Jurnal Gizi Indonesia (The Indonesian Journal of Nutrition)
Vol. 13, No. 1, December 2024 (52-62)
Received: 15 May 2024, Revised: 29 October 2024,
Accepted: 15 November 2024, Published: 30 December 2024
https://ejournal.undip.ac.id/index.php/jgi , DOI:10.14710/jgi.13.3.52-62

Food handlers' knowledge and practices and the relationship with appropriate sanitation hygiene scores in Malang City

Nurul Aulia[1], Dwi Budiningsari[2*], Lily Arsanti Lestari[2]

ABSTRACT

Background: Food hygiene and sanitation in catering services are affected by food handlers because they are the first to come in contact with food ingredients. This matter is essential to prevent food contamination.
Objective: This study aimed to determine the relationship between food handlers' knowledge and practices and appropriate sanitation hygiene scores in catering services in Malang City, East Java, Indonesia.
Materials and Methods: Two hundred four food handlers and 24 catering services participated in this cross-sectional study. Knowledge data were collected through validated questionnaires filled out by subjects, and food handlers' practices were obtained through observation with a checklist. Subjects who scored >70 were considered to have sufficient knowledge and practice. Good sanitation hygiene was collected through interviews and face-to-face observations and given a score to determine appropriate sanitation hygiene scores. χ^2 and Pearson correlation analyses were performed.
Results: Subjects generally had sufficient knowledge (82.8%) but poor food handling practices (57.8%) because of less frequent and comprehensive training, and food handlers did not apply their knowledge in food processing. Only a quarter of catering services (6 of 24) were rated as having good sanitary hygiene. There was no relationship between food handlers' knowledge and practices and appropriate sanitation hygiene scores in catering services (p = 0.925 and 0.2363, respectively).
Conclusion: Food handlers generally have sufficient food safety knowledge but have poor practice categories, and sanitation hygiene scores are in the inappropriate category. There is no relationship between food handlers' knowledge and practices and sanitation hygiene scores in catering services.

Keywords: Knowledge; practice; food handlers; hygiene sanitation; catering services.

BACKGROUND

Hygiene is defined as an effort to prevent a disease that focuses on health efforts covering individuals or humans and the environment in which the person is located.[1] Sanitation is defined as a health effort to maintain and protect the cleanliness of the subject's environment. Frequent foodborne outbreaks in large factories and school canteens are a public health problem. The potential for food contamination during the preparation stage has not been addressed by public health authorities, particularly the knowledge, attitudes and food handlers' practices regarding food safety.[2]

Personal hygiene and hygiene practices affect the hygienic conditions of food and drinks in the process of preparing cooked food. If hygiene conditions are not considered, it will be easy for food to be contaminated by microorganisms.[3] Although there is a positive association between the level of knowledge, attitudes and practices of the subjects, through observation, it appears that many of them do not always apply the knowledge they learn in actual food handling practices.[4]

Brawijaya University Malang in February 2023 had stopped the Student Work Camp activities, after its students were poisoned by boxed food provided by the committee. The number of poisoning victims reached 510 people.[5] According to the Director of the Brawijaya University Hospital, this poisoning was caused by the food processing process. The role of a nutritionist is very important in overseeing the organization and serving of food to avoid food contamination and ensure that the food is safe for consumption.[7]

An appropriate sanitary hygiene score is a score used to obtain an appropriate sanitary hygiene certificate as a guarantee that catering services meet health requirements related to factors in food processing, such as location, facilities, food storage and processing, as well as human resources.[8] This study aimed to

[1]Department of Biostatistics, Epidemiology, and Public Health, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Daerah Istimewa Yogyakarta, Indonesia
[2]Department of Health Nutrition, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Daerah Istimewa Yogyakarta, Indonesia

***Correspondence:** budiningsari@ugm.ac.id

determine the relationship between food handlers' knowledge and practices and appropriate sanitation hygiene scores in catering services in Malang City, East Java, Indonesia.

MATERIALS AND METHODS

This research is an analytical survey research with a cross-sectional study design. The location was catering institutions in Malang City because there had never been research like this in Malang City. The time of research was March to April 2023. This research was conducted with permission from the Medical and Health Research Ethics Committee, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada (no. KE/FK/0404/EC/2023; approved on March 13, 2023).

Malang City is a culinary city with affordable prices. The residents, who are mostly students, make their culinary dishes affordable, too. Malang, Javanese, Indonesian, Asian and European culinary specialties are in Malang because it is a multicultural city. The subjects of the study were 415 food handlers from 24 catering services in various sub-districts in Malang City.

