

Article

Specific Personal Hygiene Procedures and Practices in Food Handlers—A Cross-Sectional Study in Butcher and Fishmonger Shops in Almada

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Abstract: Good manufacturing practices play an important role in obtaining safe food and preventing foodborne diseases. To achieve this goal, food handlers must receive appropriate training to be aware of their responsibilities. In this work, compliance with specific personal hygiene requirements by food handlers was assessed in a cross-sectional study of traditional small retail establishments, namely butcher ($n = 56$) and fishmonger ($n = 17$) shops in Almada, Portugal. Food handlers ($n = 140$, of which 113 worked in butcher shops, and 27 worked in fishmonger shops) were interviewed for data collection, and retail establishments were audited considering specific hygiene requisites. In fishmonger shops, most food handlers are women (89%), aged 18 to 45 years (70%), with a high school degree, having worked for less than 5 years in this activity, while in butcher shops most food handlers are men (90%) over 45 years old (58%), with a basic education level, and more than 26 years of experience. Most food handlers (>95%) attended recent food safety and hygiene training courses and were able to recognize that hand sanitizers cannot replace a proper hand wash, and to identify *Staphylococcus aureus* transmission routes to food. However, approximately 23% of retail establishments failed to provide hot water in the handwashing basin and exhibited improper placement of handwashing instructions. Furthermore, these establishments did not implement corrective actions following non-conforming microbiological results of hand hygiene monitoring. These findings reinforce the need for consistent management commitment, and for providing food handlers with regular training, which is crucial for maintaining a strong food safety and hygiene culture in these traditional small retail establishments.

Keywords: food retail; food handlers; food hygiene; food safety; hygiene practices; hygiene procedures



Citation: Oliveira, I.; Almeida, M.; Gomes, J.J.F.; Henriques, A.R. Specific Personal Hygiene Procedures and Practices in Food Handlers—A Cross-Sectional Study in Butcher and Fishmonger Shops in Almada. *Hygiene* **2024**, *4*, 207–220. <https://doi.org/10.3390/hygiene4020017>

Academic Editor: Günter Kampf

Received: 15 April 2024

Revised: 20 May 2024

Accepted: 23 May 2024

Published: 31 May 2024



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1. Introduction

Access to enough safe and nutritious food is key to sustaining life and promoting good health. According to the World Health Organization (WHO), each year worldwide, unsafe food causes 600 million cases of foodborne diseases and 420,000 deaths [1]. Most foodborne outbreaks occur in retail food settings [2].

Butchers and fishmongers, due to the direct contact with raw meat and seafood, are an important source of food contamination [3]. Poor personal hygiene and inappropriate food handling practices have been reported as major causes of food contamination by food handlers [4]. This study aimed to assess levels of compliance with specific personal hygiene requirements among food handlers working in butcher and fishmonger shops in Almada, Portugal.

Food handlers' hands can act as vectors for foodborne pathogenic agents (*Salmonella* spp., *Campylobacter jejuni*, *Staphylococcus aureus*, *Escherichia coli*) [5], especially when correct hand hygiene is not guaranteed [6]. They may be asymptomatic carriers of microorganisms that contaminate food via manual contact, or through respiratory secretions, as is the case with staphylococcal food poisoning [7]. Prevention relies on efficient handwashing with clean and safe water, soap and hand sanitizer [8].

The availability of water, together with handwashing agents, simple handwashing instructions to increase adherence, and innovative technological solutions to ensure the presence of soap at handwashing dispensers are crucial components to improve handwashing behavior [9]. In the studied retail establishments, as well as in a previous study of Portuguese butcher's shops [10], this was not guaranteed, which could contribute to poorer hand hygiene.

Gloves can be used to prevent the transfer of microorganisms that may exist on the surfaces of hands to food. However, there is also a risk of cross-contamination [11]. This is especially important for food handlers that work as fishmongers, who use gloves when handling fish products that have characteristics that can facilitate the deterioration of gloves, such as pimples and scales.

