

# Food safety and quality awareness: promoting the WHO's 5 keys safer food through community service program in Banjarsari Village, Kulon Progo Regency, Yogyakarta

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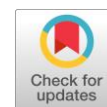
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## ABSTRACT

Implementing food safety and quality practices at the household level is crucial to preventing foodborne illnesses and ensuring family health. This community service program focuses on promoting food safety and quality awareness in Banjarsari Village, Samigaluh District, Kulon Progo Regency, based on the World Health Organization's (WHO) 5 Keys to Safer Food protocol. The program aimed to educate local communities on essential food handling practices to reduce foodborne illnesses and analyze the success factor prioritization of food safety and quality implementation. The community service activities encompassed conducting technical meetings, packaging all safe food items, executing the program, identifying the success factors for food safety and quality using the Analytical Hierarchy Process (AHP), and evaluation. The trainer explained in detail that the five keys to safer food include keeping clean, separating raw and cooked foods, cooking thoroughly, keeping food at safe temperatures, and using safe water and raw materials. According to the AHP analysis, factor 6 (choosing food processed for safety) had the highest weight (0.285) and the alternative of keep foods at safe temperature showed the most desirable values on the vertical axis (0.279). All participants expressed enthusiasm in this community service program and anticipated its continuation in the future



## KEYWORDS

Food safety  
Food quality  
Safer food  
Community service  
Analytical hierarchy process



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## 1. Introduction

Food safety and quality are currently critical aspects of public health that ensure consumer protection from foodborne illnesses and hazards [1], [2]. Food safety refers to the conditions and behaviors that maintain food quality and prevent contamination and foodborne illnesses [3], [4]. Food quality refers to the characteristics that affect how valuable a product is to consumers, such as its safety, nutritional content, and sensory aspects [5]. Foodborne illnesses continue to be a substantial issue for public health on a global scale due to the increased prevalence of poisoning and illness caused by contaminated food products, either in the form of physical, biological, or chemical contamination [6]. According to the World Health Organization (WHO), contaminated food causes illness in approximately 600 million individuals, or nearly 1 in 10 people, and results in approximately 420,000 fatalities annually [7]. Therefore, this fact emphasizes the critical importance of strong food safety practices in order to prevent such illnesses and ensure consumers' well-being.

In response to the pervasive threat of foodborne illnesses, the Pan American Health Organization (PAHO) and WHO) recommends suggested the "5 Keys to Safer Food" promotion, which provides practical guidance to prevent food contamination [8]. These five keys include keeping clean, separating raw and cooked foods, cooking thoroughly, keeping food at safe temperatures, and using safe water and raw materials. These measures, tailored to various settings, from household kitchens to large food production facilities, aim to address the most common causes of foodborne diseases. Approximately one-third of foodborne illness outbreaks are attributed to food that is cooked and consumed at home [9], [10].

Furthermore, a substantial percentage of all instances of foodborne illness may be traced back to bacterial contamination, which arises from a relatively small number of unsafe practices. Consuming food that is contaminated with bacteria, viruses, parasites, or toxic chemicals can lead to more than 200 illnesses, ranging from diarrhea to cancer [11]. Common symptoms of foodborne illness encompass abdominal discomfort, diarrhea, nausea, shivering, elevated body temperature, and headache. Foodborne sickness can, in certain instances, result in death. The onset of symptoms can occur within a range of 30 minutes to two weeks after an individual has been exposed to foodborne germs, although they are typically seen within the initial 4–48 hours [12]. By addressing the fundamental food safety and quality practices that prevent contamination and bacterial growth, promoting these keys effectively reduces the incidence of foodborne illnesses in the community level.

Regulations in Indonesia govern food safety and quality standards, with the goal of protecting consumers in compliance with the Law of the Republic of Indonesia (RI) Number 8/1999 concerning consumer protection and ensuring the safety of the food supply in compliance with the Law of the RI Number 18/2012 concerning food. The Indonesian government has implemented various food safety laws and guidelines aligned with international standards [13]. However, challenges such as inconsistent enforcement, lack of public awareness, and limited resources hinder the effective implementation of these regulations. The Food and Agriculture Organization (FAO) Committee on Agriculture (COAG) emphasizes the need for stronger coordination among government agencies and increased investment in food safety promotion and infrastructure to overcome these obstacles and improve overall food safety system [14]. However, local initiatives are expected to be effective action for improving food safety and quality awareness in rural areas [15]. In this case, community service programs play a vital role in educating residents about the importance of food safety practices and the WHO's 5 Keys to Safer Food. Previously, these programs often involved collaboration between local governments, health agencies, universities, and community organizations to conduct training sessions, workshops, and public awareness campaigns. By engaging the community and providing practical guidance, these initiatives aim to empower individuals to adopt safer food handling and preparation practices, thereby reducing the prevalence of foodborne illnesses in the rural area [16]. The emphasis on community-driven approaches ensures that the interventions are culturally relevant and sustainable, as well as fostering a proactive attitude towards food safety among the local community.