The subjects were 415 food handlers in catering services in Malang City. The sample size was 204, obtained from the Slovin formula. The inclusion criteria used in the study were healthy food handlers, willing to be respondents, present at the time of the study, able to read and write. While the exclusion criteria used in the study were food handlers who were sick and busy preparing food. The technique used was proportionate stratified random sampling, which is applied if the members of the population were inhomogeneous and the number of units in the strata was not the same.

The independent variable was the food handlers' knowledge and practices, and the dependent variable was the appropriate sanitation hygiene score in catering services. Variable operational definitions were as follows: (1) Food handlers' knowledge were things known to food handlers in implementing food hygiene and sanitation. The instrument used was a questionnaire containing basic questions about food hygiene; (2) Food handlers' practices were the practices carried out by food handlers when carrying out sanitary hygiene in food preparation while still paying attention to the cleanliness of each individual and the environment. The parameter used was the food handlers' practice assessment form of food sanitation hygiene. If appropriate, it was given a score of one; if not, it was given a score of zero. Scores were in the good practice category if the food handler obtained a score of >70% of the total questions, whereas scores were in the bad practice category if the food handler only obtained a score of ≤70% of the total questions;[9] (3) The appropriate sanitation hygiene score was the value for catering services categorized as fulfilled or did not fulfil sanitary hygiene according to their class. The parameters used are the physical adequacy test sheets for the hygiene and sanitation of catering services. In group A1, namely catering services that serve the needs of the general public using a household kitchen and are managed by families, they are categorized as appropriate if they meet a minimum value of 65 and are not appropriate if <65; in group A2, namely catering services that serve the needs of the general public using a household kitchen and employing workers, they are categorized as appropriate if they meet a minimum value of 70 and are not appropriate if <70. These values are in accordance with the Food Hygiene Sanitation Physical Feasibility Test table for Catering Services in the Regulation of the Indonesian Minister of Health number 1096, namely the minimum weight value that must be possessed by catering services in groups A1 and A2. The method of collecting primary data in the form of an appropriate sanitation hygiene score was obtained through observation and interviews conducted by researchers by filling out a physical fitness test form for food sanitation hygiene in catering services. Food handler knowledge data were obtained by giving a knowledge questionnaire form to food handlers. Food handlers' practices were obtained through observation during processing by filling out the food handlers' practice assessment form. The number of food handlers in Malang City was obtained from the Health Office of Malang City, and the list of catering services in Malang City was obtained from the Office of Cooperatives, Industry and Trade of Malang City.

Table 3. Food Handlers' Knowledge Questionnaire

Number	Topic	Explanation
1-3	Personal hygiene	Covers all aspects of hygiene of food handlers
4-5	Food hygiene	Covers all aspects of food hygiene
6-7	Personal hygiene	Covers all aspects of hygiene of food handlers
8-9	Equipment sanitation	Sanitation of equipment that comes into direct contact with food
10	Water sanitation	Sanitation of water used for raw materials in food processing and washing equipment
11-12	Food hygiene	Covers all aspects of food hygiene

e-ISSN : 2338-3119, p-ISSN: 1858-4942

Before the food handlers' knowledge questionnaire was given, a validity test was carried out using the product moment correlation formula, the r count must be >0.4329. A reliability test was carried out using the α Cronbach's coefficient formula, and the reliability coefficient was α=0.7865.

Food handlers' knowledge was measured using a questionnaire consisting of 12 questions regarding food handlers' knowledge of personal hygiene and food sanitation as below.

From the data above, the questionnaire for food handlers' knowledge is dominated by questions about personal hygiene and food hygiene. Added with several questions about sanitation of equipment that has direct contact with food and sanitation of water used to process food and wash equipment. Scores were obtained by the number of correct answers divided by the total number of questions multiplied by 100. Scores were in the high knowledge category if food handlers could answer >70% of the total questions, whereas scores were in the low knowledge category if food handlers could only answer ≤70% of the total questions.[7]

Food handling practice data was measured using a checklist form consisting of 10 practices carried out by food handlers on food hygiene and sanitation shown in the table below.

Table 4. Food Handlers' Practice Checklist

Number	Topic	Explanation
1-5	Personal protective equipment	Personal protective equipment used by food handlers while working
6-7	Personal hygiene	Covers all aspects of hygiene of food handlers
8	Tools for handling food	Tools used to handle food
9	Personal hygiene	Covers all aspects of hygiene of food handlers
10	Work ethics	Ethics that food handlers must follow when working

From the data above, the food handler practice checklist form is dominated by personal protective equipment that must be used by food handlers. Coupled with personal hygiene, tools for handling food and work ethics.