Food handlers must receive appropriate food hygiene and safety training and be aware of their responsibilities [12]. Food hygiene and safety training is a legal requirement in food retail establishments [13], and it is a recognized strategy to prevent foodborne diseases [4]. As reported in previous studies, food handlers who had attended food hygiene and safety training courses demonstrated better food safety and hygiene practices [14,15]. Additionally, previous studies found that individuals who had received training or had a higher educational level had better theoretical knowledge [16–18].

Personal hygiene practices and procedures can vary based on both age and professional experience. Other works associated better hygiene practices and knowledge with older and more experienced food handlers because they have been more-exposed to the activity [5,14,19]. Therefore, there is a greater acquisition of knowledge, specialization, and perception of good manufacturing practices. However, experience can lead to incorrect practices due to lack of training, repetition of incorrect behaviors over the years, and resistance to changing habits [20].

It is crucial that training in food hygiene and safety remains continuous to effectively transmit relevant information and clarify concepts, facilitating the achievement of better hygiene practices. Awareness campaigns and information disseminated during the COVID-19 pandemic have influenced changes in some hygiene practices carried out by food handlers, contributing to an increased awareness regarding the importance of personal hygiene and hand hygiene [21].

2. Materials and Methods

2.1. Study Design

A cross-sectional study was conducted from October to December 2021 to evaluate specific personal hygiene requirements of food handlers working in butcher and fishmonger shops located in the Portuguese municipality of Almada. Butcher shops were defined as food establishments that prepare and/or sell poultry, beef, pork, and lamb meat to the final consumer, and fishmonger shops were defined as establishments that sell or supply fresh and prepared fishery products to the final consumer, according to regulatory definitions [22]. All butcher and fishmonger shops operating in the municipality of Almada, both street-located shops and those within supermarkets, were contacted to voluntarily participate in

the study. The exclusion criterion was the unwillingness of a retail establishment's manager and/or food handlers to participate in this study.

2.2. Participants and Data Collection

For data collection purposes, an informed consent was used to provide participants, both retail establishment managers and food handlers, with comprehensive information about the study aim and methodology, including details about the voluntary nature of participation, and confidentiality assurance embedded in the Declaration of Helsinki's principles. Those who volunteered to participate were asked to sign the informed consent form.

The study considered relevant legal requirements [13,23–26]. An audit checklist and a questionnaire were developed based on these legal frameworks.

The audit checklist was pre-tested in three retail establishments, while the questionnaire was tested with a sample of 21 people, including food handlers, food technicians and other individuals not professionally related to the topic; the necessary adjustments were made to enhance data collection.

The audit checklist covered aspects such as facilities, equipment, and documentation related to food safety management, with a specific focus on personal hygiene (Table 1).

Table 1. Checklist sections and evaluated requisites.

Sections	Questions
Facilities and equipment	Is there an exclusive handwashing sink/other sink with an automatic/non-hand operated water supply for handwashing? Is this handwashing sink equipped with running water? Is hot water used for handwashing purposes? Is this handwashing sink located near the food preparation area?
Personal hygiene-related documents	Has the establishment adopted a manual for good hygiene practices? Are there available and properly displayed work instructions for proper hand hygiene? Are the in-use soap and sanitizer appropriate and specific for the handwashing procedure? Is there a regular microbiological monitoring of hand hygiene? Are food handlers informed of the results of these analyses? In the case of nonconforming results, have corrective actions been implemented?

The questionnaire included open-ended questions, addressing sociodemographic characteristics, attendance in food safety and hygiene training courses and years of experience in food handling, and questions concerning procedures, practices, and knowledge of personal hygiene (Table 2).

Table 2. Food handler's questionnaire.

