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Food Safety Compliance in Islamic Schools: Knowledge, attitudes and practices of food handlers

Nadiatul Syima Mohd Shahid[1*,2], Muhammad Hazim Ismail[3], Siti Norashikin Mohamad Shaifuddin[4], Wan Ismahanisa Ismail[2]

**Corresponding Author*

[1] Malaysian Institute of Transportation (MITRANS), Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia
[2] Faculty of Health Sciences, Universiti Teknologi MARA Cawangan Pulau Pinang, Bertam Campus, 13200 Kepala Batas, Pulau Pinang, Malaysia
[3] Johor State Health Department, Public Health Division, Jalan Persiaran Permai, 81200 Johor Bahru, Johor, Malaysia
[4] Centre of Environmental Health and Safety Studies, Faculty of Health Sciences, Universiti Teknologi MARA Selangor, Puncak Alam Campus, Selangor, Malaysia

nadiatul@uitm.edu.my, hazimismail@moh.gov.my. norashikinshaifuddin@uitm.edu.my, ismahanisa@uitm.edu.my
Tel: +6011-11977619

Abstract

The incidence of food poisoning in school canteens is increasing and poorly understood. It involves young and vulnerable children. School food handlers must understand food safety knowledge, attitudes, and practices to prevent cross-contamination during food preparation effectively. This study aimed to assess the knowledge, attitudes, and practices related to food safety compliance among food handlers in Islamic schools. A cross-sectional study involving 33 food handlers from 15 schools under the Islamic Education District Office in Tangkak, Johor, was conducted using a structured questionnaire. The findings demonstrate that the school food handlers exhibited sufficient knowledge (85.15%), attitudes (84.55%), and practices (84.85%).

Keywords: Food safety; Knowledge-attitude-practice (KAP); Food handler; School canteen

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1.0 Introduction

Food safety and security issues in school environments are significant public health concerns, particularly for children in developing countries (Ay & Doğan, 2025). Children represent a notably vulnerable population to foodborne illnesses, as their immune systems are still in the process of development (Ling et al., 2021). As a result, they are particularly susceptible to various health risks. In Malaysia,

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school canteen foods refer to the meals and beverages prepared or sold within the school canteen premises (Tan et al., 2013). These meals are typically designed to be affordable and accessible to students, frequently priced lower than food offered in other dining establishments. Surprisingly, the school canteen environment presents a significant reservoir for a variety of microorganisms, including bacteria, parasites, and pathogens. For instance, the presence of *Staphylococcus aureus* on food handlers' hands significantly contributes to food contamination. The prevalence of *Staphylococcus aureus* and *Escherichia coli among food handlers has been* shown to be high in many nations (El-Nemr et al., 2019). The transfer of pathogens from food handlers to food is a critical control point in maintaining food safety, particularly in institutional environments such as school canteens that serve large numbers of children (Chaudhary et al., 2023). Foodborne illness outbreaks in the global school setting have been reported due to the consumption of contaminated food (Tutu et al., 2020; Salvador et al., 2024).

A significant number of cases of foodborne illness in schools are linked to food handlers as the primary source and are not yet fully understood. There are multiple paths that food handlers may lead to cross-contamination during food preparation, handling and serving to students in school canteens. For instance, it is often observed that kitchen cleaning cloths are repeatedly used and frequently reused by food handlers to clean the surface of dish plates, dining tables, equipment and utensils. With this condition, wet cloths kept in humid spaces can become a niche or welcoming environment for the growth of microorganisms such as *Salmonella* (Desalegn et al., 2025). Some food handlers may even store their aprons in a high-risk place or wear an apron to the toilet. In other scenarios, poor pest control management within school canteen premises may attract flies, rodents, cats, and other unwanted animals.

Previous studies have shown that the knowledge, attitudes, and behaviours of food handlers greatly impact compliance with food safety in many environments (Chatzimpyrou et al., 2025). Research indicates that inadequate food safety knowledge among food handlers may lead to improper food handling practices and attitudes, hence elevating the risk of foodborne diseases (Ling et al., 2021). Therefore, this study aimed to assess the knowledge, attitudes, and practices of Islamic school food handlers regarding food safety in the Tangkak District of Johor, Malaysia. It is crucial to understand these factors, as they significantly influence food safety compliance and can reduce the potential risk of spreading and transmitting bacteria or pathogens to food.