Data processing was carried out in several stages: checking the completeness of the data obtained, transferring the data obtained in tabular form, and grouping the data in detail in the table form. Data analysis was univariate and bivariate. Before the univariate analysis was carried out, data were first tested for the normality of the data distribution. Food handler knowledge data is not normally distributed, so it uses chi square tests. In food handler practice data is normally distributed, so it uses Pearson correlation tests. Bivariate analysis was performed to identify whether there was a correlation between the independent and dependent variables.

RESULTS

Characteristics of subjects

The subjects were food handlers who worked in catering services in Malang City. There were 204 subjects in total, and their characteristics included gender, age, education, length of work, whether they attended training, frequency of training, time of training, place of training, and training implementer for those who had attended the training. Characteristics of subjects were shown in Table 1.

Based on gender, women are more dominant, namely (60.78%) who are 18-50 years old, namely (81.86%). Based on education, 51.96% have a dominant education (high school/equivalent) and 39.71% have a bachelor's degree. Food handlers have worked for 1-5 years, which is 65.69% of all subjects.

Table 1. Characteristics of Subjects

Characteristics	Total (n=204)	Percentage (%)
Gender		
Male	80	39.22
Female	124	60.78
Total	204	100
Age		
<18 years old	3	1.47
18-50 years old	167	81.86
>50 years old	34	16.67

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Table 1. Characteristics of Subject (Continued…)

Characteristics	Total (n=204)	Percentage (%)
Education		
Elementary school	3	1.47
Middle school	14	6.86
High school	106	51.96
Undergraduate	81	39.71
Total	204	100
Length of Work		
<1 year	28	13.73
1-5 years	134	65.69
6-10 years	27	13.23
>10 years	15	7.35
Total	204	100

Subjects who have participated in sanitation hygiene training are only 21.57% of all subjects, dominated by the frequency of training once a year, which is 19.61%. The last training was carried out in 2022, which was 2.94%. The training places and organizers were dominated by local health services, namely 9.32%, and the least was carried out by public health centers, namely 3.92%. Characteristics of training participated by subjects were shown in Table 2.

Table 2. Characteristics of Training by Subject

Characteristics	Total (n=204)	Percentage (%)
Hygiene Sanitation Training		
Yes	44	21.57
No	160	78.43
Total	204	100
Training Frequency		
1 per year	40	19.61
>1 per year	4	1.96
Did not to do the training	160	78.43
Total	204	100
Last Training in		
2015	1	0.49
2017	1	0.49
2019	1	0.49
2020	31	15.2
2021	4	1.96
2022	6	2.94
Did not to do the training	160	78.43
Total	204	100
Training Places		
Local health office	19	9.32
Public health center	8	3.92
Others[1]	17	8.33
Did not to do the training	160	78.43
Total	204	100
Training Organizer		
Local health office	19	9.32
Public health center	8	3.92
Other[2]	17	8.33
Did not to do the training	160	78.43
Total	204	100

[1]Community hall, Hotel, Catering
[2]Kelurahan officer, Department of Cooperatives, Industry and Trade, Catering officer

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Food Handlers' knowledge and practices

The distribution of the level of food handlers' knowledge is shown in Figure 1.