Sections	Questions
Sociodemographic data	Profession. Gender. Age. Nationality. Level of education. Years of work in this activity. Do you have training in food safety and hygiene? When did your last training course in food safety and hygiene occur? Do you attend periodical medical screenings, according to the law?
Personal hygiene procedures and practices	Do you change your outdoor clothes before you begin working? What components are included in your work apparel? Do you keep your nails clean, short, and unvarnished? Do you take off your adornments (rings, piercings, bracelets, watches, others) before work? Are hands and wrists fully washed with soap during the handwashing procedure? Does the handwashing procedure take 40–60 s? Is soap used in the handwashing procedure? Is hand drying appropriately performed? Is a hand sanitizer used? When do you change gloves? When wearing gloves, when do you wash your hands?
Personal hygiene knowledge	Food handlers are an important source of food contamination. If you wear gloves, there is no need to wash your hands. Hand sanitizing using an alcohol-based solution can replace handwashing with soap and water. What symptoms should prevent us from handling food (vomiting/diarrhea; inflammatory processes of the mouth, eyes, ears, skin; runny nose)? What bacteria are usually in our noses that pass into food through our hands?

Data collection occurred during unannounced visits on regular working days, and the audit involved the observation of food handlers throughout the entire process of food handling and retail sale activities. The questionnaire was administered orally, with interviewers recording participants' responses.

2.3. Data Analysis

Audit and questionnaire data were recorded and organized using MS Office Excel 2019 software (Microsoft Corporation, Redmond, WA, USA).

The scoring criterion for the answers was one (1) point for each correct answer and zero (0) points for each incorrect answer or "I don't know". In the attitude section, 1 point was given for a positive attitude; otherwise, the question was given 0 points [18]. Theoretical knowledge was considered acceptable when the score was 3 or more (>50%), while the section on practices was considered acceptable when the score was 5.5 or more (>50%).

Statistical analysis was performed using R Core Team (2023). Chi-square test was used to test homogeneity between butcher shops and fishmonger shops with all sociodemographic characteristics, practices and knowledge levels. Chi-square test and Fisher's exact test were used to test the independence between knowledge and practices, to test the independence between practices and type of establishment and to test the independence between knowledge and type of establishment. Logistic regression was used to see if the practices or knowledge were associated with the sociodemographic variables.

3. Results

3.1. Sociodemographic Profiles of the Participants

All the butcher and fishmonger shops ($N = 73$, of which 56 worked as butchers and 17 as fishmongers) in Almada municipality were approached to voluntarily participate in the study. A 100% participation rate was obtained. In total, 140 food handlers were assessed, of which 113 worked in butcher shops and 27 worked in fishmonger shops.

Figure 1 shows the sociodemographic characterization of the food handlers working as butchers and as fishmongers. While men were predominant in butcher shops (90.3%; $n = 102$), similarly to the results reported by Santos et al. (2017) when evaluating butcher shops in Portugal [10], in fishmonger shops, women prevailed (88.9%; $n = 24$), as indicated by Agueria et al. (2018) [18] and Oliveira et al. (2021) [12], when assessing fish establishments. Traditionally, while men are overrepresented as food handlers in the meat industry [27], in the fishery products food chain, men's roles are more associated with fish harvesting, while women predominate in post-harvest activities. Women were also predominant in cafeterias, restaurants, and fishmonger shops in Saudi Arabia, Ireland, and Brazil, respectively [5,16,28,29]. Other authors identified the opposite, with a prevalence of male predominance in cafeterias, restaurants, and butcher shops in Pakistan, Thailand, Dubai, and Kenya, respectively [14,15,30,31]. The dominance of each gender in food retail activities could be linked to social inheritance [17].

In butcher shops, most food handlers (57.5%; $n = 65$) were aged 45 years and above, and a substantial portion (51.3%; $n = 58$) had accumulated over 25 years of experience in this type of work. In previous studies, similar results were reported among butcher's food handlers in Romania, Portugal, and Kenya [10,15,32]. On the other hand, most food handlers in fishmonger shops were under 46 years of age (70.3%; $n = 19$), and had been working in that activity for less than 5 years (44.4%; $n = 12$), which is in agreement with the results reported in fishmonger shops and restaurants in Bangladesh [33]; contrarily, all the food handlers working in fishmonger shops in Lisbon were over 30 years old, and most (77.1%; $n = 57$) presented a long working experience (>20 years) in that activity [12]. In Argentina, most individuals (60%; $n = 174$) working in the fishery industry were over 40 years old and had worked as food handlers for at least 5 years (83%; $n = 174$) [18].

