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Differences in Sanitary Hygiene Behavior and Bacterial Identification in Minimizing Pathogenic Bacteria in Food Handlers

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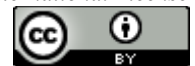
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Abstract— Food as a biological substance with the potential to cause foodborne illness. According to the Food and Drug Supervisory Agency (BPOM), more than 20 million incidents of poisoning occur in Indonesia each year. The objective of this study is to examine the impact of hygiene and sanitation counseling on the behavior of food handlers, as well as to conduct microbiological examinations on the palms of food handlers. The method in this study uses quasi-experimental research, using a one-group pretest and posttest experimental design, and sampling was accomplished by unintentional sampling pretest and posttest. As a result, 17 out of 20 (85%) traditional food handlers carry pathogenic bacterial species such as *Escherichia coli* (65.3%), *Staphylococcus aureus* (23.5%), and *Klebsiella spp* (10.2%), but after treatment, the number of traditional food handlers carrying bacterial species pathogens decreased to 6 out of 20 (30%). The Mann-Whitney U test revealed that there was a significant influence on changes in the behavior of food handlers before and after receiving counseling regarding hygiene and sanitation behavior in handling food, which is 0.000 smaller than 0.05. Swabs were also used on the hands. With the Kolmogorov-Smirnov Z test, food handlers have a significant shift in the bacterial organisms identified on their hands before and after counseling, which is 0.000, smaller than 0.05.

Keywords— Counseling, Hygiene and Sanitation, Bacterial Pathogens, Food Handlers.

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I. INTRODUCTION

The Deli Serdang Regency Government is aggressively promoting one of its flagship tourist attractions, the Bagan Percut Culinary Tourism Area, which is located in Percut Village, Percut Sei Tuan sub-district, and is part of the range of North Sumatra's east coast, Indonesia, which is directly adjacent to the Malacca Strait and neighboring Malaysia. There are various restaurants in the area that serve a mainstay menu of seafood meals near the edge of the Percut village river.

Food is a biological substance that becomes a medium for microbial growth, which has the potential to become an agent of foodborne illness if it is not managed properly and correctly, and it can cause negative impacts such as disease and poisoning due to chemicals, microorganisms, plants, or animals, and it can also cause allergies[1].

According to World Health Organization (WHO), 600 million people, or about one in every ten people worldwide, become unwell after eating contaminated food, and 42 million die each year[2]. According to the Indonesian Food and Drug

Monitoring Agency (BPOM), more than 20 million poisoning episodes occur in Indonesia each year[3].

Food poisoning symptoms range from moderate to severe, including stomach cramps, nausea, and vomiting. Until a life-threatening condition, such as renal failure or paralysis, occurs[4]. Food-borne infections are typically caused by *Escherichia coli*, *Bacillus cereus*, *Salmonella*, *Shigella*, *Rotavirus*, and other intestinal bacteria[5]. According to the findings of a research on food handlers on culinary traders in Medan, all food handlers did not comply with the basic principles and were classified as unqualified, with 18 out of 22 (81.8%) traditional food handlers carrying pathogenic bacterial species such as *Escherichia coli* (50%), *Staphylococcus aureus* (22.72%), and *Klebsiella spp* (9.09%)[6].

Microorganisms in food get contaminated as a result of poor hygiene and sanitation[7]. Food handlers who do not maintain personal hygiene, such as not washing their hands before carrying out tasks, scratching limbs, keeping long nails, not wearing work equipment, smoking, and chewing food while working, play a significant part in this scenario. Pathogenic microorganisms can be transferred to food during preparation[7-9].

Food hygiene, according to Indonesian Minister of Health Regulation No.1096/MenKes/PER/VI/2011, is an effort to manage elements in food, people, locations, and equipment that can or may cause disease or health concerns[10]. Disease transmission via food, 25% of which is caused by diseased food workers and poor personal hygiene[11].

Therefore, the purpose of this study is to see how the behavior of food handlers before and after counseling with the addition of microbiological examination of the palms of food handlers.

II. MATERIAL AND METHODS

A. Material

Cotton buds are then used to take a swab for a food handler's hand. Hand swabs are used on both palms, between the fingers and nails. The swab results were then taken to the lab and cultured in MacConkey agar (MAC) and blood agar media. The colony was then incubated for 24 hours to assess growth. The hand swab culture findings will be evaluated using SPSS with the Kolmogorov Smirnov Z statistical test of comparison of two samples with a significance level of 0.05 to determine the significance level of the results of the food handlers' hand swabs before and after counseling.

