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The practice of halal and *toyyib* principles among migrant food handlers IIUM food services: A food safety and hygiene perspective through a mixed-methods approach

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Abstract

Food service establishments in universities serve as the primary dining destinations for students, where the principles of halal and *toyyib* become significant considerations in maintaining overall hygiene and safety within food production and processing environments. However, ensuring adherence to these principles has become critical, particularly when migrant workers are involved in food handling. Despite their significant contribution to food service operations, limited research has examined their compliance with halal, hygiene, and food safety practices. The objective of this study was to assess the level of compliance with halal and *toyyib* principles among migrant food handlers at the International Islamic University Malaysia (IIUM), Gombak, about food safety and hygiene practices. This study also aimed to identify the factors contributing to non-adherence to these practices. A mixed-method approach was employed, combining quantitative and qualitative data collection. A structured questionnaire was distributed to 30 migrant food handlers, and 10 respondents were selected for in-depth interviews to gain deeper insights into the factors influencing their practices. Data were analysed using descriptive analysis and Creswell's five-step method. The results revealed that 73.3% of respondents demonstrated high compliance, with an overall mean score of 4.32 on a 5-point Likert scale. However, specific weaknesses were identified in key areas, including protecting food from contamination, properly thawing food, and using thermometers for temperature control. Additionally, the findings identified four factors contributing to non-compliance, including limited training, poor attitudes, operational and resource constraints, and differing cultural or religious perspectives. Although overall adherence to the practices is excellent, targeted improvements are needed to address the identified gaps. This highlights the necessity of continuous awareness and training initiatives that account for the cultural and linguistic diversity among migrant groups, as well as the implementation of rules and monitoring systems to ensure the integrity of halal food consumed.

Keywords:

Halal; *Toyyib*; Food safety; Hygiene practice; Migrant food handler

1. Introduction

The term halal is derived from Arabic and signifies what is 'permissible' and 'lawful' according to Islamic law (Sungit *et al.*, 2020). In contrast, the term haram refers to what is prohibited. The concept of halal is not isolated within the contemporary food service industry; instead, it should be integrated with the principle of wholesomeness, which encompasses attributes such as high quality, safety, purity, and hygiene, collectively called '*toyyib*' (Zainal Arifin *et al.*, 2021). The concepts of halal and *toyyib* encompass all facets of food production, including safety, hygiene, ethical handling, and preparation methods (Md Dahlal, 2021). It extends beyond just the permissible foods that Muslims may consume in their diet. Seeking and consuming halal food is not only a religious obligation but also a comprehensive guideline that safeguards consumers' well-being by addressing their health, safety, and spiritual needs. The importance of integrating halal procedures into daily operations is becoming increasingly evident. Although a halal certificate is not mandatory for all food operators, obtaining

one is highly encouraged as assurance of halal compliance (Ab Talib *et al.*, 2017). Strict adherence to halal procedures is crucial to meet established standards and expectations. The International Islamic University Malaysia (IIUM) is well-known for its diverse international cuisine, prepared by multinational food handlers. IIUM can serve as a model for other institutions and universities, demonstrating how food services can align with halal standards, uphold Islamic values, and meet community expectations.

Food service outlets within universities serve as the primary dining establishments for their communities, resulting in a high reliance on campus-provided meals (Bakar & Abdullah, 2020). Food premises are often the favoured venues for daily nourishment due to their economical pricing and accessibility. Nonetheless, challenges exist in maintaining halal compliance, particularly given the significant reliance on migrant labour. Migrant food handlers come from diverse cultural and religious backgrounds, which may influence their understanding and implementation of halal practices. Lack of knowledge of Islamic dietary requirements and food safety regulations can

lead to gaps in halal compliance (Asha'ari & Kamarulzaman, 2023). Consequently, this may jeopardise the trust of Muslim customers and potentially affect the health of the broader university's population. In Malaysia, food safety remains a significant concern primarily due to improper food handling, unsanitary conditions in dining establishments, inadequate personal hygiene practices among food handlers, and a lack of cleaning procedures during food service operations (Bashir *et al.*, 2024).