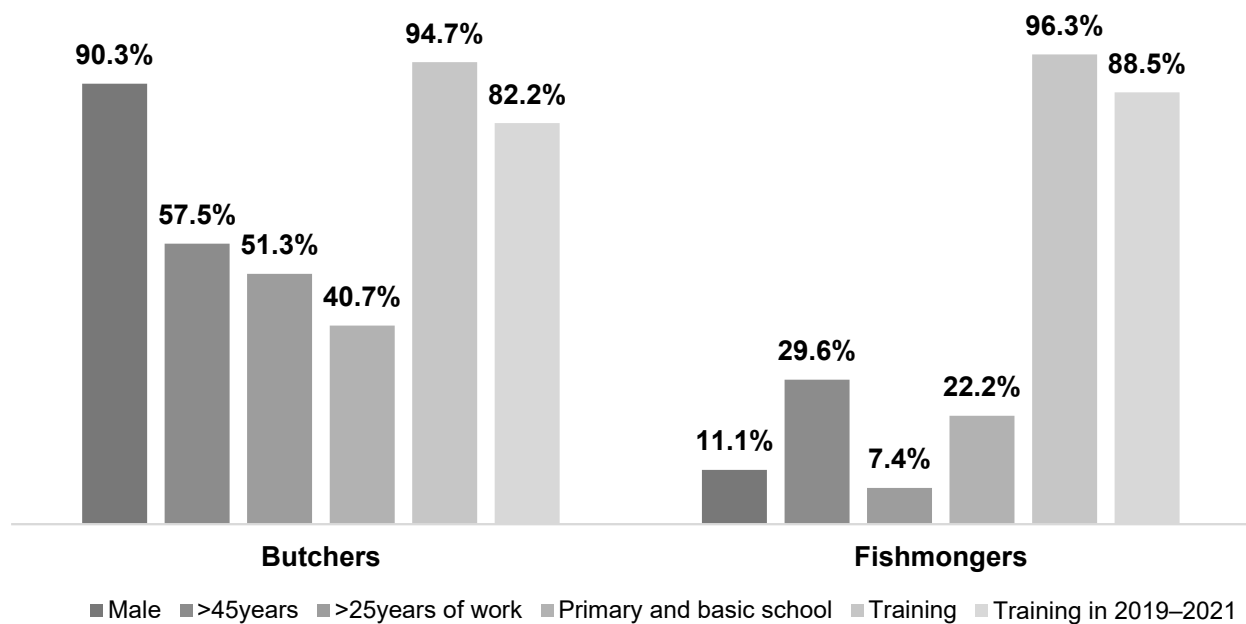


Figure 1. Sociodemographic characteristics of the studied food handlers ($n = 140$) in butcher and fishmonger shops.

Regarding the education level, in butcher shops, the number of food handlers with a completed 1st cycle, 2nd cycle, 3rd cycle, and high school level was similar ($n = 22$; $n = 24$; $n = 30$; $n = 25$, respectively). These findings align with those presented by workers of butcher shops in the north of Portugal, in which most food handlers had a low educational level [10]. Contrastingly, in fishmonger shops, most food handlers (44.4%; $n = 12$) had completed high school, and 29.6% ($n = 8$) reported having completed the 3rd cycle of education. In this study, the level of education among food handlers in fishmonger shops was higher than in butcher shops. Several authors have reported that food handlers with higher educational levels evidenced better hygiene practices and food safety knowledge [14,15,30,31]. This may be due to an increased ability to attain food safety and hygiene concepts and knowledge passed on through training sessions or by supervisors and food inspectors, which, combined with their educational level background, translates into better practices [14,19,34].

