$ 0.29

*Negative questions

Score for each option = strongly disagree (1), disagree (2), neutral (3), agree (4), strongly agree (5)

Based on the response analysis, vendors exhibited positive behavior on average. Negative behavior was observed among a small proportion of vendors: 27.3% regarding the use of proper packaging, 18.2% regarding the use of utensils when handling food, and 9.09% regarding the use of soap for cleaning and the removal of expired products from sale. The vendors' behavioral responses are shown in Table 10.

Table 10. Behavioral Responses of Vendors (N=11)

Response category	Never	Rarely	Sometimes	Often	Always	Mean ± SD
Questions	%	%	%	%	%	
Use safe packaging (e.g., banana leaves, rice paper, plastic packaging with the "Tara Pangan" logo)	18.2	9.1	0	36.4	36.4	3.64 ± 1.49
Wash hands before and after handling food	0	0	9.1	45.5	45.5	4.36 ± 0.64
Use staples to seal food packaging*	36.4	18.2	36.4	9.1	0	3.82 ± 1.03
Clean the area before and after displaying, storing, and selling food products	0	0	0	54.5	45.5	4.45 ± 0.50
Arrange products when storing and displaying them, such as by separating food and non-food items	0	0	0	27.3	72.7	4.73 ± 0.45
Storing food products according to storage instructions (e.g., frozen food stored in the freezer)	0	0	0	18.2	81.8	4.82 ± 0.38
Using spoons, tongs, or gloves to handle food	9.1	9.1	27.3	0	54.5	3.82 ± 1.40
Using soap to clean the sales area	9.1	0	0	45.5	45.5	4.18 ± 1.11
Maintaining clean hair and nails while selling	0	0	0	45.5	54.5	4.55 ± 0.50
Removing expired products from the sales area	9.1	0	0	36.4	54.5	4.27 ± 1.14

*Negative questions

Score for each option = never (1), rarely (2), sometimes (3), often (4), always (5)

Positive responses regarding knowledge, attitudes, and behaviors may be attributed to the impact of food safety interventions. Previous research on food safety interventions has also shown that these interventions affect respondents. Sari (2017) demonstrated improvements in knowledge, attitudes, and behaviors in Purasari Village and Puraseda Village, Bogor Regency, where food safety interventions were implemented through the Village Food Safety Movement program. Knowledge increased by 15.33% and 9.91% in each village, respectively; attitudes improved by 8.82% and 4.26%; and behaviors improved by 6.00% and 3.26%. A study (Dewi, 2024) of food handlers who received an educational intervention showed a significant increase in knowledge, with the percentage of respondents in the "good" knowledge category rising from 60% to 80%. An improvement in food handlers' behavior following the intervention was also found in the study by Kurniawan et al. (2024),

which showed a significant difference in practice scores between the intervention group (41.39) and the control group (38.13).

The results obtained in this study are also consistent with the findings of several recent studies. Tuglo et al. (2021), in a study of street food vendors in Ghana, found that most vendors demonstrated positive attitudes toward food safety, although hygiene practices still need improvement. Research conducted by Desye et al. (2023) showed that, on average, vendors in developing countries had a good level of knowledge (55.2%), positive attitudes (66.3%), and good practices (50.5%). The higher results in this study were likely influenced by the PPABK program intervention, which directly targeted vendors at Parungkuda Market. This study only examined the levels of knowledge, attitudes, and behaviors among vendors who received the intervention; therefore, further research is needed to examine changes in the levels of knowledge, attitudes, and behaviors within the market community before and after the intervention.

Based on the respondents' answers to each questionnaire item, it can be concluded that market vendors still lack knowledge regarding food storage standards in distribution facilities and the potential for contamination in the types of food they sell. Table 8 shows low mean scores of 0.64 ± 0.48 and 0.36 ± 0.48 , respectively. Regarding attitudes, the mean scores indicate that food vendors are not entirely positive in their responses to questions regarding their contribution to ensuring food safety in distribution facilities. This is evident in the questions that yielded mean scores of 3.82 ± 0.38 , 3.45 ± 0.99 , and 3.82 ± 0.94 , as shown in Table 9. Meanwhile, regarding behavior, mean scores that tended to be lower than those for other questions were found in questions related to the use of packaging and utensils for handling food. Table 10 shows relatively low mean scores for questions with mean values of 3.64 ± 1.49 , 3.82 ± 1.03 , and 3.82 ± 1.40 .