2.0 Literature review

Food safety is a serious public health concern that presents significant health risks, as poor food safety compliance and practices can cause foodborne illnesses. Each year, approximately 600 million individuals are affected by foodborne diseases, including 125,000 children under the age of five (Sultana et al., 2025). Regions such as Southeast Asia, Sub-Saharan Africa, and South Asia, which are classified as low- and middle-income countries (LMICs), showed that over 70% of mortality is attributable to foodborne disease cases (Jaffee et al., 2019). Nevertheless, most of these countries' populations comprise children and students who may not seek medical doctors or report their symptoms due to the mildness of the symptoms. Unfortunately, some of the milder symptoms, such as diarrhoea and vomiting, may cause further severe impact, such as dehydration and kidney damage, all of which can progress silently. To make matters worse, most people believed that diarrhoea is a common symptom and is frequently underreported (Yosef et al., 2025). Globally, diarrhoea illnesses impacted around 1.8 million individuals owing to the ingestion of contaminated food and water (Al-Shabib et al., 2015). In Malaysia, food poisoning cases usually occur in primary and secondary schools, with an incidence rate of about 44 per 100,000 population in 2022. Although the number of documented cases and outbreaks of food poisoning in schools has been steadily increasing in both developed and developing countries, there is a notable lack of research concerning food handlers in educational institutions (Desalegn et al., 2025).

Foodborne outbreaks and food poisoning cases consistently result from the consumption of contaminated food or unsafe sources (Perilli et al., 2023). School canteens play a crucial role in providing safe, hygienic, healthy, and nutritious food for both students and staff, particularly in today's urban lifestyles, where many parents are busy with work and most students do not bring their own food to school (Batista et al., 2024). They rely on canteens to provide balanced meals that support their children's physical growth and mental well-being, which can potentially impact students' academic achievement and performance. Hence, school food handlers are essential in protecting students' well-being by assuring the safety of the meals they prepare and serve. Inadequate knowledge, attitudes, and practices regarding food safety among school food handlers can lead to food contamination and the subsequent spread of foodborne pathogens (Majowicz et al., 2017). Typically, pathogens in food are associated with factors such as food preparation methods, handling, personal hygiene, canteen cleanliness, and water quality, including *Escherichia coli* and *Salmonella Typhi* (El-Nemr et al., 2019; Ling et al., 2021).

Food handlers' knowledge encompasses their understanding of foodborne illnesses, proper food handling techniques, and hygiene standards (Sultana et al., 2025). Studies indicate that insufficient food safety knowledge among food handlers may result in improper food handling practices, inappropriate temperature control, and long fingernails, thereby elevating the risk of foodborne illnesses (Ling et al., 2021). Food safety knowledge among school food handlers is critical for implementing safe food handling practices and complying with the Malaysian Food Hygiene Regulations 2009 (Shahid et al., 2023). Food handlers might unintentionally contaminate food owing to inadequate hand hygiene or improper cleaning of equipment or utensils (Shahid et al., 2023). Even though food handlers may have knowledge and be aware of the importance of handwashing, they may not take handwashing procedures with insufficient seriousness. In certain situations, some food handlers may lack knowledge about appropriate food storage methods and the potential consequences of improper storage practices (Tutu et al., 2019). Food handlers' attitudes towards food safety profoundly demonstrate their practices. According to Chaudhary et al. (2023), attitudes can be reflected in food handlers' beliefs and perceptions regarding food safety, which in turn influence their motivation to adhere to safe practices. For example, good attitudes towards food safety may be related to the way

they conduct and maintain the cleanliness of utensils, premises, equipment, and other items. In contrast, practices refer to their actual behaviours and actions of food handlers performed while handling food, such as washing their hands, cooking food at the right temperature, and storing food properly (Berglund et al., 2024). Compliance with food safety regulations in school settings is critical, as non-compliance is often reflected in foodborne disease outbreaks or cases of food poisoning. These issues can be attributed to compliance factors, including improper temperature storage, inadequate food handling practices, insufficient cleanliness, and a lack of proper hand hygiene (Kosola et al., 2025). That statement can be interpreted based on the compliance with their temperature storage and holding food practices, cleanliness, and hand hygiene (Kosola et al., 2025). Furthermore, the knowledge, attitudes, and practices of school food handlers regarding food safety can be significantly impacted by the frequency of training sessions, the outcomes of food inspections, and their ratings based on the national food inspection system. Therefore, continuous training and education for school food handlers are essential to ensure they possess the requisite skills and knowledge necessary to maintain high standards of food hygiene and comply with food safety regulations.