Most food handlers in butcher shops (95%) and fishmonger shops (96%) reported having attended professional training courses in food safety and hygiene. Training courses are an important way for food handlers to be acquainted with and acquire knowledge on good manufacturing practices [35]. Professional training in food safety and hygiene contributes to increasing food handlers' knowledge, shaping their attitudes and encouraging compliant behavior [14]. Training programs are expected to positively affect food handling practices, decreasing the risk of foodborne disease [36]. Nevertheless, professional training does not always translate into correct attitudes and practices [14,37].

In most retail establishments (butcher shops: 82.2%; fishmonger shops: 88.5%), the latest food safety and hygiene training course took place within the previous two years, and only 4% of the food handlers had never attended those training courses, in disregard of the law [13].

Similar results were presented in previous studies in Portugal, such as the one conducted by Oliveira et al. (2021), in which only 6.8% of the assessed food handlers in fishmonger shops from Lisbon had never attended a food safety and hygiene training course [12]; additionally, in butcher shops in Porto, 2.3% had never attended a food safety and hygiene training course [10].

Considering nationality, in this study, food handlers were all native Portuguese speakers, more specifically, from Portugal (91.4%, $n = 128$), Brazil (6.4%; $n = 9$), Cape Verde (0.7%;

$n = 1$) and Angola (1.4%; $n = 2$). As such, language is expected not to constitute a barrier to training, as all food handlers were from Portuguese-speaking countries.

Additionally, 95% of food handlers ($n = 133$) underwent regular medical examinations, similarly to the results reported by Gomes-Neves et al. (2011) among Portuguese food handlers in butcher shops [38]. Periodic medical examinations within the scope of occupational health in food establishments are mandatory [13].

3.2. Audit Assessment of Retail Establishments

3.2.1. Personal Hygiene-related Documents

Regarding the existence of available and easily displayed personal hygiene procedures (manual of good hygiene practices) and work instructions with a focus on complete handwashing technique, most of the studied retailers presented these documents as part of their food safety management system (Table 3). Nevertheless, in certain establishments (32.1% of butcher shops and 35.3% of fishmonger shops), proper handwashing work instructions were not appropriately displayed, particularly in the vicinity of the handwashing basin. This fact may hinder the guidance provided to food handlers on the correct handwashing technique. Handwashing instructions should be readily available for food handlers to consult. Powell et al. (2011) have emphasized the significance of these documents as an important factor contributing to improved hand hygiene practices [37].

Table 3. Personal hygiene-related document audit results.

Requisites	Compliance	
	Butcher Shops	Fishmongers
	<i>n</i> (%)	<i>n</i> (%)
Has the establishment adopted a manual for good hygiene practices?	53 (94.6%)	16 (94.1%)
Are there available and properly displayed work instructions for proper hand hygiene?	38 (67.9%)	11 (64.7%)
Are the in-use soap and sanitizer appropriate and specific for the handwashing procedure?	53 (94.6%)	17 (100%)
Is there a regular microbiological monitoring of hand hygiene?	47 (83.9%)	13 (76.5%)
Are food handlers informed of the results of these analyses?	40 (85.1%)	13 (76.5%)
In the case of nonconforming results, have corrective actions been implemented?	26 (55.3%)	9 (71.4%)

Adherence to personal hygiene procedures, particularly the practice of effective handwashing, is crucial in preventing food contamination by food handlers. This includes minimizing the risk of transmitting potentially harmful pathogens, such as *Staphylococcus aureus* and *Escherichia coli* [39,40]. Microbiological monitoring of food handlers' hands allows for the evaluation of the effectiveness of the handwashing procedure [7]. In the majority of the studied retail establishments, microbiological monitoring of handwashing procedures was regularly conducted (Table 3). Of these establishments, 85.1% ($n = 40$) of the butchers and 76.5% ($n = 13$) of the fishmongers informed the workers about the obtained results. However, the interviewed food handlers indicated a lack of understanding regarding the purpose of these analyses. This may result from a misunderstanding of the evaluation's intent, coupled with difficulties associated with identifying contaminating agents and sources. This identification is essential for implementing subsequent hygiene interventions [41]. In 55.3% ($n = 26$) of butcher shops and 71.4% ($n = 9$) of fishmonger shops, corrective actions were taken in response to nonconforming analyses (Table 3). Nevertheless, these actions did not lead to effective changes in the personal hygiene practices of food handlers, underscoring the importance of regular monitoring and follow-up of hand hygiene practices to achieve better microbiological results [42].