In this regard, Universitas Ahmad Dahlan (UAD), in collaboration with the local community in Banjarsari Village, Samigaluh District, Kulon Progo Regency, Yogyakarta Province, held the food safety and quality awareness community service program in February 2024. The primary objective of this community service program was to improve knowledge and awareness on promoting safe practices in household level to reduce the prevalence of foodborne illness and analyze the success factor prioritization of food safety and quality implementation using AHP method. According to the Codex Alimentarius General Practice of Food Hygiene CXC 1-1969: 2023 and the WHO's 5 Keys to Safer Food Manual, the researchers performed a community service program to raise awareness about food safety and quality. The program delivered through classical lecture, question and answer session, and distributed halal, safe, and nutritious food items, and prioritization of common food safety practices using Analytic Hierarchy Process (AHP). Collaboration with all relevant stakeholders is essential for the successful implementation of the safe food communal program (*Desa Pangan Aman*) and the food safety communal movement (*Gerakan Keamanan Pangan Desa*) in Kulon Progo Regency, which in turn enables the achievement of the Indonesian government's goals.

## 2. Method

From January to February 2024, 32 local participants from several nearby hamlets, including West Ngaran, East Balong, and Klendrekan, participated in this food safety and quality awareness community service program in Banjarsari Village, Samigaluh District, and Kulon Progo Regency (07°42'30,38" S, 110°10'23,28" E). The participants consist of 15 males and 17 females, with an age range of 26 to 75 years old. The community service team implemented this program in several stages (Fig. 1), beginning with a technical meeting to prepare field activities, then continued by preparing presentation materials, packing all safe food items, monitoring technical preparation, implementing the program, prioritizing food safety and quality success factors, and evaluate the implementation of the program. In the initial stage, the community service team held a Zoom online meeting with the local team to prepare the field activities and presentation materials. From February 20 to 26, 2024, the community service and local teams packed

all food items and performed the technical preparation. The program implementation and the success factors of food safety and quality practice prioritization were executed on February 26 and during the period of March until April 2024, respectively, under the Letter of Assignment of the Dean of Faculty of Economics and Business UAD Number F5/60/J.2/II/2024.

