

ORIGINAL ARTICLE

Knowledge, attitude and practice of hygiene and sanitation among food-handlers in a psychiatric hospital in Indonesia - a mixed method study

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Keywords

Food-handler • Hygiene and sanitation • Psychiatric hospital • Knowledge • Attitude and practice

Summary

Introduction. In a psychiatric hospital that also provides nutritional service, food hygiene and sanitation is considered as an important factor to prevent infection. This study aimed to describe knowledge, attitude, and practice of hygiene and sanitation and the contributing factors in food-handlers of a psychiatric hospital.

Methods. A mixed method study was conducted in a referral mental health hospital in Central Java, Indonesia. To obtain the quantitative data, 37 food-handlers were recruited through a purposive sampling. A self-administered questionnaire was distributed to measure knowledge and attitude, while hygiene and sanitation practice was observed directly using a checklist. In-depth interview was carried out with food-handlers as well as supervisors of food production and distribution at the Nutrition Unit. Rank Spearman correlation and Kruskal Wallis test with content analysis were utilized for data analysis.

Results. A total of 33 (89%) and 31 (84%) subjects had respectively good knowledge and attitude regarding hygiene and sanitation. However, more than one third (38%) of food-handlers performed poor hygiene and sanitation practice. No correlations were found between knowledge, attitude, and practice regardless of any combination between two factors ($p > 0.05$). Possible causes of unfavourable hygiene and sanitation practice included person-related factors and human resource management. Further analysis indicated that training received by food-handlers had an association with their practices ($p < 0.05$).

Conclusion. Knowledge and attitude on hygiene and sanitation are generally good among food-handlers in the psychiatric hospital. There is a need to improve the practice through training programs.

Introduction

A psychiatric hospital is essentially a health service facility for patients with mental illnesses [1]. Similar to regular hospitals, a psychiatric hospital provides inpatients nutritional service to prevent malnutrition. Patients in psychiatric hospitals may have nutritional risks which could be affected by insufficient dietary intake and their long-term hospitalizations [2]. Provision of foods in the psychiatric hospital is also expected to fulfill patient rights in obtaining quality health services through adequate food-handling standards, yet issues around meals are frequent. A study conducted in two mental health facilities in South Africa found that the poor quality and quantity of hospital food as well as unhygienic condition of the wards caused much frustration and dissatisfaction among patients [3].

Food service in the hospital should be given particular attention as foods can act as transmission vehicles for infection, causing foodborne disease outbreaks in the vulnerable population. Health workers can transmit infections through direct contacts, air, or foods given to patients [4]. One of the prominent attributes of hospital outbreaks is that psychiatric wards and elderly-care wards (including psychogeriatric wards) are likely to be

most seriously affected [5]. Fatal foodborne outbreak occurrence at a state psychiatric hospital in Louisiana (USA) underlines the need for strict guidelines regarding food preparation at psychiatric inpatient facilities [6].

Hygiene and sanitation is an aspect that needs to be maintained in all activities that take place in the hospital to protect patients, health workers, and visitors from risks of infection [7]. According to Indonesia's Ministry of Health Decree No. 1096 of 2011, food catering facilities are required to meet the hygiene and sanitation regulatory standard specified for every type of establishment in order to prevent adverse health effects [8]. Studies have pointed out that the majority of foodborne disease outbreaks were caused by improper food-handling practices [9, 10] and directly linked to food-handlers [11-13]. WHO identified five food-handling factors associated with foodborne disease outbreaks: improper cooking, temperature mishandling during food storage, cross contamination, poor sanitation and hygiene, and the use of unsafe water and raw materials [14], most of which are closely related to the work activities of food-handlers. To ensure that food-handlers practicing the right way of handling foods, knowledge and training are crucial as part of their job [15].

“Prof. Dr. Soerojo” psychiatric hospital is one of national referral hospitals for mental health. It occupies a rela-

tively large area of 41 hectare of land and applies decentralized kitchen system where meals are produced in the main kitchen and transported to various locations near customer (pantry wards) for the meal assembly. Thus, challenges in the hygiene and sanitation implementation may present due to double handling of food and supervision at many pantries throughout the facility. Several studies have been conducted on knowledge, attitude and practice of hygiene and sanitation among food-handlers of mental health facilities in Indonesia, but none of them were performed using a qualitative method to better understand the variables in question [16, 17]. The aim of our study was to describe knowledge, attitude, and practice (KAP) regarding hygiene and sanitation, the relations among these factors and the contributing factors in food-handlers of a psychiatric hospital.