Growing concerns over foodborne illnesses and hygiene violations have emphasised the necessity for rigorous compliance with food safety rules. Currently, the Food Act 1983 and Food Regulations 1985 are enforced in Malaysia, serving as the foundation of food safety initiatives to protect the public from health risks and deception in food preparation, sale, and consumption (Halim *et al.*, 2024). Meanwhile, the Food Hygiene Regulations 2009 aim to guarantee food hygiene and quality to mitigate the incidence of foodborne infections. For example, Part IV, Regulation 31, stresses that medical examination and the health condition of food handlers are compulsory for all food handlers, where anyone who suffers from, or is a carrier of, foodborne diseases shall not be allowed to enter food premises or handle food (Food Hygiene Regulations 2009).

According to the Act and the Regulations, all food workers are required to hold a basic food handling training certificate and be vaccinated (Abdul Rashid *et al.*, 2020). In addition, adequate food-handling training ensures that food handlers follow high-standard hygiene practices, thereby reducing the risk of contamination and the spread of foodborne pathogens that may lead to serious illness. However, migrant food handlers may face additional hurdles, including language barriers, limited training opportunities, and unfamiliarity with local culture. Therefore, this study evaluates migrant food handlers' compliance with halal and *toyyib* principles, food safety and hygiene standards, and the factors contributing to non-adherence to these practices.

2. Methodology

2.1 Research design

A mixed-method approach was employed, integrating both quantitative and qualitative research methods. The quantitative component examined practices related to the halal and *toyyib* concept among migrant food handlers, with a particular focus on food safety and hygiene. The qualitative case study examined the factors contributing to non-adherence to food safety and hygiene practices among migrant food handlers. The study was conducted at the International Islamic University Malaysia (IIUM), in Gombak, Selangor, from February to July 2025. The selection of IIUM was influenced by the presence of migrant food handlers operating across multiple food premises, including *Mahallah* cafeterias, food stalls, and vendors.

2.2 Sampling method

This study utilised a convenience sampling approach due to accessibility, time limitations, and the unavailability of the actual population size for migrant food handlers within the institution. The respondents were migrant food handlers employed in IIUM cafeterias, food stalls, and restaurants. A total of 30 migrant food handlers were selected, encompassing individuals responsible for food preparation, cooking, serving,

and cleaning. Convenience sampling was employed to recruit participants who were readily accessible and met the study's inclusion criteria until the required sample size was reached (Sekaran, 2007). Furthermore, ten participants were purposively selected for the qualitative phase to investigate factors contributing to non-adherence to halal, food safety, and hygiene practices among migrant food handlers.

2.3 Research instrument

The study adopted a mixed-methods approach, using both structured and semi-structured questionnaires as the primary data collection instrument. The questionnaire was divided into two main sections. The first section described socio-demographic profiles, including gender, age, education level, work experience, country of origin, and typhoid vaccination status. The second section consisted of statements assessing respondents' practices regarding food safety, hygiene, and compliance with halal and *toyyib* standards. A 5-point Likert scale (1-Never, 2-Rarely, 3-Sometimes, 4-Often, 5-Always) was used to evaluate self-reported practices concerning food preparation, hygiene management, and adherence to halal food-handling standards. These results were further adapted from the categorisation framework used by Asha'ari & Kamarulzaman (2023), with refinements to suit the current study. Accordingly, the level of adherence to practices was categorised into three levels: high, moderate, and low. Furthermore, responses categorised as 'never' receive zero marks, 'rarely' yields 0.5 marks, 'sometimes' is given one mark, 'often' earns 1.5 marks, and 'always' is given two marks. The overall practice scores were converted to percentages and classified as poor (below 50%), fair (51%-69%), or good (70% or above).

Open-ended questions were designed to explore the factors contributing to non-adherence to food safety and hygiene practices among migrant food handlers. The items in the survey questionnaire were adapted from established studies, including those by Dora-Liyana *et al.* (2018), Moscare-Balanquit & Dolon-Sanoria (2019), Asha'ari & Kamarulzaman (2023), Rohin *et al.* (2024), and Mphasha *et al.* (2024). Several items were further modified and customised to align with the study's specific context of halal food-handling practices. Experts reviewed the questionnaires to check on their reliability. The final version of the questionnaire for the subsequent pre-test incorporated the experts' suggestions and revisions. Furthermore, a pilot test was conducted involving 10% of the food handlers prior to the actual data collection phase. Errors and comments from the respondents were recorded, and corrections were made based on their feedback to develop the final version of the questionnaire.