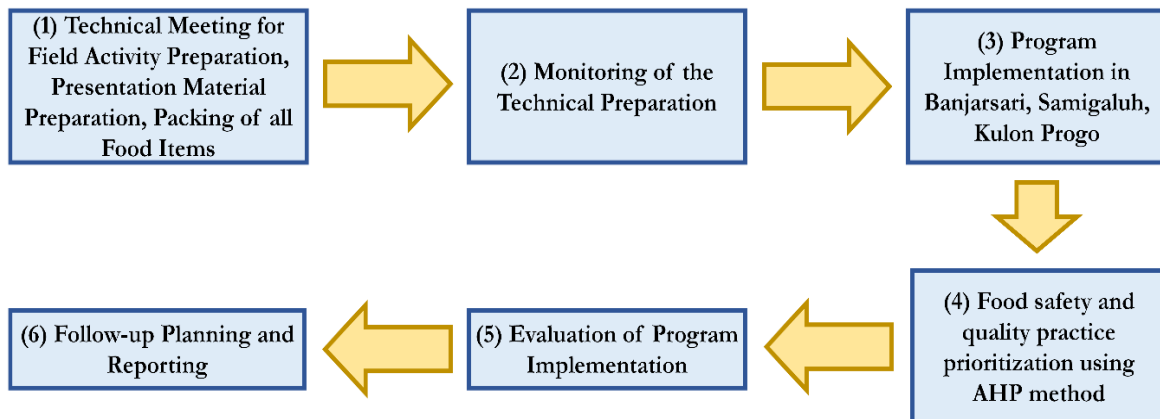


Fig. 1. The flow chart of program implementation method

Subsequently, the success factors of food safety and quality practice prioritization were evaluated using the AHP method through organizing and analyzing complex categories structured hierarchically at different levels (Fig. 2). This prioritization was processed using Expert Choice Comparison® AHP Software version 11 (<https://www.expertchoice.com/>) to showcase the success factors ranking of the participants in implementing the WHO's 5 Keys to Safer Food protocol. After the program concluded, the tutors evaluated and weighted the pairwise comparison decisions for each category, which included keep clean (alternative 1), separate raw and cooked food (alternative 2), cook thoroughly (alternative 3), keep food at safe temperatures (alternative 4), and use safe water and raw materials (alternative 5). The AHP utilizes analytical principles derived from psychological principles and integrates mathematical models to perform pairwise comparisons. Typically, the hierarchical structure of AHP begins with the top layer, which is the target (goal) of the problem. The next layer comprises the selected main factor (criteria) and sub-factor (sub-criteria), while the final layer encompasses potential alternative options or approaches for problem-solving (alternatives) [17]. Based on the purposive sampling method and inclusion criteria, which included having at least five years of experience in a community service program, understanding the condition of Banjarsari Village's people, and relevance in education, training, knowledge, and skills of the food safety auditing, standards, and management system, the training team members selected the experts for this AHP analysis. Finally, the evaluation of program implementation, along with follow-up planning and reporting, concluded on June 30, 2024.

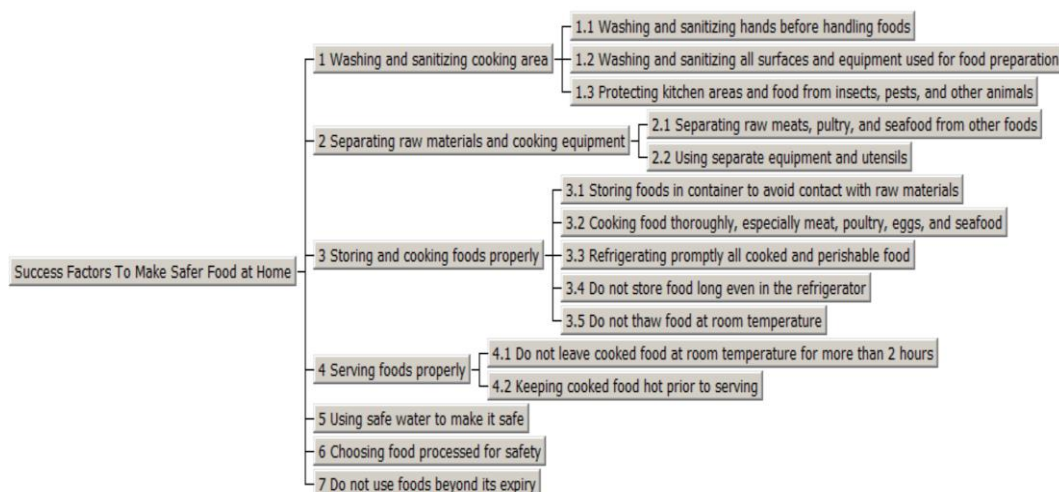


Fig. 2. Hierarchy view of the success factors of food safety and quality practice prioritization constructed in Expert Choice Comparison software version 11

### 3. Results and Discussion

#### 3.1. Community Overview

Banjarsari Village is situated on a plateau within the Menoreh Hills, at an elevation ranging from 450 to 750 meters above sea level (Fig. 3a). The average air temperature in the village is often between 29 and 32 degrees Celsius. Banjarsari Village's total land area measures 855.44 hectares [18], [19]. Banjarsari Village shares boundaries with the following areas: to the north, adjacent to Purwoharjo Village, Gerbosari Village, and Ngargosari Village; to the east, adjacent to Purwoharjo Village and Banjararum Village; to the south, adjacent to Kebonharjo Village and Purwosari Village; and to the west, adjacent to Pagerharjo Village and Purworejo Regency. Banjarsari Village comprises 14 hamlets, encompassing 29 RW (neighborhood units) and 64 RT (residential units) [18], [19]. Subsequently, the population as of the end of July, 2024 stood at 3,540 individuals, consisting of 1,779 males and 1,761 females [20]. The majority of people earn their living by working in the agricultural, plantation, and cattle sectors (1,335 people) presented in Fig. 3b, followed by private workers (589 people), laborers (115 people), and the rest of occupations involving government servants, teachers, and private employees. In Banjarsari Village, the non-agricultural land uses encompass various activities such as human settlements, cemeteries, commercial establishments, offices, markets, and similar functions [21]. The prominent tourist destinations in this village include Mount Kucir, Semurup Cave, Punggang View, and Simatupang Tower. The prominent tourist destinations in this village include Mount Kucir, Semurup Cave, Punggang View, and Simatupang Tower.