Methods

The study was conducted in “Prof. Dr. Soerojo” psychiatric hospital, a national referral hospital situated in Magelang, Central Java Province, Indonesia, during February until March of 2018. Having had a large number of food service workers performing food production and distribution tasks in the main kitchen and pantry wards, the hospital was able to provide a sufficiently large sample size (greater than 30) for our study. We applied mixed method or a combination of qualitative and quantitative approach to examine KAP among food-handlers. The cross-sectional design was used in the quantitative study to identify the level of knowledge, attitude and practice of hygiene and sanitation and to analyze the relations among these factors. Subsequently, a qualitative case study was conducted to support results from the quantitative study and to explore the contributing factors for KAP in food-handlers.

Thirty-seven food-handlers were recruited as samples of the quantitative study through purposive sampling. These respondents were staffs of the hospital’s Nutrition Unit who performed direct contacts with foods during food-handling processes, including food receiving, production, distribution and service. A self-administered questionnaire was distributed to measure food-handler’s knowledge and attitude, while hygiene and sanitation practice was observed directly using a checklist. The checklist and questionnaires used in this study were adapted from a previous published research article [18]. Instruments’ validity and reliability were tested on a group of food-handlers (n = 20) at another psychiatric hospital, resulting in all questionnaire items as being valid and reliable (Cronbach’s alpha > 0.6). Variables of KAP were categorized as good (a score between 76 and 100%), fairly good (a score between 56 and 75%), and poor (a score < 56%) [19].

Qualitative data were collected by the researchers through in-depth interviews, participant observation, and document analysis on the Standard Operating Procedures or SOPs, as a means of methodological triangulation. Participants for the in-depth interview were food-

handlers who participated in the quantitative survey or staffs of the Nutrition Unit; all of whom had to show willingness to share their insights through an audio-taped interview. A total of 11 participants, consisting of 2 cooks, 1 kitchen staff who was in charge of food storage, 6 food service assistants who performed food distribution, and 2 nutritionists/dietitians who were appointed as supervisors of the food production and distribution, were interviewed until data saturation was reached. The interview was carried out in Indonesian language and in accordance with in-depth interview guides which comprised open-ended questions about personal protective equipments (e.g. aprons, gloves, masks) as well as the food service system and facilities related to knowledge, attitude and practice of the food-handlers. On completion, the interview tapes were transcribed verbatim by the researchers. To ensure that the participants’ meanings had not been modified during analysis process, all transcripts were checked by the study supervisor.

Tech’s approach of open coding was used to analyze the qualitative data [20, 21]. Themes and categories were sorted manually and then overall thematic descriptions were developed in regard to food-handler’s views on hygiene and sanitation in the context of hospital food service. All coding and interpretation in the present study were discussed among research team. For quantitative data, statistical analyses were performed by using SPSS (Statistical Package for the Social Sciences) software. Descriptive statistics were presented in the forms of frequency distribution (%) and the Rank Spearman correlation test was undertaken to identify the relationship between two KAP variables. Additionally, Kruskal Wallis tests were employed to determine individual characteristics that had an association with food-handler’s practice of hygiene and sanitation.

This study was approved by Ethics Committees of the Faculty of Medicine, Public Health and Nursing Universitas Gadjah Mada (Ref. KE/FK/0427/EC/2018) and “Prof. Dr. Soerojo” psychiatric hospital (Ref. TEC/001/III/2018). Approval and signing of informed consent were also sought from all respondents.

Results

FOOD SERVICE IN THE “PROF. DR. SOEROJO” PSYCHIATRIC HOSPITAL

“Prof. Dr. Soerojo” psychiatric hospital implemented a decentralized food distribution system in which the main kitchen became an area where food production took place and was supervised by a nutritionist as the chief of production. Then, food assembly was carried out at the small kitchen of each ward (pantry) located at different buildings. Foods were distributed by some cooks to the pantry wards using distribution cars. At general wards, food assembly and distribution to patients were performed by food service assistants or waiters under the supervision of a nutritionist as the chief of service. At the psychiatric ward, however, once the food containers reached the entrance, they were received by the patients.

There were no food service assistants appointed at this particular ward. Instead, mental health patients would assemble and distribute foods under the supervision of a nutritionist and nurses. Every mental health patient staying in this hospital was scheduled to take turn in the food apportioning at their wards as a therapy to have an outcome of independent living.