3.0 Methodology

3.1 Study area and participants

A cross-sectional study was conducted in Tangkak town, in the state of Johor, Malaysia. There were about 38 Islamic schools present in the Tangkak district. Only 15 primary Islamic school canteens are registered with the Islamic Education District Office in Johor. Thirty-six (36) food handlers were employed in their school canteens.

3.2 Questionnaire

Questionnaires were distributed for face-to-face interviews, and self-administered questionnaires were used. The questionnaire was modified from Akabanda et al. (2017). The questionnaire was prepared in English and Malay. This questionnaire consisted of four (4) parts: Part I contained seven (7) questions of demographic characteristics of the food handlers, such as gender, age, race, level of education, working experience, food handler training and Thyphim injection. Part II consisted of ten (10) questions to examine the respondent's knowledge of food safety. Part III also consisted of ten (10) questions that were intended to evaluate the attitudes of the participants when it comes to prevention towards foodborne diseases, as well as a safe food handling system. Part IV consists of another ten (10) questions that were designed to check the way they practice food handling at the workplace. Part II and Part III were designed to allow respondents to choose among three different answers, including "agree", "disagree", and "do not know or remember". Part IV allowed respondents to choose between two options: "yes" and "no". Each correct answer is translated into one (1) point. A score of 70% (7 questions correct) for each part of the evaluation indicates that the respondents have adequate knowledge, attitudes, and practices related to food safety.

3.2 Ethical Approval

Ethical approval was obtained from the Universiti Teknologi MARA Research Ethics Committee (reference number: 600-IRMI (5/1/6)). Participants were informed that their involvement in the study was voluntary, and they could withdraw at any time.

3.2 Data analysis

A summary of participants' sociodemographic characteristics and their scores on knowledge, attitudes, and practices was obtained using descriptive statistics. Quantitative data in this study was analyzed using IBM SPSS Statistics version 22 software.

4.0 Results and Discussion

4.1 Sociodemographic characteristics of participants

The majority of food handlers were female, around 72.7% (n = 24), which aligns with research conducted by Siddiky et al. (2024) who reported that most of the food handlers in institution-based settings in Bangladesh were female (71.3%). Similarly, Dora-Liyana et al., (2018) research is also consistent, showing that 53.7% were female food handlers at boarding schools in Malaysia. The predominant age groups among respondents were 31-40 years (33.3%) and 41-50 years (33.3%). The age distribution is similar to other studies reported previously (Chaudhary et al., 2023; Siddiky et al., 2024). The age distribution indicates that a considerable segment of the workforce is within their prime working years, potentially impacting the efficiency and productivity of food handling practices. Additionally, it was expected that all canteen workers belonged to the Malay ethnicity. This indicates the cultural demographics of the region, with a significant representation of the Malay and Islamic community. In this study, many of them attended secondary school (93.9%), and 78.8% possessed 6-10 years of experience in the food industry. This result contrasts with prior research, which has demonstrated that, among most school food handlers, only 12.9% have experience of 6-10 years (Tan et al., 2013). Food safety training is another essential component, where, unfortunately, 75.8% of respondents had not participated in food handler training. It is mandatory for all food handlers, irrespective of nationality, to attend under the Malaysian Food Act 1983. A previous study revealed that food handlers in restaurant settings have largely not participated in food safety training, with around 45.25% lacking such training (Aquino et al., 2021). However, it was not unexpected that 28 individuals (84.8%) were vaccinated for typhoid fever. This profile showed that factors such as experience working in food services or establishments play an important role in practising food safety according to the law. Factors

including age, gender, education, work experience and typhoid injection affect food handlers' ability to acquire food safety knowledge, attitudes and practices (Yosef et al., 2025). This training addresses fundamental subjects, including appropriate hygiene, safe food handling practices, and the significance of contamination prevention.