(a). Banjarsari Village office



(b). Traditional harvesting activities carried out by local farmers in Banjarsari village

Fig. 3. Banjarsari Village

#### 3.2. Technical meeting, presentation material preparation, and packing all safe food items

The initial stage of the food safety and quality awareness program in Banjarsari, Kulon Progo was crucial for laying a solid foundation for the program's success. The purpose of this stage was to ensure that all stakeholders were aligned, the promotional materials were well-prepared, and the safe food items were meticulously packed (Fig. 4). The process begins with a technical meeting involving the program coordinators, local team, and key community members. This meeting aimed to discuss the program's objectives, outline the implementation strategy, and allocate responsibilities among the team members. Following the technical meeting, the next step involved the preparation of presentation materials (Fig. 5). These materials were designed to be informative and engaging, tailored to the local context to maximize community understanding and retention.



Fig. 4. Food safety and quality promotion and checking practice through food packing process

The promotional materials covered the WHO's 5 Keys to Safer Food, using data, case studies, and practical examples relevant to the community. The preparation process includes creating slides, handouts, and visual aids that are easy to comprehend, even for those with limited literacy. This step ensures that the community receives accurate information about food safety and quality. Simultaneously, the packing of safe food items was undertaken by students and the local team. This activity was significant as it provides practical demonstrations of the WHO's 5 Keys in action. The food items are carefully selected and checked to represent safe food practices, including properly packed without any defect in the packaging, the food items had not expired and free of physical, chemical, and biological hazards. The packing process was a hands-on educational experience for the students and local team, reinforcing their understanding of food safety and quality principles (Fig. 4). Additionally, involving the local team fosters community participation, ensuring the program's sustainability.



Fig. 5. Parts of presentation material created using Microsoft PowerPoint 365

### 3.3. Food safety and quality awareness program

The trainer delivered this awareness program over a two-hour lecture, followed by a question and answer (Q&A) session and a discussion (Fig. 6a). The trainer conveyed the learning material for this program using PowerPoint presentation slides and case studies. The trainer introduced the importance of food safety and quality, emphasizing its critical role in public health and community well-being. The trainer outlined the objectives of this awareness program, focusing on promoting the community's understanding of the WHO's 5 Keys to Safer Food. In the introduction section, the trainers set the stage for understanding the necessity of implementing these keys in daily life to prevent foodborne illnesses. The trainer then described the fundamental concepts of food safety and quality, which included definitions, the global burden of foodborne diseases, and their socioeconomic impacts. Referencing Indonesian Food and Drug Agency (Badan Pengawas Obat dan Makanan/BPOM), WHO, and Centers for Disease Control and Prevention (CDC) data, the tutor highlighted the prevalence and consequences of foodborne pathogens, illustrating the need for effective community-level interventions.

The trainer continued the lecture by explaining the WHO's 5 Keys to Safer Food core section, which includes maintaining cleanliness, separating raw and cooked foods, cooking thoroughly, keeping food at safe temperatures, and using safe water and raw materials. Data from BPOM, WHO, and FAO, along with scientific backing, demonstrated the effectiveness of each key in reducing foodborne illnesses, and illustrated these points with practical examples and case studies from the community (Fig. 6b). The lecture focused on explaining the importance of hygiene in food safety in the first section of key 1: keep clean, emphasizing the importance of handwashing, cleaning utensils, and maintaining a clean cooking environment. Furthermore, the trainer shared various scientific findings on how proper cleaning practices

reduce pathogens. In the second section, which focused on key 2: keeping raw and cooked foods separate, the trainer presented data on how cross-contamination occurs and its impact on food safety, supported by BPOM studies.