CHARACTERISTICS OF RESPONDENTS

Of the 37 food-handlers, 21.6% were a college graduate and the majority of respondents ($n = 27$ or 73%) never received any training related to hygiene and sanitation (Tab. I).

KNOWLEDGE, ATTITUDE, AND PRACTICE OF FOOD-HANDLERS

Table II shows that the proportion of food-handlers who had good scores of knowledge and attitude about hygiene and sanitation was 89.19 and 83.78%, respectively. However, hygiene and sanitation practice were classified as poor for more than one third (37.84%) of the respondents, while the other 27.03% were categorized as fairly good. Table III presents no significant correlation between knowledge and attitude, knowledge and practice, as well as attitude and practice of food hygiene and sanitation (all p -values were larger than 0.05).

In agreement with the finding of the quantitative study which shows a relatively high level of knowledge, the study participants indicated that they had awareness of regulations and SOPs that had been set for the implementation of hygiene and sanitation during food service operations:

- “Yes, there are SOPs. When portioning foods, we should use PPE (personal protective equipment) ... masks, aprons and gloves. To cover the hair, male workers wear uniform hats and female workers had worn headscarves in the first place” (food service assistant/waitress-female, 18 years of work experience).
- “The standard in our kitchen is that a personnel wears boots, an apron, orange clothes (uniforms), a hat and a mask” (cook-male, 10 years of work experience).

Another participant was able to demonstrate comprehension in hygiene and sanitation standard by explaining its details:

- “There are supervision of the temperature and inspection of food ingredients in terms of quantity discrepancy, specifications and expiry date. There are also standards for the size of (kitchen) facilities. For instance, a food shelf should have a distance with the wall and the height is at least 15 cm from the floor (according to the Ministry of Health decree)” (kitchen staff-male, 35 years of work experience).

Participants in the study also expressed positive understandings on proper use of PPE when delivering foods to patients as they realized its importance for the patients’ and their own safety:

- “There are no specific instructions (to use PPE during food distribution). But, if I look at the patient’s condition, I usually use PPE (because) it is safer

Tab. I. Respondents features.

| Characteristics | n = 37 | % |
|--|--------|------|
| Age (years) | | |
| 19-30 | 7 | 18.9 |
| 31-50 | 20 | 54.1 |
| 51-70 | 10 | 27.0 |
| Sex | | |
| Male | 22 | 59.5 |
| Female | 15 | 40.5 |
| Education level | | |
| Primary school | 3 | 8.1 |
| Secondary school | 26 | 70.3 |
| Higher education | 8 | 21.6 |
| Job position | | |
| Cook (production unit) | 25 | 67.6 |
| Food service assistant or waiter (distribution & service unit) | 11 | 29.7 |
| Kitchen staff (in charge of food storage facilities) | 1 | 2.7 |
| Length of work experience | | |
| < 6 years | 4 | 10.8 |
| 6-10 years | 13 | 35.1 |
| > 10 years | 20 | 54.1 |
| Training received (in food safety, hygiene and sanitation, or prevention and infection control) | | |
| Yes | 10 | 27.0 |
| No | 27 | 73.0 |

Tab. II. Food handlers’ knowledge, attitude, and practice (KAP) in hygiene and sanitation.

| KAP level | Knowledge | | Attitude | | Practice | |
|-------------|-----------|-------|----------|-------|----------|-------|
| | n | % | N | % | n | % |
| Good | 33 | 89.19 | 31 | 83.78 | 13 | 35.14 |
| Fairly good | 2 | 5.41 | 6 | 16.22 | 10 | 27.03 |
| Poor | 2 | 5.41 | 0 | 0.00 | 14 | 37.84 |

Tab. III. Correlation among knowledge, attitude and practices level of subjects ($n = 37$).

| Variable’s correlation | r | p |
|------------------------|--------|-------|
| Knowledge-attitude | -0.153 | 0.366 |
| Attitude-practice | 0.073 | 0.667 |
| Knowledge-practice | -0.118 | 0.486 |

r: Rank Spearman’s correlation coefficient; p: p-value (significant at $p < 0.05$).

... (just) for my own safety” (food service assistant/waitress-female, 18 years of work experience).

- “Even though we serve mental health patients, the standard (to be followed) is similar (to serving general-ward patients). We still have to wear masks, especially for staffs who have direct contacts with patients” (cook-male, 3 years of working experience).