4.2 Food Safety Knowledge

The food safety knowledge level among school food handlers was considered sufficient knowledge with a mean score of 85.5 ± 28.10 (Figure 1). The explanation for our finding could be the educational material and methods used in training on the foodborne disease topic, as well as storage and experience, which could assist in translating into a better understanding of food safety knowledge. The highest percentage of knowledge was on personal hygiene, involving glove usage (90.9%), followed by the importance of washing hands (84.8%). Most school food handlers in this survey consider an understanding of essential hygiene measures to be highly critical. The hands of food workers can serve as a channel for the transmission of foodborne infections, mostly due to cross-contamination or inadequate personal hygiene practices (Tan et al., 2013). Although food handlers reported that they had adequately cleaned their hands, several school canteen food handlers, as found in research by Dorotíková et al. (2022), were contaminated with *Staphylococcus aureus*, which was isolated from their hands and may have contributed to cross-contamination. Furthermore, they believe that consuming food and drink at the workplace increases the risk of food contamination by around 84.8%. This knowledge statement may require clarification from a supervisor or food business operator regarding the risk of cross-contamination due to direct contact with food using unwashed hands. A comprehensive understanding of direct and indirect cross-contamination pathways is essential for food handlers to implement effective preventative measures. Food handlers must be educated on the potential risk of disease transmission via contaminated equipment, surfaces, or utensils (Yosef et al., 2025). However, a previous study on food safety knowledge among school food handlers in Malaysia showed that knowledge of food poisoning and personal hygiene was only at 74 to 80% (Tan et al., 2013). Most of food handlers in this research recognized the relevance of fundamental knowledge that need to be understood including knowledge such as; 1] putting food at risk when prepared in advance (81.8%), 2] awareness of cross-contamination through specific medium (81.8%), 3] factors that cause risks to ready to eat food such as vegetable (81.8%), 4] presence of microorganisms on skin, nose and mouth (81.8%), and 5] *S. aureus* can cause food poisoning as well as 6] the need for leave of absence if workers presented with skin infections (81.8%). Chaudhary et al. (2023) mentioned that if food handlers are sick, they should rest or perform a simple task. However, many of them disagree (100%) with the statement '*proper cleaning and sanitization of utensils decreases the risk of food contamination'*. However, there is a lack of research on the necessity of cleaning storage knowledge. This gap in understanding may result in ineffective practices and possible hazards in managing food handler knowledge. Furthermore, knowledge of cleaning techniques could lead to an impact on organizational operations.

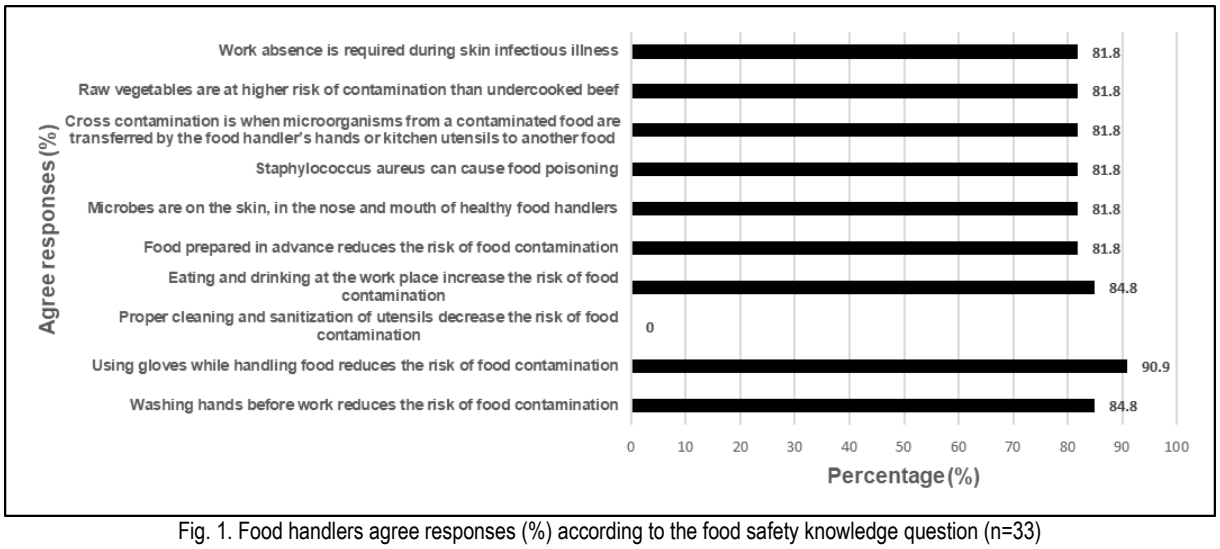

Fig. 1. Food handlers agree responses (%) according to the food safety knowledge question (n=33)