3.2.2 The Correlation Between the Characteristics of Food Vendors Who Participated in the Intervention and Their Levels of Knowledge, Attitudes, and Behaviors

The correlation coefficients between educational level, knowledge, and behavior indicate a weak negative relationship among the vendors in the intervention group. A weak positive relationship was observed between educational level and the attitudes of the vendors in the intervention group. The results of the correlation analysis for the vendors in the intervention group show that educational level is not directly proportional to knowledge and behavior but is directly proportional to positive attitudes. The results of the correlation test between vendor characteristics and each aspect can be seen in Table 11. Different results were found in a study conducted by Vo et al., (2015) on food handlers in Vietnam, which found that educational level was positively correlated with the knowledge and behavior of food handlers. Nevertheless, the correlation analysis did not reveal a significant relationship between educational levels and the levels of knowledge, attitudes, and behaviors of the vendors who participated in the intervention in this study.

Table 11. Correlation coefficients between trader characteristics and knowledge, attitudes, and behavior

Characteristics		Knowledge	Attitudes	Behavior
Level of education	Correlation coefficient	-0.250	0.348	-0.183
	Sig.	0.344	0.180	0.464
Length of time in business	Correlation coefficient	0.559*	0.389	0.204
	Sig.	0.043	0.151	0.432

*Significant correlation coefficient

The results of the correlation analysis indicate a positive relationship between the length of time the vendors in the intervention group have been selling and their levels of knowledge, attitudes, and behaviors. The longer vendors have been selling, the greater their knowledge, the more positive their attitudes, and the better their behavior. Previous research conducted on seafood processing workers in Brazil showed no positive relationship between experience or length of employment and levels of knowledge, attitudes, and food safety behaviors (Zanin et al., 2015). Nevertheless, the correlation coefficients do not indicate a strong relationship between the time spent selling and the vendors' knowledge, attitudes, and behaviors. The significance values also indicate that the relationship was significant only between the duration of selling and the level of knowledge.

3.2.3 The Correlation Between Vendors' Levels of Knowledge, Attitudes, and Behavior

The correlation coefficients and significance levels among the aspects are shown in Table 12. The knowledge and attitude aspects show a positive relationship, although the correlation coefficients indicate it is not very strong. The relationships among the other aspects, as indicated by the correlation coefficients, show a weak negative relationship. However, the correlation analysis did not reveal any significant relationships across all aspects.

Table 12. Correlation coefficients between aspects

Aspect		Knowledge	Attitude	Behavior
Knowledge	Correlation coefficient		0.516	-0.194
	Sig.		0.102	0.540
Attitude	Correlation coefficient	0.516		-0.100
	Sig.	0.102		0.752
Behavior	Correlation coefficient	-0.194	-0.100	
	Sig.	0.540	0.752	

There is no clear relationship among the respondents' levels of food safety knowledge, attitudes, and behaviors. Research conducted by Zanin et al. (Zanin et al., 2017) also showed that the knowledge gained after training by some food handlers was not positively correlated with improvements in their attitudes and behaviors. Desye et al. (2023) reported that the level of knowledge among food vendors, acquired through food safety education and training, was positively associated with their food safety attitudes and behaviors. The relationship between knowledge, attitudes, and behaviors among market communities that

have been targeted by the PPABK program requires further investigation using a larger sample size and a wider variety of locations.

4. Conclusion

The questionnaire items developed for each aspect have been validated. The questionnaire series for staff and visitors showed moderate reliability for the knowledge aspect and high reliability for the attitude and behavior aspects. The questionnaire series for staff showed moderate reliability for the knowledge aspect and high reliability for the attitude and behavior aspects. The vendor questionnaire series showed high reliability across all aspects (knowledge: $\alpha = 0.772$; attitudes: $\alpha = 0.960$; behavior: $\alpha = 0.869$). The staff questionnaire series showed moderate reliability in the knowledge aspect and high reliability in the attitudes and behavior aspects. The validity and reliability of all questionnaires are sufficient to measure the levels of knowledge, attitudes, and behaviors of the market community regarding the PPABK program.

On average, vendors who have participated in the intervention at Parungkuda Market have demonstrated a good level of knowledge (score of 8.00 ± 1.04 on a scale of 10; 80.00% achievement), positive attitudes (score of 41.00 ± 2.04 on a scale of 50; 82.00% achievement), and good behavior (score of 42.64 ± 3.25 on a scale of 50; 85.0% achievement). A significant relationship was observed only between the length of time vendors had been selling and the knowledge level of the vendors who participated in the intervention. There was no significant relationship among the aspects of knowledge, attitude, and behavior of the vendors who participated in the intervention.

The developed questionnaire can be used in markets that have not yet received the PPABK program and those that have, to determine whether there are differences in knowledge, attitudes, and behaviors across market communities. Future research is recommended to include a larger sample size and a wider variety of locations to strengthen the generalizability of the findings, as well as to measure knowledge, attitudes, and behaviors before and after the PPABK program intervention to assess the impact of the intervention more comprehensively.

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