3.2.2. Personal Hygiene-related Facilities and Equipment

All establishments had at least one handwashing basin, but in 8.9% ($n = 5$) of butcher shops and 5.9% ($n = 1$) of fishmonger shops, the handwashing basin was not close to the area where food is handled (Table 4). Twenty-three percent of the butcher and fishmonger shops were not equipped with hot water in the handwashing basin located closer to the food handling areas, failing to comply with the legal requirements set in Regulation (EC) No. 852/2004 (Annex II, Chapter I) on the hygiene of foodstuffs [13]. A lower percentage was reported by Santos et al. (2017) for Portuguese butchers (17.8%; $n = 28$) [10]. Still, this study's findings were more favorable than those reported for fishmonger shops in municipal markets in Lisbon (73%; $n = 54$) [12]. While hot water is a legal requirement in food establishments [13], it is not essential for proper hand hygiene [43]. Nevertheless, its existence can enhance user comfort, promoting more frequent handwashing.

Table 4. Personal hygiene-related facilities and equipment audit results.

Requisites	Compliance	
	Butchers	Fishmongers
	<i>n</i> (%)	<i>n</i> (%)
Is there an exclusive handwashing sink/other sink with an automatic/non-hand operated water supply for handwashing?	54 (95.6%)	25 (92.6%)
Is this handwashing sink equipped with running water?	113 (100%)	27 (100%)
Is this handwashing sink equipped with hot water?	43 (76.8%)	14 (77.8%)
Is this handwashing sink located near the food preparation area?	51 (91.1%)	16 (94.1%)

In most establishments, the in-use liquid soap and sanitizer were appropriate and specific for handwashing and provided in dispensers, evidencing observance of the law [13]. However, in certain audited establishments, these dispensers and hand drying materials were unusable due to being empty. The insufficiency of materials and/or appropriate structures for hand hygiene has been identified as a factor contributing to the inefficiency of handwashing practices [44]. Interestingly, in this study, fishmonger shops were found to be well-equipped, providing their food handlers with better conditions for hand hygiene.

3.3. Verification of Personal Hygiene Procedures and Practices

Most food handlers interviewed in both butcher shops (88.5%; $n = 100$) and fishmonger shops (81.5%; $n = 22$) exhibited clean hands without bruises and maintained clean, short, and unpolished nails (Table 5), as reported by [10,36,45], and in accordance with the food safety and hygiene code of practice [25]. In contrast, discordant results have been reported for food handlers working as fishmongers [12], with only 58.1% compliance regarding the visual appearance of hands and nails among food handlers.

Regarding the use of adornments, 82.3% of meat handlers and 67.7% of fish handlers did not display any accessories, such as rings, bracelets and earrings, in line with the recommendations [24,25]. In the municipal markets of Lisbon, only 28.4% ($n = 21$) of fish handlers removed their adornments while working [12]. Similar percentages were reported in butcher shops in Kenya [15]. When assessing food handlers in restaurants in Kuwait, Al-Kandari et al. (2019) reported that 86.1% ($n = 346$) did not use adornments in the workplace [45]. Food handlers acknowledge that adornments can be potential sources of food contamination [17]. However, there seems to be a lack of awareness regarding the fact that these adornments represent a potential physical hazard. Consequently, items like earrings, functioning as fomites without direct contact with food, are often neglected in terms of removal before food handling. This perception likely acts as a barrier to the adoption of good hygiene practices [17].