4.3 Food Safety Attitudes

Food safety attitude level among school food handlers has a mean score of 84.55 ± 27.90 (Figure 2). Nonetheless, research conducted in Selangor, Malaysia, among primary school food handlers demonstrated better results than ours, with an overall mean of 87.59 ± 8.45 (Tan et al., 2013). Nearly all respondents (90.9%) correctly answered the statement *'proper hand hygiene can prevent food-borne diseases'*. Most food handlers in this study (approximately 82%) have good attitudes and correctly choose the agreed-upon importance of using protective gloves, masks, proper clothing and caps in minimizing the risk of food contamination. The results demonstrated a positive attitude among the majority of food handlers. Approximately 81.8% of food workers concurred that long and painted nails were inappropriate for handling food. Similarly, the majority of respondents (81.8%) also agreed with the statement that discusses the necessity of avoiding contact with unwrapped items when an individual has abrasions or cuts on their fingers or hands. This demonstrates a robust understanding of hygiene attitudes among participants. It also emphasises that those with open skin wounds,

gastrointestinal issues, and eye disease conditions should be prohibited from food handling to prevent contamination (Adesokan et al., 2015). In contrast, our findings were more positive than the study conducted in Bangladesh among food vendors, where most of their hand washing and personal hygiene attitudes obtained a mere 53% each, which showed positive attitudes towards food safety (Ahammed et al., 2025). The participants also recognised the potential for a dish towel to serve as an agent for cross-contamination of food (81.8%), and their attitudes that food is generally free from contamination when it is thoroughly cooked (90.9%). However, well-cooked food free from contamination can be doubted, as physical and chemical contamination cannot be completely eliminated or prevented. Another issue, most food handlers answered incorrectly (90.9%) when they agreed that *'cleaning products can be stored with food cans and jars'*. This finding suggests that most food handlers disregard or are not sensitive to the requirements set by the government due to not attending training. The current results suggest that local reinforcement training programs, workplace policies are necessary to be more effective in fostering a responsible mindset among food handlers.

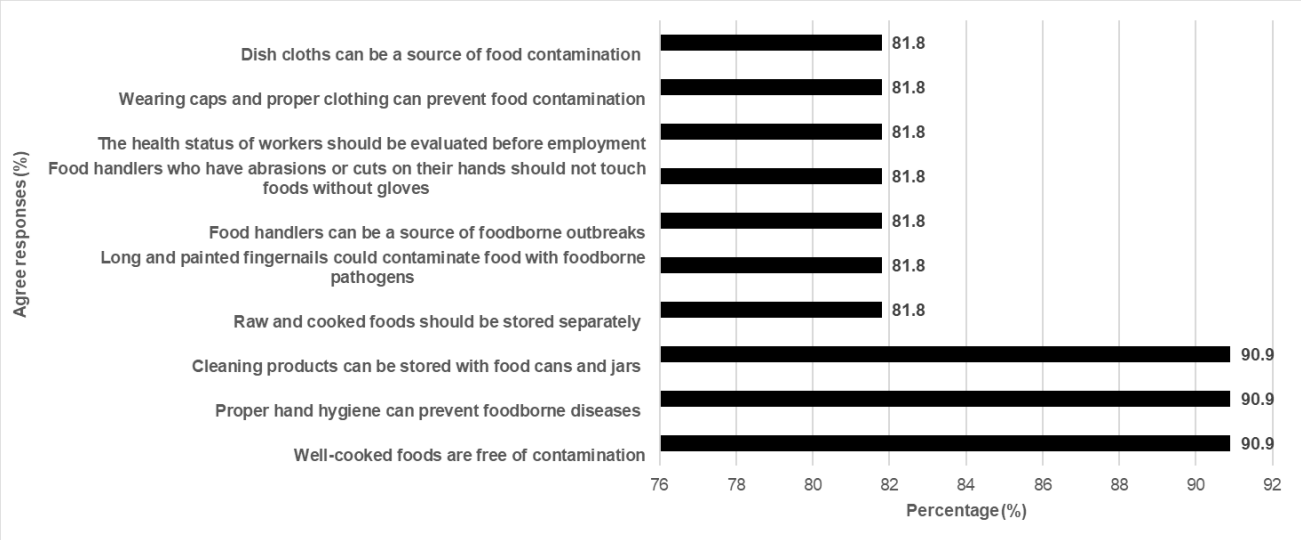

Fig. 2. Food handlers agree responses (%) according to the food safety attitudes question (n=33)