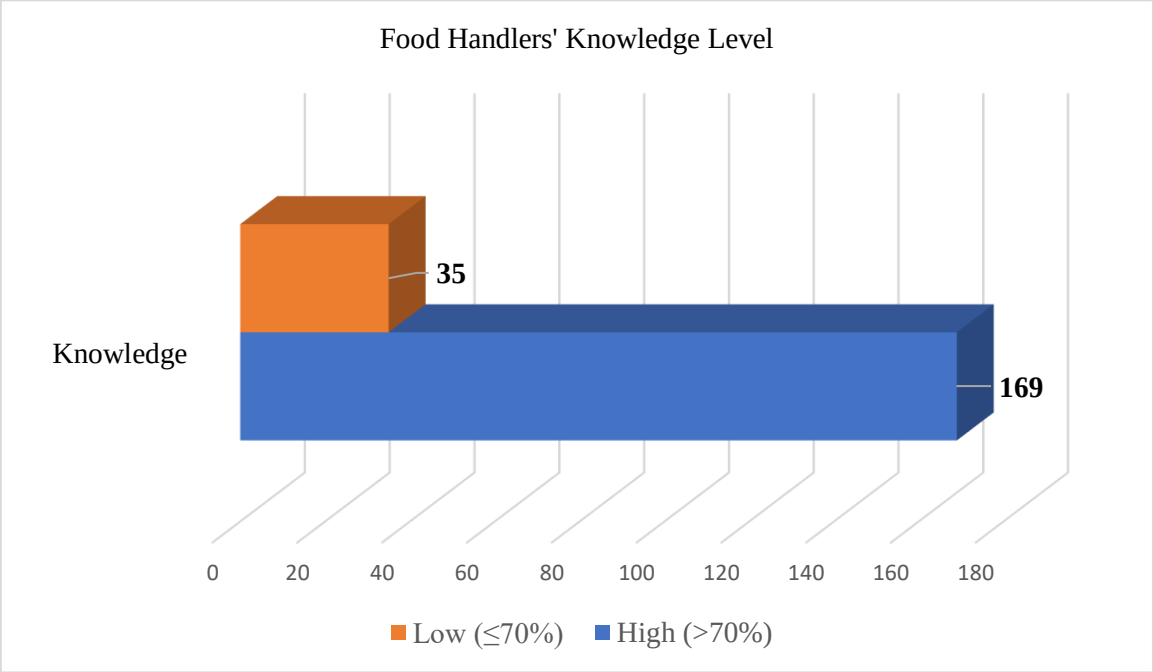

Figure 1. Food Handlers' Knowledge Level

Assessment of food handlers' knowledge of personal hygiene and food sanitation showed that there were more subject in the high knowledge category [169 (82.84%)], whereas there were 35 (17.16%) food handlers in the low knowledge category. The distribution of food handlers' practice is shown in Figure 2.

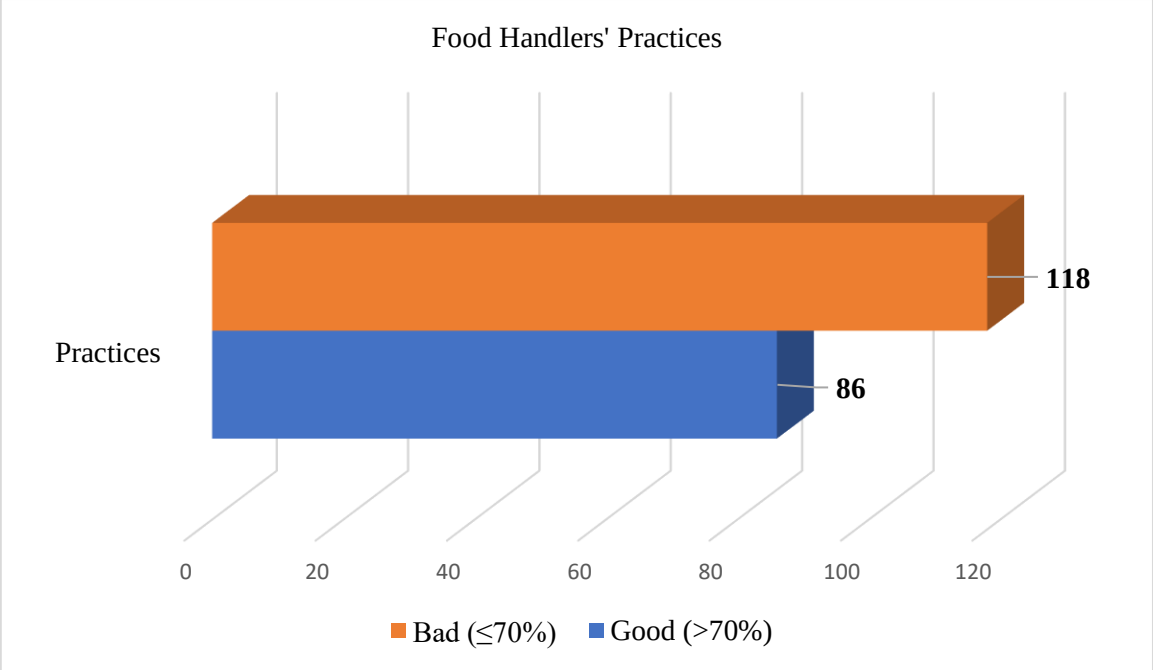

Figure 2. Food Handlers' Practices

Assessment of food handlers' practices carrying out several hygiene principles when processing food in catering services showed that there were more in the category of bad practices [118 (57.8%)], whereas there were [86 (42.2%)] food handlers in the good practice category.