Table 5. Results of assessment of personal hygiene procedures and practices.

Requisites	Compliance		
	Butchers	Fishmongers	
	<i>n</i> (%)	<i>n</i> (%)	
Do you change your outdoor clothes before you begin working?	88 (77.9%)	24 (88.9%)	
What components are included in your work apparel?	T-shirt or jacket	66 (58.4%)	22 (81.5%)
	Pants	75 (66.4%)	22 (81.5%)
	Waterproof footwear	93 (82.3%)	27 (100%)
	Apron	57 (50.4%)	18 (66.7%)
Cap	60 (53.1%)	23 (85.2%)	
Do you keep your nails clean, short and unvarnished?	100 (88.5%)	22 (81.5%)	
Do you take off your adornments before work?	93 (82.3%)	18 (67.7%)	
Are hands and wrists fully washed with soap during the handwashing procedure?	109 (96.5%)	27 (100%)	
Does the handwashing procedure take 40–60 s?	79 (69.9%)	21 (77.8%)	
Is soap used in the handwashing procedure?	109 (96.5%)	27 (100%)	
Is hand drying appropriately performed?	109 (96.5%)	27 (100%)	
Is a hand sanitizer used?	109 (96.5%)	27 (100%)	
When do you change your gloves?	Torn	31 (27.4%)	12 (44.4%)
	Dirty	15 (13.3%)	4 (14.8%)
	Sweaty	3 (2.7%)	1 (3.7%)
	Switching tasks	58 (51.3%)	19 (70.4%)
	Don't change	3 (2.7%)	1 (3.7%)
When wearing gloves, when do you wash your hands?	Before	8 (11%)	1 (3.8%)
	After	34 (46.6%)	14 (53.8%)
	Before and after	30 (41.1%)	11 (42.3%)
	Never	1 (1.4%)	0 (0%)

When it comes to the composition of apparel in butcher shops, over 50% of meat handlers used various components as working clothes, including waterproof footwear (82.3%; $n = 93$), pants (66.4%; $n = 75$), t-shirt or jacket (58.4%; $n = 66$), cap (53.1%; $n = 60$) and apron (50.4%; $n = 57$), following the legal requirement of wearing suitable and protective clothing in food-handling activities [13]. In the study of Santos et al. (2017) assessing Portuguese butcher shops, a high percentage of food handlers were observed wearing an apron (97.3%, $n = 71$), while fewer were wearing a cap (12.3%; $n = 9$) and waterproof footwear (67.1%; $n = 49$) [10]. In Kenya, a different pattern was identified, with a substantial percentage of meat food handlers wearing an apron (94%), waterproof footwear (99%), and a cap (78%) [15]. In fishmonger shops (Table 5), all food handlers wore waterproof footwear, and over 50% used a cap (85.2%; $n = 23$), t-shirt or jacket (81.5%; $n = 22$), pants (81.5%; $n = 22$) and apron (66.7%; $n = 18$). In restaurants and cafeterias in Kuwait and Pakistan, more than 90% of food handlers used work apparel [30,45]. Additionally, a substantial percentage of food handlers (over 80%) were found to wear a cap in cafeterias and restaurants in Saudi Arabia and the United Arab Emirates [14,16]. While this pattern may be influenced by cultural or religious considerations, its significance cannot be dismissed, given that all workers were involved in food preparation activities. The WHO food hygiene code of practice states that all food handlers should wear protective clothing, head coverings, and

footwear appropriate to the operation that the employee is engaged in, and that it should be worn and maintained in a sanitary manner [24].

Considering the use of protective clothing, food handlers working as fishmongers achieved better results than those in butcher shops (Table 5), which can likely be attributed to the nature of each type of establishment. The audited butcher shops were predominantly street establishments, in which many meat handlers wear work apparel along with outer garments. On the other hand, the audited fishmonger shops were primarily integrated into supermarkets, where the work apparel is more extensive and has the same composition for all food handlers.