4.4 Food Safety Practices

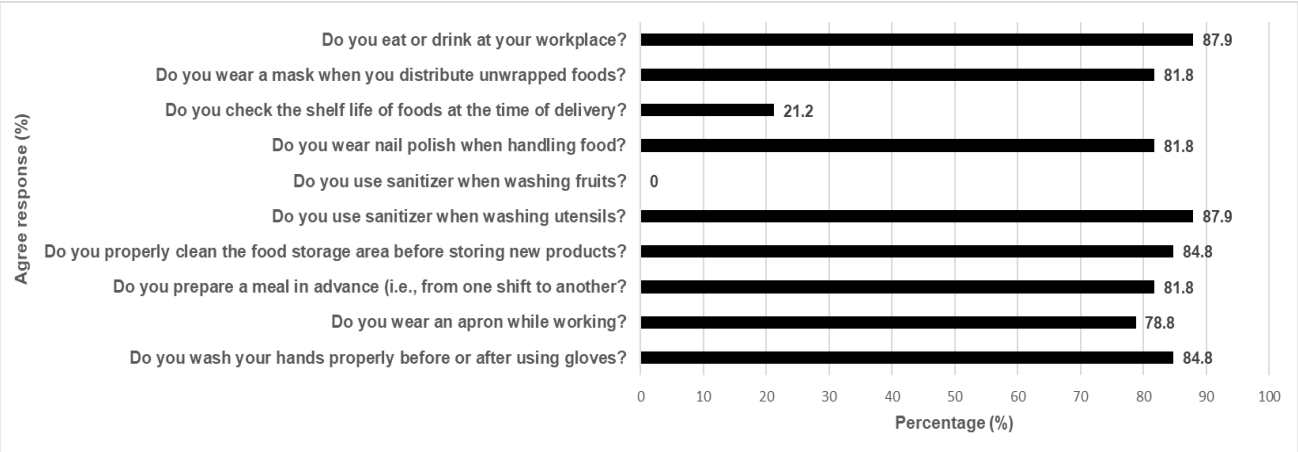

Fig. 3. Food handlers agree responses (%) according to the food safety attitudes question (n=33)

The level of food safety practices amongst school food handlers was sufficient, with a mean score of 84.85 ± 28.00. This finding contradicts Ahammed et al. (2025), who reported an average food safety practice score of only 25.11 ± 6.25 among street food vendors, based on a 22-question survey. Meanwhile, Figure 3 displays the food safety practices among food handlers conducted in Islamic schools in Johor. None of them applied sanitizer when washing fruits (100%). The second-highest percentage (87.9%) for food safety practices was on using sanitizer during washing and commonly during working, eating, and drinking. Predictably, more than 80% of school food handlers frequently practice hand hygiene, routinely clean their food storage before storing, and know the importance of wearing a mask when distributing unwrapped foods. In this study, many respondents (81.8%) admitted that they always prepare food in advance. This practice issue may compromise students' food safety due to the necessity of maintaining appropriate hot holding temperatures, which depend on several factors, including the type of food, storage methods, the cleanliness of facilities, and pest control strategies, such as using electric fly traps. Additionally, one question had a lower percentage of food safety for practice, where the respondents indicated that they did not 'check the shelf life of foods at the time of delivery' (78.8%); this scenario poses a possible public

health hazard. Overall, the current score suggests that food safety practices are a significant positive outcome of existing training, awareness, and broader access to information about food safety and hygiene. This suggests that school food handlers, irrespective of their suburban areas or religious backgrounds, maintain consistent food safety practices. In comparison, the lower practice levels recorded in Sudan (74.4%) and Pakistan (58%) (Siddiky et al., 2024) reflect that these percentages may be associated with the effectiveness of enforcement and hygiene regulations.

5.0 Conclusion & Recommendation

It can be concluded that school food handlers in this study demonstrated a commendable level of compliance with food safety practices, attitude, and knowledge. This study also indicated that a satisfactory level of food safety knowledge does not necessarily translate to safe practices at the workplace. Furthermore, the limitation in this study was that the school food handlers were drawn from only one region, which restricts the representation in other regions. Future research should consider observing the actual behaviours of food handlers, using a larger population sample that encompasses a variety of religious schools and types of food handlers. It is recommended that continuous training in understanding food safety protocols is important to bridge the gaps between knowledge and actual application.

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Paper Contribution to Related Field of Study

This research contributes to the field of environmental health in Malaysia by elucidating the state of food safety concerning the food safety knowledge, attitudes and practices of school food handlers. This information can serve as foundational data for the development of targeted educational programs and preventative strategies.

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