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Appropriate sanitation hygiene scores

The distribution of appropriate sanitation hygiene scores in catering service is shown in Figure 3.

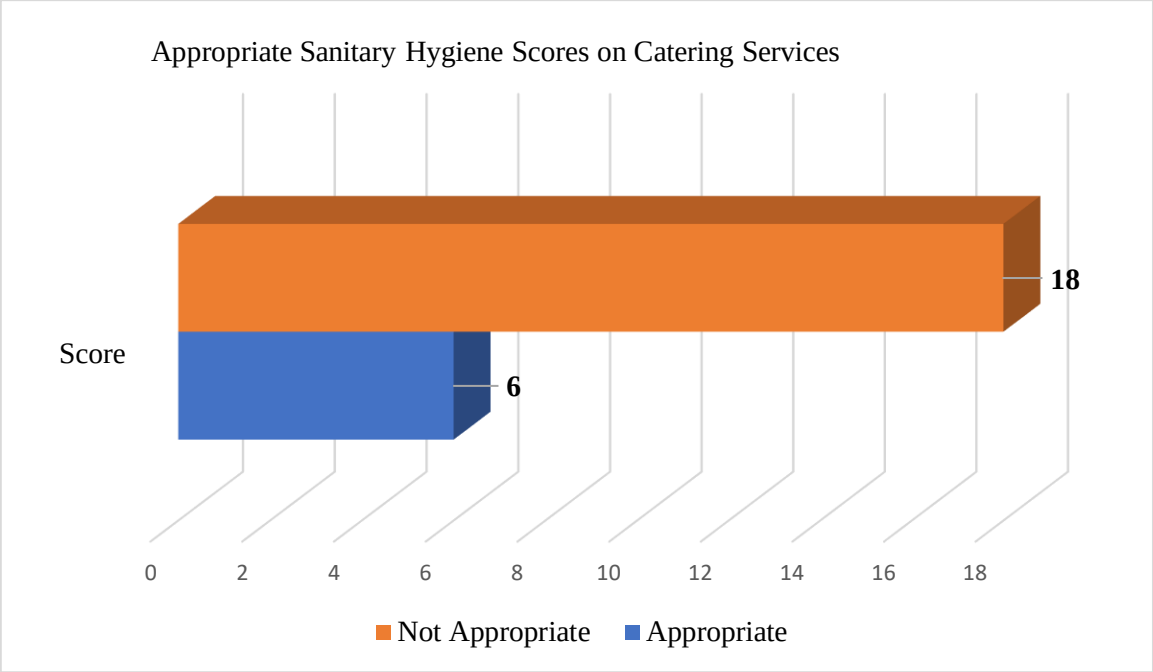

Figure 3. Appropriate Sanitary Hygiene Scores on Catering Services

Assessment of appropriate sanitation hygiene scores in catering services showed that there were more catering services still not in accordance with the minimum score for appropriate sanitary hygiene scores [18 (75%)], whereas there were 6 (25%) catering services in accordance with the minimum score for appropriate sanitation hygiene scores. This was caused by facilities in catering services still not in accordance with the assessment variables on the hygiene and sanitation feasibility form in eateries and restaurants.[8]

Relationship between knowledge and practice with appropriate sanitation hygiene scores

The relationship between knowledge and practice with appropriate sanitation hygiene scores in catering services is shown in Table 5.

Table 5. Correlation Between Knowledge and Practice with Appropriate Sanitation Hygiene Score

Variable	Statistical Test	*p value*
Knowledge	Chi Square	0.925 (>0,05)
Practice	Pearson Correlation	0.236 (>0.05)

Statistical tests for knowledge and appropriate hygiene sanitation scores using the χ^2 test obtained p=0.925 (>0.05), demonstrating no relationship between food handlers' knowledge and appropriate sanitary hygiene scores in catering services. Statistical tests for practice and appropriate sanitary hygiene scores using the Pearson correlation test obtained p = 0.236 (>0.05), demonstrating no relationship between food handlers' practices and appropriate sanitary hygiene scores in catering services. Sanitary hygiene facilities in catering services were unrelated to food handlers' practices.[11]

DISCUSSION

Based on the subjects' characteristics during training, 78.43% had never attended training on sanitation hygiene before, whereas 21.57% had never attended training. The frequency of training for subjects who had attended training was once yearly (90.90%), whereas those who attended training twice yearly were 9.10%. On average, the last training was attended in 2020 or before the coronavirus disease 2019 (COVID-19) pandemic (70.45%). In addition, 43.18% of the training locations were held at the health office, 38.64% at community halls, hotels and catering services, and 18.18% at the health centre. The average training implementer is the health service (43.18%).