2.4 Data collection

The data collection process consisted of two steps conducted through in-person interviews. Participants were initially asked to complete the structured questionnaire. Subsequently, interviews with 10 participants were carried out to explore in greater depth the factors influencing non-adherence to food safety and hygiene practices, using open-ended questions as a guiding framework. Interviews were audio-recorded with participants' consent, ensuring that their responses were accurately documented for thematic analysis. The questionnaire was designed to be bilingual, offered in both English and Malay, to assist migrant food handlers with limited proficiency in either language.

2.5 Data analysis

The data were analysed through descriptive analysis and thematic analysis. Quantitative data analysis was performed using Microsoft Excel. In contrast, thematic analysis was applied to examine qualitative data from face-to-face interviews, focusing on factors contributing to non-adherence to food safety and hygiene practices. Creswell's research design guided the data assessment, which involved five phases (Creswell & Poth, 2018). First, the transcripts were thoroughly read, followed by data coding. Next, categories were labelled, and themes were selected. Finally, conclusions were drawn. The results are presented alongside relevant quotes from participants to highlight significant themes and patterns.

2.6 Ethical consideration

Participants were asked to carefully read and understand the study's summary prior to answering the questionnaire. They were assured that their data would be used exclusively for research purposes. The aims of the study were clearly explained, and informed consent was obtained prior to their participation.

3. Results and discussion

3.1 Socio-demographic profiles of respondents

A summary of the respondents' socio-demographic profiles is presented in Table 1. The majority of respondents were female 20 (67%), and the remaining 10 (33%) were male. The largest group of food handlers was aged 31-40 years, accounting for 10 (33%), followed by those aged 41-50 years, comprising 9 (30%), and only 4 (13%) were aged 50 or older. Most respondents were originally from Indonesia 21 (70%), with China and Bangladesh each representing 4 (13%). Only one respondent (3%) had attained a bachelor's degree, while 20 (67%) had completed secondary school. The results also showed that 12 (40%) of respondents had more than 6 years of experience in food handling, 9 (30%) had between 1 and 3 years, and 4 (13%) had less than 1 year. A total of 21 (70%) respondents had attended food-handling training courses, while 9 (30%) had not. Almost all respondents 28 (93%) had received a typhoid injection, while 2 (7%) had not been injected.

3.2 Adherence level of halal and *toyyib*, food safety, and hygiene practices among migrant food handlers at IIUM

The mean score represents the frequency of behaviours, actions, or occurrences associated with migrant food handlers' adherence to halal and *toyyib* principles, as well as food safety and hygiene practices (Table 2). The mean score between 1.00 and 2.33 indicates a low frequency level, 2.34 and 3.66 reflect a moderate frequency level, and 3.67 and 5.00 represent a high frequency level (Chik *et al.*, 2023). The majority of respondents demonstrated high adherence to halal and *toyyib* food safety and hygiene practices, as indicated by a mean score above 3.67. All were reported to be constantly clean in the work area after operating hours, with a mean score of 5.00. Almost all food handlers refrain from smoking while preparing meals, with a mean score of 4.97. Respondents covering food at the food stall reported a moderate frequency, with a mean score of 3.54, and only 8 participants (2.7%) reported occasionally practicing this measure. Similarly, thawing food using safe methods such as under running tap water or in chillers recorded a lower mean score of 2.50, reflecting less consistent adherence to this food

safety practice. Lower mean scores were also observed in questions involving more technical or equipment-related practices. For instance, the use of a thermometer to determine a suitable cooking temperature recorded the lowest mean score of 1.53, indicating that this practice was the least frequently performed among respondents, with only 6.7% reporting its use. The overall mean score was 4.32.

Table 1: Sociodemographic profiles of migrant food handlers in IIUM

Profiles	Frequency	Percentage (%)
Gender		
Male	10	33
Female	20	67
Total	30	100
Age		
Below 20 years	0	0
21-30 years	7	23
31-40 years	10	33
41-50 years	9	30
Above 50 years	4	13
Total	30	100
Country of Origin		
Indonesia	21	70
China	4	13
Bangladesh	4	13
Thailand	1	3
Total	30	100
Education level		
No formal education	2	7
Primary School	2	7
Secondary School	20	67
Diploma/ Certificate	5	17
Bachelor's Degree	1	3
Total	30	100
Work Experience in Food Handling		
< 1 year	4	13
1-3 years	9	30
4-6 years	5	17
> 6 years	12	40
Total	30	100
Attend Food Handling Courses		
Yes	21	70
No	9	30
Total	30	100
Typhoid Vaccination		
Yes	28	93
No	2	7
Total	30	100

Overall, 22 respondents (73.3%) demonstrated a high level of practice, while 8 respondents (26.7%) demonstrated a moderate level of practice in halal *toyyiban*, food safety, and hygiene practices (Table 3).