(a). Food safety and quality awareness program at Banjarsari Village office

(b). Discussion session concerning foodborne illness prevalence

**Fig. 6.** Food Safety Program

In the third section concerning key 3: cook thoroughly, the lecture explored the significance of cooking food thoroughly to kill harmful microorganisms and recommended cooking temperatures and techniques, with scientific evidence highlighting the reduction of foodborne pathogens through proper cooking. In the fourth section concerning key 4: keep food at safe temperatures, the lecture explained how to maintain safe temperatures for food storage and discussed the dangers of the temperature danger zone, referencing studies from BPOM on the growth of pathogens at various temperatures. In the fifth section concerning key 5: use safe water and raw materials, the lecture emphasized the use of safe water and quality raw materials in food preparation, presented information on common contaminants in water and food, and strategies to ensure safety, referencing BPOM guidelines. The trainer also discussed the strategies for implementing the WHO's 5 Keys to Safer Food in the community of Banjarsari Village, Kulon Progo Regency, specifically focusing on community engagement methods, educational workshops, and collaboration with local authorities and organizations. The trainer shared success stories and best practices from other regions to demonstrate effective implementation (Fig. 6a).

In the final section, the trainer described the methods for evaluating the food safety and quality awareness program's effectiveness, which covered the use of surveys, food safety audits, and health outcome tracking to measure the impact. The trainer briefly explained the use of data collection and analysis techniques to ensure the sustainability and continuous improvement of the awareness program (Fig. 6a). In the conclusion section, the trainer summarized the key points covered in the presentation, reiterating the importance of food safety and quality, as well as the practical steps the community can take. The conclusion also covered a call to action, encouraging community members to adopt the WHO's 5 Keys to Safer Food and contribute to a healthier, safer community.

Other researchers have previously implemented a variety of food safety-themed community service programs, focusing on the WHO's 5 Keys to Safer Food in various locations. These programs included food safety and nutrition education for integrated healthcare center (*Pos Pelayanan Terpadu/Posyandu*) cadres in Pasir Buncir Village, Caringin District, Bogor Regency, West Java Province; food safety extension through the use of CekBPOM (<https://cekbpom.pom.go.id/>) and BPOM Mobile (<https://play.google.com/store/apps/details?id=com.bpomttac>) applications' education in Lonuo Village, Tilogkabila District, Bone Bolango Regency, Gorontalo Province; education on the WHO's 5 Keys to safer food at the Muslimah Forum of the Baiturrahim Mosque, Pekalongan Regency, Central Java Province; and improving food safety knowledge in small and medium food enterprises in Limo District, Depok City, West Java Province [22]–[25]. Of all the community services on food safety promotion conducted elsewhere, none conducted an analysis of prioritizing food safety and quality success factors. This community service in Banjarsari Village is unique in that it employs the AHP method to prioritize common food safety practices, achieved by conducting pairwise comparison decisions for each category in the WHO's 5 Keys to Safer Food protocol, which includes maintaining cleanliness, separating raw and cooked food, cooking thoroughly, keeping food at safe temperatures, and using safe water and raw materials. In this data analysis of this community service program, the goal, main factors, and sub-factors were constructed in a hierarchical tree (Fig. 2).

### 3.4. Success factors of food safety and quality practice prioritization

The AHP theory does not necessitate absolute consistency. AHP permits inconsistency, but it also calculates the degree of inconsistency in each set of judgments [26]–[28]. This measure is a significant by-product of the process of establishing priorities through pairwise comparisons. Tom Saaty, a founder of Expert Choice Comparison® software and the creator of AHP, posited that consistency is crucial in our daily lives, but we must also accommodate some inconsistencies in order to acquire new knowledge. Saaty concluded that an inconsistent ratio of approximately 10% or less is reasonable [27], [28]. The AHP analysis results for food safety and quality success factors revealed that experts' opinions were inconsistent 0.09 times out of 10, with no judgments missing, which falls within the range of values that do not exceed the limits in the AHP analysis (Fig. 7). According to the AHP analysis, out of the seven factors shown in Fig. 2, factor 6 (choosing food processed for safety) had the highest weight value (0.285), followed by factor 4: serving food properly (0.226), factor 3: storing and cooking foods properly (0.179), factor 2: separating raw materials and cooking equipment (0.111), factor 1: washing and sanitizing cooking area (0.093), factor 5: using safe water to make it safe (0.070), and factor 7: do not use foods beyond its expiry (0.035) (Fig. 7). The training team conducted a Q&A session and semi-structured interviews during the community service discussion forum, which yielded opinions for further analysis through pairwise comparison using the AHP method.