e-ISSN : 2338-3119, p-ISSN: 1858-4942

Assessment of food handlers' practices carrying out several hygiene principles when processing food in catering services showed that there were more in the category of bad practices [118 (57.8%)], whereas there were 86 (42.2%) food handlers in the good practice category. Personal hygiene practices are essential to ensure food production is safe for consumers. Food handlers should maintain safe practices, such as wearing appropriate uniforms, aprons, hats and closed shoes, and they should not be smoking, coughing, sneezing or wearing jewellery that can contaminate food while working.[4]

Appropriate sanitation hygiene scores for catering services were obtained by measuring appropriate sanitation hygiene scores using the physical fitness test form for sanitation hygiene for catering services. The categories were divided into appropriate and inappropriate. In group A1, it was categorized as appropriate if it met a minimum value of 65 and inappropriate if <65; in group A2, it was categorized as appropriate if it met a minimum value of 70 and inappropriate if <70. The number of catering services was 14 for class A1 and 10 for class A2, for a total of 24 catering services.

Knowledge is a term used when someone knows about something. It always consists of the one who knows and something that is known and someone aware of what he wants to know. Therefore, knowledge always requires a subject, who has the awareness to know about something, and an object, which is something encountered. Knowledge or cognition is a very important aspect in forming a person's actions.[12]

A person's knowledge is influenced by his education level. The higher a person's level of education, the more information he will receive and, ultimately, the more knowledge he will have. In contrast, a lower education will hinder a person's development in acquiring new information and values.[13] More than half of the subjects' educational backgrounds are high school (51.96%) and undergraduate degrees (39.71%), which affected the level of food handlers' knowledge. These results aligned with Dewi[14] in Surabaya City, which revealed that the education influences knowledge.

Food handlers' training had little impact on increasing food handlers' knowledge. A previous study showed that training in lecture format, only in class, without opportunities for practical practice, can be another factor that hinders food handlers' effective learning.[2] Results from that study aligned with the characteristics of research subjects who have taken part in training, which was considerably lower than those who got high scores on the knowledge level.

Hygiene sanitation requirements are one of the qualities and food safety standards that must be met by every restaurant business owner. This is a type of food processing place that is standard for restaurants that produce ready-to-eat processed food to ensure that the products produced meet standards and are safe for consumers. As proof of fulfilling the requirements, the restaurant will receive a certificate of appropriate hygiene and sanitation.[10]

Based on the Malang Mayor's regulation number 3 of 2020 concerning Delegation of Licensing and Non-Licensing Authority, starting 17 February, 2020, applications for Certificates of Sanitation and Hygiene Worthiness for Restaurants will be processed to the Department of Manpower, Investment and One-Stop Integrated Services (Disnaker PMPTSP) for Integrated Offices on Jalan Mayjen Sungkono, Kedungkandang, Malang City. Processing this certificate is free, except for laboratory examinations. Requirements for obtaining a hygiene sanitation certificate for restaurants are to submit an application, a photocopy of the applicant's ID, location map and building floor plan, a letter of appointment of the person in charge of the restaurant, a photocopy of the food sanitation hygiene course certificate for entrepreneurs and food handlers, recommendation from the House Association Meals and a location and facilities survey to be carried out by the health service.

Not all eateries and restaurants have hygiene and sanitation certificates. Several catering services and business or catering service owners do not know food hygiene and sanitation.[15] This aligned with the characteristics of food services with sanitary hygiene certificates from this research; 12 (85.7%) of class A1 food services and 2 (20%) of class A2 food services from a total of 24 food services do not have sanitation hygiene certificates.

Inspections to obtain sanitation hygiene certificates for restaurants are carried out based on two things: checklists and report cards. There are 9 (nine) variables with few components in each variable. Each variable and component examined is scored according to the real conditions when the inspection was carried out. All variable and component values are added up, producing a final score.[10] This final score is called the sanitary hygiene score. Results from this research showed that six food services (25%) had met the minimum score for sanitation hygiene and 18 food services (75%) have not met the minimum score for sanitation hygiene in food

e-ISSN : 2338-3119, p-ISSN: 1858-4942

services. This is caused by facilities and conditions that still have not met the requirements in the variables from the checklist form.