Table 2: Mean scores of statements on halal *toyyiban*, food safety, and hygiene practices among IIUM migrant food handlers

No.	Questions	Scale					Mean	SD
		1	2	3	4	5		
		Percentage (%) Frequency (n)						
1.	Do you check that all ingredients are halal or halal-certified before use?	0	3.3% (1)	20% (6)	6.7% (2)	70% (21)	4.43	0.920
2.	Will you avoid using utensils and equipment that have been contaminated with non-halal substances?	0	0	0	13.3% (4)	86.7% (26)	4.87	0.340
3.	Will you separate halal and non-halal items to avoid cross-contamination?	0	0	0	23.3% (7)	76.7% (23)	4.77	0.423
4.	Do you check the refrigerator's temperature before storage?	3.3% (1)	20% (6)	20% (6)	6.7% (2)	50% (15)	3.80	1.327
5.	Do you ensure that the refrigerator is always maintained and functioning well?	0	16.7% (5)	20% (6)	16.7% (5)	46.7% (14)	3.93	1.153
6.	Do you store raw food and ready-to-eat food separately?	0	0	0	6.7% (2)	93.3% (28)	4.93	0.249
7.	Do you separate leftovers from newly cooked or fresh products?	0	0	13.3% (4)	3.3% (1)	83.3% (25)	4.70	0.690
8.	Do you thaw food by putting it under running tap water or in chillers?	43.3% (13)	16.7% (5)	10% (3)	6.7% (2)	23.3% (7)	2.50	1.628
9.	Do you use a thermometer to determine a suitable meat temperature to cook?	80% (24)	3.3% (1)	6.7% (2)	3.3% (1)	6.7% (2)	1.53	1.176
10.	Do you cover all the food at the food stall?	10% (3)	6.7% (2)	26.7% (8)	23.3% (7)	26.7% (8)	3.54	1.267
11.	Do you remove any jewellery or watches when you handle food?	20% (6)	0	10% (3)	6.7% (2)	63.3% (19)	3.93	1.590
12.	Do you wash your hands before starting work and follow proper hand-washing procedures?	0	0	0	13.3% (4)	86.7% (26)	4.87	0.340
13.	Do you wash your hands after disposing of food scraps or trash?	0	0	3.3% (1)	6.7% (2)	90% (27)	4.87	0.427
14.	Do you put on a clean and suitable uniform before starting work? (e.g., apron, hairnet, shoes, gloves)	0	0	13.3% (4)	26.7% (8)	60% (18)	4.47	0.718
15.	Do you keep your nails short and clean?	0	0	3.3% (1)	26.7% (8)	70% (21)	4.67	0.537
16.	Do you avoid smoking when you prepare food?	0	0	0	3.3% (1)	96.7% (29)	4.97	0.180
17.	Do you use tissues and avoid coughing or sneezing over food to prevent contamination?	0	0	0	6.7% (2)	93.3% (28)	4.93	0.249
18.	Do you avoid touching food if your fingers are cut and not adequately covered?	0	0	3.3% (1)	16.7% (5)	80% (24)	4.77	0.496
19.	Do you refrain from working if you have any foodborne illness or symptoms of illness (e.g., flu, cough, diarrhoea)?	6.7% (2)	6.7% (2)	26.7% (8)	10% (3)	50% (15)	3.90	1.274
20.	Do you report your illness or symptoms to your supervisor or manager if you do not take leave?	3.3% (1)	0	13.3% (4)	23.3% (7)	60% (18)	4.37	0.948

21. Do you ensure that work surfaces, chopping boards, utensils, and equipment are clean before use?	0	0	0	13.3% (4)	86.7% (26)	4.87	0.340
22. Do you immediately clean up the leftover food spilled on the floor?	0	0	0	20% (6)	80% (24)	4.80	0.400
23. Do you clean your working area after operating hours?	0	0	0	0	100% (30)	5.00	0.000
Overall mean and standard deviation							4.32
							0.725

Table 3: Level of adherence to halal *toyyiban*, food safety, and hygiene practices among IIUM migrant food handlers

Level	Frequency (n)	Percentage (%)
High/Good Practices (scores 70 - 100)	22	73.3
Moderate/Fair practices (scores 51 - 69)	8	26.7
Low/Poor practices (scores 1 - 50)	0	0
Total	30	100

3.3 Factors affecting compliance and adherence to halal principles, food safety, and hygiene practices

Our analysis, following Creswell's steps, identified factors influencing compliance with halal *toyyiban*, food safety, and hygiene practices. These include knowledge and training gaps, personal and behavioural factors, environmental and operational constraints, and cultural or religious influences.