However, a number of participants perceived the use of PPE during food distribution process as being unnecessary. One participant remarked:

- *“If the patient is not from the isolation ward or having a special condition such as tuberculosis (infection), it is fine to not wear the PPE”* (food service assistant/waitress-female, 7 years of work experience).

The nutritionists as managers of the food production and distribution stated that the Nutrition Unit had created standard operating procedures for food service activities. However, they acknowledged challenges in the implementation of hygiene and sanitation within food service processes, especially in the use of personal protective equipment, possibly caused by several factors. Firstly, there were differences in perceiving a single SOP by food-handlers who worked in different positions, as was described by this participant:

- *“(The procedure is) when the workers come to the kitchen, they have to wash their hands, wear masks and cover the head for men and women (everyone). When portioning foods and washing utensils, the workers have to wear an apron. However, in the distribution process, (wearing an apron) is not required ...”* (chief of service/nutritionist-female, 10 years of work experience).

The difference in the SOP interpretation between cooks and food service assistants might affect their hygiene and sanitation practice, in which cooks did not wear an apron when they did the dishes in the kitchen as their waiter counterparts did not wear one either.

The next factor that could hinder the implementation of hygiene and sanitation was the improper use of PPE by food-handlers which was still tolerated by supervisors. The key informants suggested that not wearing PPE was tolerable under certain circumstances, including not wearing mask in the kitchen when the temperature is too hot or during a food distribution process when the food-handlers had a face-to-face time with patients:

- *“Ideally, food-handlers have to wear masks and head covers. But, sometimes we do have some tolerance for mask wearing, if the weather is really hot and as long as they do not talk too much during cooking. To minimize food contamination, they are asked to not talk too much (when they are working in the kitchen)”* (chief of production/nutritionist-female, 25 years of work experience).
- *“During the distribution process, food service assistants are not obliged to wear a mask. (Actually), it is the patients who are expected to wear mask, as in a medical situation if someone is sick, then they are the ones who are supposed to wear protective equipments like masks. Also, we do not consider it as very polite for food-handlers to wear a mask (which covers their face) during the food distribution”* (chief of service/nutritionist-female, 10 years of work experience).

Another factor that can cause challenge in the implementation of food hygiene and sanitation is the issue of human resource management and person-related fac-

tors, including the traits and age of an individual. Participants in the study felt that the managers had constraints in the supervision of personal protective equipment use in many food service workers, especially senior food-handlers:

- *“Not all food-handlers wear masks and head cover when they cook. So, usually we are (only) recommended to not have too long hair. But, sometimes the older employees seem unwilling to comply with the inputs given by the younger staffs”* (cook-male, 3 years of work experience).

Another remark confirmed that food-handlers' practice was not perfectly good and personal characters might correspond to hygiene practices:

- *“Every day we check the use of PPE (in food-handlers). The problem is, here, we have so many food service workers with different personal characters. The practice of wearing uniform and head cover has already been good (among food-handlers), but we remain struggling with the mask. Frankly, we have to remind food-handlers to wear their masks very often, but it is rather difficult because everyone has a different character. Some individuals may put on their masks (after being reminded by the supervisor), but they remove it shortly after they wear it (chief of production/nutritionist-female, 25 years of work experience).*

INDIVIDUAL CHARACTERISTICS AND PRACTICE OF HYGIENE AND SANITATION

As indicated by several participants in the interview, individual characteristics might correspond to one's hygiene practice. Further analysis was performed to identify an association between individual characteristics and food-handler's practice.

Table IV outlines the significant difference of hygiene and sanitation practice between groups of food-handlers who received and did not receive training related to hygiene and sanitation ($p = 0.024$; $p < 0.05$). The group that never received any training had the largest number of individuals with poor hygiene and sanitation practice ($n = 13$). Hence, the high proportion of respondents in the poor practice category could be attributed to the lack of hygiene and sanitation training.

Participants in the current study reported that formal trainings related to hygiene and sanitation, whose topics included personal hygiene and use of personal protective equipment, had not been received by all food-handlers:

- *“Not all food-handlers (in this hospital) received training on food safety or hygiene and sanitation. These included the majority of food service assistants. Only the nutritionists received (formal) training on Prevention and Infection Control”* (chief of service/nutritionist-female, 10 years of work experience).