χ^2 tests were used for bivariate analysis between food handlers' knowledge and sanitation hygiene scores because data were nonnormally distributed. There was no relationship between food handlers' knowledge and appropriate sanitation hygiene scores in catering services [p=0.925 (>0.05)]. Knowledge was unrelated to the sanitation hygiene score in food services because what was more influential was the infrastructure in food services, in accordance with Amelia [16] in Jambi, which stated that the factors related to sanitation hygiene in food services are infrastructure, supervision from catering service officers or owners and food handlers' knowledge and practices. This bivariate test aligned with Rahmayani[17] in Aceh, which revealed that there was no relationship between knowledge and sanitation hygiene. However, this contradicted Puteri[18] in Bangkinang, which showed that knowledge is related to the implementation of sanitation hygiene.

Bivariate analysis between food handlers' practices and sanitation hygiene scores in catering services was carried out using the Pearson correlation test because data were normally distributed. There was no relationship between food handlers' practices and sanitary hygiene scores in catering services [p=0.236 (>0.05)]. Sanitary hygiene facilities in catering services were unrelated to food handlers' practices.[11]

The length of work did not influence food handlers' practices, but knowledge was a key element in influencing the results of food handlers' practices.[19] Based on the characteristics of research subjects, most worked for 1 to 5 years [134 (65.69%)]. Research by Yahya[20] in Jakarta regarding food management in schools also showed the same thing; there was no relationship between the length of work and the practices carried out by food handlers.

There was no relationship between age and level of education on sanitation hygiene practices.[20] Based on the subjects' characteristics, most food handlers were 18 to 25 years old [167 (81.86%)]. For the dominant educational level, there were 106 (51.96%) food handlers with high school/vocational school/equivalent education levels. Training or counselling did not influence food handlers' practices. This was due to a lack of training or counselling provided by government agencies, and the training provided was not comprehensive in each region and there was a lack of health personnel to provide counselling or supervision.[21] Based on the subjects' characteristics, only 44 (21.57%) had attended training, which was not conducted comprehensively in every region. Some regions provided training individually or from their respective catering services.

Many food handlers do not always apply the knowledge they have learned in sanitary hygiene practices for food. Therefore, effective and mandatory training on a regular and ongoing basis must be carried out for all employees or food handlers to minimise the prevalence of food hazards.[4] Based on the subjects' characteristics, the frequency of training for food handlers was only once yearly [40 training times (90.90%)]. Likewise, 31 food handlers (70.45%) had their last training before the COVID-19 pandemic or in 2020.

Supervision from catering service owners is important to control the sanitary hygiene of food handlers' practices. The main task of supervision is to seek feedback that will provide direction and improvement if activities are not running well. Supervision has an important influence on sanitation and hygiene practices.[11] Based on the research conducted, there was no good supervision of the food handling practices of catering service owners.

Assessment of sanitary hygiene worthy scores for food services showed that more food services still do not meet the minimum score for sanitary hygiene worthy scores [18 (75%)]. This was caused by the facilities at food services still not being in accordance with the assessment variables on the sanitary hygiene fitness form for restaurants and eateries. This form checks the appropriateness of sanitary hygiene in eateries and restaurants.[10]

Sanitary hygiene facilities in food services are unrelated to food handlers' practices.[11] This aligned with the bivariate analysis using the Pearson correlation test with p = 0.236 (>0.05), which means no relationship exists between food handlers' practices and sanitation hygiene scores in catering services. Food handlers' practices are unrelated to sanitation hygiene scores because what is most related to sanitation hygiene scores is the facilities at the food service compared to the training carried out by food handlers. Research by Baringbing[21] in Jambi stated that the factors that influence the implementation of sanitation hygiene in food services are supervision, availability of sanitation facilities, knowledge and training.

Based on the food handlers' practice checklist, a practice that is rarely carried out by food handlers is using masks when processing and serving food. Although COVID-19 has subsided, the use of masks when processing and serving food is very important to avoid contamination of the food being served. Food handlers must use personal protective equipment such as aprons, hair nets, footwear and masks to prevent food

e-ISSN : 2338-3119, p-ISSN: 1858-4942

contamination.[22] This also aligned with Haryanti[23] which stated that sanitation hygiene will meet the requirements if food handlers use complete personal protective equipment, namely aprons, masks and gloves, closed food storage areas, wash with running water and not smoking in the food preparation area.

Age and education are related to personal hygiene actions or food handler practices.[24] Based on the subjects' characteristics, the dominant food handlers were between 18 and 50 years old [167 (81.86%)]. At the education level, the dominant food handlers were at the high school education level [106 (51.96%)].