3.3.1 Theme 1: Insufficient training and lack of knowledge

The respondents emphasised the need for proper training programmes to ensure they are well-informed. Migrant food handlers who had not attended food-handling courses reported lacking knowledge of halal practices, food safety, and hygiene, leaving them unaware of essential practices. The following quotations support these:

R1: "I think it is because of training. If there is insufficient training, people are not sensitive to food safety practices, cleanliness, and even halal."

R6 "My answer is a lack of training and personal factors. I do not attend training, so I do not know the accurate responsibilities as food handlers, and how to maintain cleanliness properly."

R8 "The number one reason for non-adherence is when someone has never attended food handling courses. If you work in a restaurant, you definitely need a food-handling certificate and a typhoid vaccine. So, if someone does not follow the instructions or rules, it means they do not know."

R9 "From my observation, I think it is because the food handlers do not know or lack knowledge about it."

3.3.2 Theme 2: Individual attitude and behaviour

Attitude can significantly influence the outcomes of actions. The participants highlighted that non-adherence was often driven by ignorance, negligence, or resistance to rules, as illustrated in the following quote:

R3: "I would say it is due to a personal factor. As for me, I always work one by one or step by step and follow standard operating procedures. Thus, I stay clean and maintain hygiene."

R5: "Personal factor. I do not even wear shoes during work as I only wear slippers, even though the manager has given instructions."

R8: "If someone does not follow the instructions or rules, it means they are ignorant. If they know but do not practice, it is because of their bad attitude or behaviour."

3.3.3 Theme 3: Operational and resource constraints

Operational issues, such as high workload, limited staff, and inadequate facilities, hinder proper practices. Having sufficient employees is critical for ensuring adherence to halal, hygiene, and food safety requirements, and the absence of an adequate workforce poses a significant challenge. Participants also indicated that the lack of proper uniforms and insufficient equipment contributed to non-adherence to personal hygiene standards. The following quotations support this:

R4: "Usually, non-adherence towards hygiene practices happens because of heavy workload and staff shortages. If there are many people lined up, I always serve the customers first. For example, if rice falls on the floor and someone steps on it, the floor will be dirty. However, because there are many customers, I will clean it later."

R7: "I think it is because insufficient PPE, like gloves and aprons, as well as a food-grade thermometer, are not provided adequately. Also, there are situations where workers have to buy their uniforms or borrow pieces of equipment from other places."

3.3.4 Theme 4: Cultural and religious influences

Cultural habits and beliefs can influence the consistent application of hygienic and halal practices. While some respondents demonstrated awareness of Islamic teachings on cleanliness, others indicated that practice varied, shaped by their beliefs and customs. The quotes below provide support for these:

R2: "Cleanliness has become a habit. Islam teaches us about cleanliness, and as a cook who prepares food on the premises, I must wash my hands every day and wear a clean uniform."

R10: "I believe the cause is that some people do not know enough about proper food handling. Furthermore, everyone has their own set of beliefs and customs in their country, which influence practice. Thus, the practices will vary."

3.4 Discussion

The majority of migrant food handlers have been working for more than a year, and most have completed food-handling courses. Training and years of experience are crucial to ensuring they fully comprehend the basic concepts of halal and *toyyib* in food-handling practices, as indicated by the majority of respondents who show a high level of compliance with food safety practices (Ahmad *et al.*, 2018). Similarly, Chaudhary *et al.* (2023) reported compliance rates of approximately 90.4% for foreign food handlers' practices. Interestingly, a study by Siau *et al.* (2015) found that non-Malaysians had a higher level of practice (83.7%) compared to Malaysians (77.7%). In contrast, Jalani *et al.* (2020) found that 87% of respondents did not practice good food-handling habits and in another study by Fekadu *et al.* (2024) found that only 55.3% of respondents had good food-handling practices.