B. Methods

This is a quasi-experimental study, as it employs a pre and posttest group control design. A parallel design is used to compare two independent groups, namely the control and intervention groups, and there are two groups of respondents in this study, namely the control and intervention groups[12]. Each food handler detected was swabbed on their hands and given a questionnaire on the hygiene and sanitation behaviour

of food handlers in accordance with Indonesian Minister of Health Regulation No.1089/Menkes/SK/VII/2003. The total number of questions is 16, with a rating system of 1 for correct answers and 0 for incorrect answers. The questionnaire responses were separated into two categories: good with a value less than 7.2 from the mean value and less with a value greater than 7.2 from the mean value. The questionnaire sheet responses will be evaluated using SPSS with the Mann-Whitney U statistical test of comparison of two independent samples with a degree of significance of 0.05 to determine the level of importance of food handlers' conduct before and after counseling. **Table 1** shows the distribution of respondents' characteristics as food handlers.

III. RESULT AND DISCUSSION

TABLE I
 DISTRIBUTION OF RESPONDENTS' CHARACTERISTICS OF
 FOOD HANDLERS

No	Characteristic Factors	Frequency (n)	Percentage (%)
1	Age		
	17 – 25 Years	11	55
	26 – 35 Years	6	30
2	Gender		
	Man	9	45
	Woman	11	55
3	Education		
	Elementary school	12	60
	Junior high school	4	20
	Senior High School	2	10
	Not School	2	10
4	Work Position		
	Cook	4	20
	Cooking Assistant	4	20
	Waiter	8	40
	Dishwasher	4	20

The results of interviews with respondents revealed that they wanted to improve the family finances and demonstrate the family that they could generate their own money without relying on the family. In terms of gender, there were 11 women (55%), owing to the fact that the majority of the males work as fishermen and the village's position is close to the sea. The economic conditions of the people in this area are still below the poverty line, it would be better if the money was used to buy basic needs, according to the majority of the community's opinion. who live there, the level of education at most only reached the elementary school level, as many as 12 people (60%). The characteristic factor of work position, it is obtained as much as 40%, namely in the position of a waiter, because a waiter does not require special skills and does not require an educational background, and restaurants throughout this village require waiters to serve guests who come to eat at their restaurant[13].

Respondents from culinary tourism areas who work in several restaurants in the area exhibit generally unsanitary behavior, such as not washing hands before and after using the restroom, not washing hands before and after handling food ingredients, and not using PPE when handling food such as a head covering, apron, gloves, and so on. This is due to a lack of education and socialization regarding hygiene and cleanliness as food handlers. However, after counseling and repeated measurements, there was a considerable change in the food handlers' behavior. This can be demonstrated in people who did not use PPE as food handlers at first, but after receiving counseling, practically all handlers used PPE.

It is not easy to change someone's behaviour quickly and completely because they have been doing it for years, which has become a habit and eventually becomes their culture of behaviour. However, there was a considerable shift in behavior after counseling in this study, though not in all of them. This must also be supported by restaurant owners and the local health agency in order to continue to develop, coach, and supervise food handlers so that they continue to behave hygienically in food handling.

Discovered a substantial difference in food handler behavior before and after hygiene and sanitation training at the Nutrition Installation at the Meuraxa Regional General Hospital in Banda Aceh[14]. Then, according to other research, providing informal food safety education to hawker traders, elementary school children get the knowledge, attitudes, and practices of most food sellers after mentoring get better results than before, and there is a positive and real relationship between knowledge and attitude of food safety with a p value less than 0.05[15].

In the previous statement, regular monitoring is necessary to ensure that people's behaviour is maintained and always operating within a reasonable scope, such as conducting ongoing training in food handlers or conducting regular inspections of hygiene and sanitation conditions, both the environment and the food handlers. This was consistent with prior research, which found that explaining that during a cleanliness training program at a teaching hospital, only food workers' attitudes changed significantly ($p < 0.05$). However, it was determined that efforts to educate food handlers, repeat training programs, and regular inspections were necessary to prevent and reduce food handling concerns[16].