Based on the answers to the food handlers' knowledge questionnaire, the lowest correct score was on questions regarding food transportation. This question asked about the equipment used to transport food over 2 h, but many food handlers were fooled by the answer choices available. In fact, according to the Indonesian Ministry of Health,[22] food handlers are directly related to food and eating utensils, starting from preparation, processing, and transportation to serving food. Therefore, food handlers must have good knowledge regarding food preparation and serving to maintain the hygiene and sanitation of the food served.

Assessment of food handlers' practices in carrying out sanitation hygiene during processing showed that there were more food handlers in the bad practice category [118 (57.8%)]. However, personal hygiene practices are very important to ensure safe food production for consumers. Food handlers must maintain safe practices, such as wearing appropriate uniforms, aprons, hats and closed shoes, and they must not smoke, cough, sneeze or wear jewellery that could contaminate food while working.[4]

Food handlers' practice checklist also revealed that as many as 91 (44.6%) food handlers still chatted when processing food, although this would affect the quality of the food being processed. Research by Sihombing[25] revealed that food can be contaminated by the handler's saliva if the food handler chats while processing the food.

Based on the bivariate analysis, the total number of food handlers with low knowledge was 35, and the total number of food handlers with high knowledge was 169. The total number of food handlers with bad practices was 118, and the total number of food handlers with good practices was 86 [$p = 0.300$ (>0.05)]. This showed that there was no relationship between food handlers' knowledge and practices.

There was no relationship between knowledge and practice because food handlers do not apply their knowledge when practicing food processing. Results of this bivariate analysis aligned with Sembiring[26] in Kabanjahe, Karo Regency, which revealed that there was no relationship between knowledge and the practices or behaviour of food handlers. However, these results contradicted Fitriana[25] in Gresik, which revealed that there was a relationship between knowledge and food handlers' practices. Research by Selviana[26] was also contradictory, revealing that there was a relationship between knowledge and personal hygiene behavior in food handlers. Research conducted by Aurum[24] also revealed that the level of knowledge was related to personal hygiene among food handlers.

The advantage of this study is that data collection does not only involve filling out questionnaires but also direct observation of catering services, so the obtained data were objective. The sample also included one city of Malang, which can describe food handlers' knowledge and practices in a larger scope. This research also illustrated that food services with a sanitation hygiene certificate do not necessarily have a score according to the sanitation hygiene assessment form.

One limitation of this study is time. This research was conducted before and during the month of Ramadan, so several catering services refused to be interviewed about catering services and fill out food handlers' knowledge questionnaires because they were busy to serve many orders. Another limitation is that the possibility the researcher could not appropriately observe food handlers' practices and take documentation when filling out the checklist because the enumerator was not assisted. There was also only one time visit to do observation.

CONCLUSION

It can be concluded that (1) the level of food handlers' knowledge in catering services in Malang City is dominant in the high category due to their high level of education; (2) The dominant food handlers' practices in catering services in Malang City are in the bad category, caused by the lack of thorough training conducted by the government, the frequency is lacking and food handlers do not apply the knowledge they have when food processing takes place; (3) The appropriate sanitary hygiene score for catering services in Malang City, which was dominant in the unsuitable category, was caused by the facilities and conditions of the catering services at the time the research took place. The facilities and conditions of the catering service are still not in

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accordance with the requirements in the hygiene and sanitation assessment table at the catering service; (4) There is no relationship between food handlers' knowledge and appropriate sanitation hygiene scores in catering services (p=0.925) and no relationship between food handlers' practices and appropriate sanitation hygiene scores in catering services (p=0.236).

For catering service owners, these results can be used as evaluation material to improve food handlers' practices by supervising and providing written rules regarding uniforms and cleanliness to food handlers and to increase the appropriate sanitary hygiene score in catering services by improving conditions and facilities in catering services, as well keep the kitchen clean. For the Malang City Health Office, it is necessary to organize training for food handlers of catering services periodically. For future researchers, it is recommended to perform further research related to the supervision carried out on food handlers' practices and to add enumerators in the research so that each activity can be appropriately documented and conduct community service regarding the socialisation of procedures for obtaining sanitation hygiene certificates.

ACKNOWLEDGMENT

The authors is grateful to the Health Office of Malang City, and the Office of Cooperatives, Industry and Trade of Malang City, East Java, Indonesia for obtaining permission to carry out this study. The authors would like to thank all of the catering services and the food handlers who participated in this study.

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