Halal and *toyyib* principles entail a physical evaluation of a product's quality, hygiene, safety, and health (Awang, 2021). Our results suggest that the majority of interviewed food handlers consistently practice ingredient verification. Emphasising the importance of ingredient checking is a crucial step in implementing the halal assurance system (Mohd Noor *et al.*, 2023). Furthermore, contaminants can originate from different sources, including animal-derived substances, posing risks to product integrity, safety, and quality. The practice of avoiding equipment contaminated with non-halal materials reflects a good understanding of halal requirements. Proper segregation of halal and non-halal items to avoid cross-contamination is crucial, especially in compact food preparation areas such as cafeterias and food stalls.

A large majority of respondents demonstrated strong adherence to key personal hygiene practices, including

consistently washing their hands before starting work and after handling food scraps or trash, and following proper handwashing techniques. They also demonstrated compliance with maintaining short, clean nails and avoiding smoking while preparing food. Nevertheless, our results show that only 60% of food handlers put on a clean, suitable uniform before starting work, including an apron, hair net, shoes, and gloves. Interestingly, another study by Putri & Susanna (2021) found that more than 80% of food handlers did not use aprons, gloves, or head coverings during food processing. Additionally, some respondents did not remove accessories such as jewellery or watches before handling food. Inadequate personal hygiene practices can allow microorganisms to enter food during preparation, increasing the risk of contamination and affecting food quality and safety (Salleh *et al.*, 2020).

The majority showed excellent compliance regarding the cleanliness of work surfaces and utensils, such as chopping boards and knives, which are critical for preventing cross-contamination. The results indicated that they would immediately clean spills to maintain floor cleanliness. All respondents kept food preparation areas free of residues, spills, and waste after operating hours to prevent contamination, attract pests, and promote bacterial growth. The study further found that the majority use tissues and avoid coughing or sneezing toward food. They managed physical injuries appropriately by avoiding direct food contact when wounds were present. However, adherence to illness reporting was moderate; although 60% informed their manager when unwell, 50% continued to work despite symptoms such as vomiting, flu, or diarrhoea, indicating gaps in awareness of the associated food safety risks.

Our results indicate that food handlers do not adhere to safe thawing practices, which recommend placing food under running tap water or in chillers. A study conducted among kitchen employees at Malaysian government hospitals found that food handlers did not follow proper thawing methods (Abdul Rashid *et al.*, 2020). Furthermore, regular checks of refrigerator temperature are essential before storing food, since temperature influences bacterial growth, and neglecting this can compromise the safety of stored ingredients. Only 50% of food handlers consistently checked the refrigerator's temperature before storing food, indicating moderate adherence, and only 46.7% ensured the refrigerator was always well-maintained and functioning correctly. Interestingly, a similar finding was reported by Dora-Liyana *et al.* (2018), who found that only half of the food handlers at boarding schools performed this check.

Covering food is essential for maintaining cleanliness and protecting it from physical or biological contaminants. In this study, only 26.7% of food handlers consistently covered food, while 33.4% responded "Sometimes" or "Rarely." These results align with a study by Wahab *et al.* (2024), which found that fewer than 50% of foreign food handlers at restaurants with extended operating hours in the Klang Valley ensured that the food they served was always covered. Cooking food to the correct internal temperature is essential for eliminating harmful pathogens, especially in meats, poultry, and eggs. A critical deficiency in temperature control practices was found due to the absence of thermometer use during cooking. In contrast, a study at Universiti Sultan Zainal Abidin reported that 96.4% of food handlers used a thermometer to determine the appropriate cooking temperature for meat, possibly due to limited resources at the university (Rohin *et al.*, 2024).

The factors contributing to non-adherence to halal and *toyyib* principles, food safety, and hygiene practices among migrant food handlers in IIUM food services were grouped into four themes: insufficient training and lack of knowledge; individual attitude and behaviour; operational and resource constraints; and cultural and religious influences. Training enhances food handlers' overall performance. Food handlers who receive training tend to have better awareness of safe food-handling techniques as they receive expert guidance during training (Azanaw *et al.*, 2019). Compared with untrained food handlers, trained food handlers demonstrate greater adherence to personal hygiene and food safety practices (Tuglo *et al.*, 2021; Dora-Liyana *et al.*, 2018). Food handlers who did not receive formal food-handling training agreed that, without proper training, halal integrity and food safety may be compromised. They repeatedly stressed that inadequate knowledge and insufficient training contribute to unawareness and negligence in applying proper practices in their daily food handling routines.