TABLE 2
 RESULTS OF HAND SWABS OF RESPONDENTS FOOD HANDLERS CONTROL AND INTERVENTION GROUPS

Results of Food Handlers' Hand Swabs	Respondent Group			P* (0.05)
	Intervention	Control	Total	
Exposure to Bacteria	6 (15.0 %)	19 (47.5 %)	25 (62.5 %)	0.000
Not Exposed to Bacteria	14 (35.0 %)	1 (2.5 %)	15 (37.5 %)	
	20 (50 %)	20 (50 %)	40 (100%)	

* Kolmogorov Smirnov Z Test

The findings of the hand swab study of food workers for the intervention and control groups are shown in **Table 2**. The results of statistical tests using the Kolmogorov Smirnov Z test yielded a significance value (p) of 0.000, which is smaller than 0.05, implying that there is a significant difference in the results of food handlers' hand swabs in food hygiene and sanitation between the intervention and control groups before and after providing food handler counseling.

Food handlers from many restaurants in the culinary tourist sector were subjected to a hand swab examination. The examination was performed before the counseling, and then the hand swab examination was performed again after the counseling. Out of the 20 food handlers and examinations, 17 people had harmful bacteria on their hands, according to the data. Six patients were found to have dangerous bacteria on their hands after counseling and re-examination microorganisms like *Escherichia coli*, *Staphylococcus aureus*, *Salmonella*, and *Klebsiella spp.*

Ready-to-eat food poisoning happens occasionally because pathogenic bacteria do not create spores. This happens as a result of cross contamination and recontamination after cooking. This can happen if the containers, processing and storage equipment, and raw and cooked materials are all used together. Re-contamination is mostly caused by a lack of sanitation and hygiene. The main causes of re-contamination include the use of polluted water, facilities, containers, or storage equipment, and workers who do not maintain personal hygiene[17].

Foodborne diseases are caused not only by a lack of quality in these foods, but also by harmful bacteria that are exposed to unsanitary food handlers. A factory discovered a relationship between handlers' personal hygiene practices and the presence of *Escherichia coli* bacteria on handlers' hands, similar to previous studies, but there was no relationship between handlers' personal hygiene practices and the presence of *Staphylococcus aureus* bacteria on handlers' hands[18]. The presence of microbial contamination in a range of production processes was also observed, which is a critical aspect in preserving the safety and quality of food of animal origin, given that microorganisms cause practically all foodborne infections[19].

Furthermore, food handlers are aware of the importance of personal hygiene. Hand washing is critical in preventing hazardous bacteria from spreading from people's hands to their food. The biggest risk factor contributing to foodborne disease caused by food handlers has been identified as contact with bare hands and failing to wash adequately[20]. In Lee's study, *Salmonella* was found on the hands of about half of the participating food handlers. These handlers can be asymptomatic carriers, as *Salmonella* can remain in the carrier state for up to 300 days after infection[21]. In the previous study, 22 food handlers had a bad habit of smoking while handling 18 out of 22 (81.8%) traditional food handlers who proved positive for the growth of pathogenic bacteria on agar. From the identification process, we determined the bacteria species including *Escherichia coli* (50%), *Staphylococcus aureus* (22.72%), and *Klebsiella spp* (9.09%). Three of the bacteria is categorized as the agent of food-borne disease; therefore, we stated all food-handlers who was confident with the pathogen are at risk of becoming a source of transmission. We commonly found *Bacillus subtilis* and *Staphylococcus epidermidis* as normal flora among food-handlers[6].

IV. CONCLUSION

These results suggest that counseling and hand swabbing can lead to a significant reduction in pathogenic bacteria identification among traditional food handlers. Before counseling and hand swabbing, 17 out of 20 food handlers identified pathogenic bacteria such as *Escherichia coli*, *Staphylococcus aureus* and *Klebsiella spp*. After counseling, only 6 out of 20 traditional food handlers identified these bacteria.

The Mann-Whitney U test showed a significant effect on changes in the behaviour of food handlers before and after receiving counselling on hygiene and sanitation behaviour in handling food ($p < 0.05$). Similarly, the Kolmogorov-Smirnov Z test revealed significant changes in bacterial organisms identified on their hands before and after counselling ($p < 0.05$).

CONFLICT OF INTEREST

Authors declare no conflict of interest to disclose.

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