Despite the large percentage of respondents who never received formal training on hygiene and sanitation, they attended staff briefing sessions arranged by the Nutrition Unit frequently. The information meetings were mostly delivered by staffs from the Prevention and Infection

Tab. IV. Differences in the practice of hygiene and sanitation based on individual characteristics.

| Individual characteristic | | Practice | | | | | | | | p |
|---------------------------|------------------|----------|----|-------------|----|------|----|-------|----|--------|
| | | Poor | | Fairly good | | Good | | Total | | |
| | | n | % | N | % | n | % | n | % | |
| Age | 19-30 | 0 | 0 | 3 | 8 | 4 | 11 | 7 | 19 | 0.117 |
| | 31-50 | 10 | 27 | 2 | 5 | 8 | 22 | 20 | 54 | |
| | 51-70 | 4 | 11 | 5 | 14 | 1 | 3 | 10 | 27 | |
| Education level | Primary school | 2 | 5 | 0 | 0 | 1 | 3 | 3 | 8 | 0.171 |
| | Secondary school | 9 | 24 | 6 | 16 | 11 | 30 | 26 | 70 | |
| | Higher education | 3 | 8 | 4 | 11 | 1 | 3 | 8 | 22 | |
| Length of work experience | < 6 years | 0 | 0 | 1 | 3 | 3 | 8 | 4 | 11 | 0.162 |
| | 6-10 years | 6 | 16 | 3 | 8 | 4 | 11 | 13 | 35 | |
| | > 10 years | 8 | 22 | 6 | 16 | 6 | 16 | 20 | 54 | |
| Training received | No | 13 | 35 | 7 | 19 | 7 | 19 | 27 | 73 | 0.024* |
| | Yes | 1 | 3 | 3 | 8 | 6 | 16 | 10 | 27 | |

*: p-value (significant at $p < 0.05$).

Control (PIC) Unit of the hospital, as was described by the Chief of Production:

- *“PIC training has yet to be organized (for all staffs). However, PIC staffs come here quite often to provide guidances and short counsellings about hygiene, sanitation, handwashing, motivation for always wearing PPE (personal protective equipment) and banning smoking in the production area”.*

Discussion

Food-handlers have a significant role in food safety as poor food-handling practices may lead to food poisoning. Food-handlers may introduce pathogens into food in the course of its preparation, production, and distribution [22]. The current study attempted to quantitatively and qualitatively describe food-handlers' knowledge, attitude and practice in the food hygiene and sanitation.

The majority (more than 80%) of the subjects in this study were in the good knowledge and good attitude category. This concurs with the result of a previous quantitative study in hospital food service settings in Jordan [23], whilst differs from findings of studies conducted in India [24] and Ghana [25]. In terms of hygiene and sanitation practice, about one third of the subjects were in the unfavorable category and the items not complied by most food-handlers were about the use of personal protective equipment during dishwashing and wearing masks when handling foods, among others. This result accords with the findings of a previous study, demonstrating that 33.33% of food-handlers had poor practice in using gloves, mask and cap [24].

Ideally, if the knowledge and attitude of food-handlers related to hygiene and sanitation is classified as good, so is the hygiene and sanitation practice. Such condition will present a positive unidirectional relation among those variables [25, 26]. However, in the present study, it was found that knowledge among food-handlers had no significant correlation with attitude and practice ($p > 0.05$). Likewise, no significant relationship was observed between attitude and practice ($p > 0.05$). A to-

tal of 83.78% of food-handlers had good hygiene and sanitation attitude and there was not a single person who had poor attitude. A previous study reported that participants of the hand hygiene campaigns were not effectively translating their knowledge into practice [27]. The absence of the relation between knowledge and attitude can be explained through participants' responses from the interview. Although in general food-handlers had good understanding regarding food hygiene and sanitation, a number of participants perceived the use of personal protective equipment was only necessary when performing food distribution for patients with tuberculosis or infectious diseases and at the isolation ward.

This study has also highlighted that knowledge does not translate into rigorous practice among food-handlers, as was in another study which showed that increased knowledge of food hygiene practices does not always result in a positive change in food-handling behavior [28]. The study participants stated 3 possible factors that might prevent the optimum implementation of food hygiene and sanitation practice, including differences in the SOP interpretation among food service staffs, tolerances from managers in PPE use under some circumstances, and personal characteristics which becomes constraints faced by managers who performed inspection function. Based on the observation, food-handlers had been working by following SOPs accordingly except for wearing masks, a procedure which often overlooked by supervisors due to the unbearably hot temperature in the kitchen. A study among food-handlers at primary schools in Malaysia indicated that the government should bring attention to the importance of wearing a mask and practicing proper hand washing through hands-on training [29]. With regard to managerial function, the pre-emptive-training and the need to develop age-aware human resource policies and practices are suggested as some of the most effective actions to sustain older workforces and their employability in the workplace [30].