Personal preferences or attitudes, such as whether to wear a proper uniform and appropriate shoes, can impact food handlers' compliance with safe food preparation practices. In addition, personal behaviours such as laziness, ignorance, or carelessness often threaten food safety practices, even among trained food handlers, as they may persist due to negative attitudes they hold (Azanaw *et al.*, 2019; Halim-Lim, 2023). Positive individual attitudes, such as discipline, responsibility, and adherence to standard operating procedures, contribute to improved food safety and hygiene by encouraging proper food preparation and helping reduce the risk of foodborne diseases (Kwol *et al.*, 2020).

Participants noted several external challenges, including staff shortages and heavy workloads, that significantly affect their ability to fully comply with halal principles and food safety and hygiene practices. Operational pressures often forced food handlers to prioritise fast service delivery over cleanliness and food safety, leading to delayed or compromised sanitation measures. A previous study found that high business volume leads food workers to sacrifice standard procedures or disregard personal hygiene recommendations (De Freitas & Stedefeldt, 2022). Participants further highlighted that the issue was exacerbated by a lack of basic resources, such as food thermometers, PPE, and hygiene-related equipment, as frequently mentioned during the interviews. A similar finding was reported in another study, in which food establishments lacked food thermometers and food doneness was more commonly assessed by visual appearance (Moscare-Balanquit & Dolon-Sanoria, 2019).

Religious teachings, such as those on cleanliness, motivate consistent compliance with personal hygiene. Religious individuals may demonstrate adherence to and commitment to organisational standards and values by engaging in behaviours considered moral or ethical within their religious context (Al Bayari *et al.*, 2023). Our study also revealed that food handlers' practices are rooted in personal beliefs and cultural upbringing, which vary by country of origin. The food handlers in this study came from Thailand, Bangladesh, China, and Indonesia, each with distinct cultural customs and food-related practices.

This study has certain limitations. First, the study relied on convenience sampling because the actual population size of migrant food handlers within the institution was unavailable. Therefore, it is hard to claim that the responses gathered truly reflect the whole population of migrant food handlers at IIUM.

Additionally, the data in this study were analysed using Microsoft Excel, with a focus on basic descriptive statistics, including frequency distributions, percentages, means, and standard deviations. The absence of advanced statistical approaches may limit the depth and extent of the research and interpretation. Finally, this study evaluated food safety, hygiene, and conformity to halal *toyyiban* principles by focusing on a single variable: practice. While this focus provides valuable insights into behavioural aspects, it overlooks other important components such as knowledge and attitude.

4. Conclusion

Migrant workers may undermine food safety regulations, increasing the risk of foodborne illnesses. Overall, most migrant food handlers show high levels of compliance with halal practices, hygiene, and food safety. Some of the most concerning areas include food protection from contamination, safe thawing methods, and temperature control using a food thermometer. Furthermore, several critical factors have been identified as contributing to the implementation of these practices, notably insufficient training and awareness, individual attitudes and behaviours, resource and operational constraints, and cultural and religious influences. These gaps could be addressed by improving food-handling practices through ongoing monitoring and inspection. Managers should establish strategies to motivate their food handlers, improve facilities, and conduct continuous monitoring through inspections, all of which are critical for effective food safety enforcement. Lastly, food operators are encouraged to adopt the requirements outlined in MS1500:2019 Halal Food-General Requirements, which can serve as a preparatory step towards obtaining halal certification. This standard not only enhances consumer confidence but also reflects their commitment to halal *toyyiban* principles.

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6. Conflict of interest

The authors declare no competing interests.

7. AI declaration

Artificial Intelligence (AI) tools, including ChatGPT (OpenAI, San Francisco, CA), were used to assist with language editing, improve sentence structure, and clarify grammar during manuscript preparation. The authors reviewed, verified, and take full responsibility for the accuracy and integrity of the content. No AI tools were used for data analysis, result interpretation, or scientific conclusions.

8. Open access

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9. Author contribution

Author 1: conceptualisation, project administration, methodology, formal analysis, investigation, data curation, writing original draft preparation. Author 2: conceptualisation, writing, reviewing, and editing.

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