Fig. 7. Priorities with respect to food safety and quality success factors and the inconsistency rate

Choosing food processed for safety emphasizes selecting food that has undergone proper treatment to eliminate harmful pathogens. Scientifically, this ensures reduction or elimination of microorganisms that can cause foodborne illnesses. The practices involve choosing pasteurized dairy products, canned foods, and heat-treated items, which undergo processing to eliminate pathogens. For example, pasteurized milk is heat-treated to kill bacteria such as *Salmonella typhimurium* (*S. typhimurium*) and *Escherichia coli*, making it safer for human consumption. This key underscores the importance of processing methods in ensuring food safety and preventing health risks. As can be seen in Fig. 8, the alternative of keep foods at safe temperature had the largest weight (0.279), showing desirable values on the vertical axis, followed by cook thoroughly (0.208), and use safe water and raw materials (0.202), separate raw and cooked food (0.185), and keep clean (0.126) (Fig. 8). While maintaining food at proper temperatures inhibits bacterial growth and prevents the proliferation of pathogens that cause foodborne illnesses, ensuring that food remains safe to eat by minimizing the risk of contamination and spoilage. The practices include refrigerating perishable foods below 5°C and keeping hot foods above 60°C, for example, storing cooked chicken in the refrigerator prevents bacterial growth like *S. typhimurium* and *Listeria monocytogenes* [6], [8], [10].

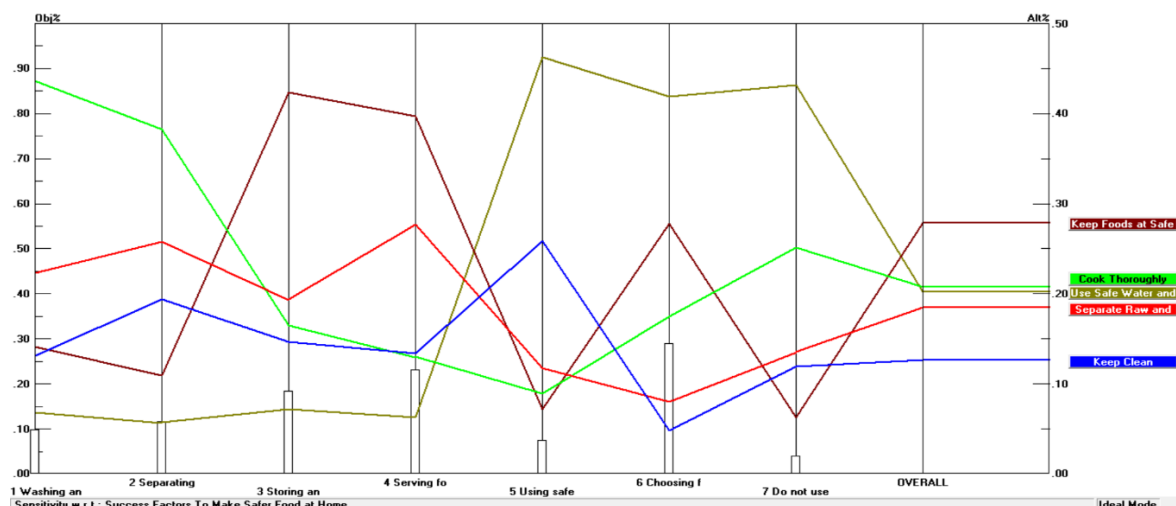


Fig. 8. Effectiveness of the success factor of food safety and quality criteria and sensitive analysis

#### 4. Conclusion

The food safety and quality awareness program in Banjarsari Village, Kulon Progo Regency successfully achieved its objectives of educating the community on the WHO's 5 Keys to Safer Food. Through a structured approach, including technical meetings, thorough preparation of educational materials, and the active involvement of students and the local team in Q&A session, discussion forum, packing and distribution safe food items, the program effectively raised awareness and promoted safe food handling practices in Banjarsari Village. The community's enthusiastic participation and engagement in lecture and classical activities demonstrated a significant increase in knowledge and implementation of food safety and quality measures. This program not only enhanced the community's understanding of foodborne illness prevention but also fostered a collaborative spirit among students and local stakeholders. The positive outcomes observed underscore the importance of continuous education and community involvement in sustaining food safety practices, ultimately contributing to improved public health and well-being in Samigaluh District, Kulon Progo Regency. The main limitation of this community service program was the limited reach and engagement due to resource constraints and varying community participation levels. It is recommended to enhance future programs by increasing funding, involving more stakeholders, and implementing diverse communication strategies to promote and implement food safety and quality more broadly and effectively.

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