The current study put emphasis on the training received by food-handlers as a factor that impact good practices ($p < 0.05$). There were only 27% of the subjects who received training related to hygiene and sanitation and

this was confirmed by the qualitative result. The Chief of Service reported that it was difficult to organize training for all food-handlers at once as it can cause disruption of food services. Therefore, food-handlers had to take turn participating in a training. Moreover, food-handlers who did not understand the principles of hygiene and sanitation were asked to learn from their colleagues whom already received relevant information or training, so exchanging knowledge among the trained and non-trained workers would help to increase their knowledge and, in turn, improve their practice in hygiene and sanitation. This perspective can thus serve as a barrier that prevent the institution from arranging a formal food safety training for their employees. In this case, sharing knowledge among food-handlers themselves may not be too effective either because of influences of personal factors including employee's age and seniority in the department. The hospital had, in fact, made efforts to provide routine briefings conducted by PIC staffs whose topics include basic principle of hygiene and sanitation, although it did not reach out to all food-handlers. Despite varied results in previous studies regarding the effect of food safety training on food-handler's KAP [31-33], structured training on food hygiene and sanitation is still recommended to be implemented towards food-handlers in the current study. As it was found that 73% of the food-handlers never received any formal training, educating and training of food-handlers is expected to encourage positive attitude and provide the opportunity for food-handlers to put their knowledge into practice. Besides, first hand training will address the issue of SOP application, in that it was performed differently by various food-handlers. A previous study which investigated the efficacy of hygiene training of food-handlers at a teaching hospital underlines the importance of periodic trainings on food hygiene to both keep the level of knowledge high by preventing the information from being forgotten as well as to improve the level [33]. Another study at several Korean hospitals supported the idea that good knowledge of hygiene and sanitation does not guarantee adequate practice performed by a food-handler. Thus, repeated training and inspection are required to implement hygiene and sanitation principles at the workplace [34]. Finding of this study also adds to the literature which stated that differences in inspection scores of hygiene were caused by a wide variety of factors, most remarkably management culture [35]. Participants' remarks in the present study imply that there remains a need in continually improving the capacity of managers in charge of enforcing compliance and inspection of the food hygiene and sanitation to maintain the good quality of foods served in the hospital.

This study is the first to employ a mixed-method approach in a study of food-handlers at a psychiatric hospital setting. It comprises both a survey and qualitative techniques that can comprehensively depict food-handlers' sights on food hygiene behaviors as well as the contributing factors and barriers for properly implementing hygiene and sanitation principles. To determine food-handlers' practice, we also use a direct observation

by the researcher rather than a self-reported measure. On the other hand, the study was limited to 37 food-handlers working in a certain hospital, which may not be generalized to describe the condition of knowledge, attitude and practice of food-handlers working in all psychiatric hospitals. In addition, the fact that in the psychiatric hospital patients acted as food-handlers who performed food assembly and service for other patients may represent a further cause of concern in the monitoring of food hygiene and sanitation in this kind of hospital. However, such problem cases has not been addressed in this study.

Conclusions

Knowledge and attitude of hygiene and sanitation are generally (> 80%) good among food-handlers, although more than one third (38%) of them are in the unfavourable category of practice. No correlations are found among knowledge, attitude, and practice regardless of any combination between two factors ($p > 0.05$); indicating that knowledge does not necessarily transfer into practice among food-handlers. The majority (73%) of food-handlers never receive any formal training related to hygiene and sanitation and this individual characteristic significantly correlates with their practices ($p < 0.05$). Possible causes of poor hygiene and sanitation practice include person-related factors and human resource management, mainly the manager's capacity in imposing regulations and monitoring the staffs' compliance with SOPs. Results of the study strongly emphasize the need for regular formal trainings on hygiene and sanitation to improve food-handlers' practice.

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Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

IRP developed research methodology, contributed in data collection and analyses, and wrote the manuscript. RPF contributed in data collection and analysis and

wrote the manuscript. FAU contributed in data analysis and manuscript's writing and translation.

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