In this study, most fish handlers used disposable gloves (96.3%; $n = 26$), whereas only 64.6% of meat handlers did. It is crucial to change gloves regularly, particularly when they become dirty, torn, or sweaty, or when transitioning between tasks, as a single hole in a glove can invalidate its protective effect [46]. As preconized by food hygiene codes of practice, when necessary, food handlers in food production activities should use suitable gloves that should be worn and maintained in a sanitary manner [24,25]. When used correctly, gloves serve to minimize cross-contamination by preventing direct contact between hands and food. However, glove changing can pose challenges, as it requires an interruption in the food handler's workflow. Unfortunately, this change may be delayed due to factors such as time constraints, peaks in workload, or lack of awareness, often resulting in the incorporation of glove fragments into the food [46]. In this study, participants reported changing gloves when switching tasks (51.3%, $n = 58$ in butchers and 70.4%, $n = 19$ in fishmongers), when torn (27.4%, $n = 31$ in butchers and 44.4%, $n = 12$ in fishmongers), when dirty (13.3%, $n = 15$ in butchers and 14.8%, $n = 4$ in fishmongers), or when sweaty (2.7%, $n = 3$ in butchers and 3.7%, $n = 1$ in fishmongers; Table 5). These behaviors hold particular significance for these food handlers, given the specific characteristics of the foodstuffs they handle, which include bones, scales, and other factors that may accelerate glove deterioration.

There is a risk of decreased frequency of hand sanitization when gloves are in use [11,47]. In both types of retail establishments, only around 40% of individuals properly sanitized their hands while using gloves, both before and after putting them on. A meaningful percentage of them opted to sanitize their hands solely after using gloves (46.6%, $n = 34$ in butcher shops and 53.8% $n = 14$ in fishmonger shops; Table 5). Many food handlers justified this practice by citing difficulties in putting on gloves after sanitizing their hands, possibly caused by inadequate hand drying [19,46]. In the studies of Wambui et al. (2017) and Amqam et al. (2021), none of the food handlers used disposable gloves in slaughterhouses in Kenya or in street food carts in Indonesia [15,48].

Liquid soap, hand sanitizer, and disposable paper were used by a high percentage of food handlers (Table 5). In the study of Oliveira et al. (2021), none of the fish handlers in Lisbon's municipal markets performed hand hygiene correctly, only 2.7% used hot water, 1.4% used liquid soap, and 18.9% used disposable paper; none of them used hand sanitizer. In comparison to other types of food establishments, such as restaurants and cafeterias, more than half of the individuals used liquid antibacterial soap [16,30]. As for hand drying, the use of cloths and air drying have been reported [12,49,50].

Hand sanitization is consistently included in food safety and hygiene training, yet a substantial number of food handlers fail to distinguish between hand sanitization and handwashing. This lack of awareness regarding the risks associated with improper hand hygiene, coupled with insufficient structures and equipment for hand hygiene, along with the demands of overwork, lead food handlers to prioritize other activities.

In terms of the actual execution of the hand hygiene procedure, a mere 3 (2.7%) meat handlers applied all the necessary steps correctly [43]. This observation aligns with the findings of Gomes-Neves et al. (2011), who noted a similar lack of knowledge among food handlers in the meat industry in Portugal regarding the necessary steps for proper hand hygiene [38].

Concerning the duration of the procedure, most food handlers adhered to recommendations set out by the WHO [43]. However, those who did not comply (Table 5), constituting 30.1% ($n = 34$) in butcher shops and 22.2% ($n = 6$) in fish shops, justified their actions by citing a lack of time or deeming the time spent on the sanitization procedure as irrelevant. Comparable findings were noted by Osaili et al. (2013) in restaurants in Jordan [19].

Previous studies have highlighted a disparity between reported and observed behaviors [51]. Typically, reported behaviors tend to be overstated, as participants often respond based on what they perceive as socially desirable [52]. This phenomenon persists even when individuals are aware that their behaviors are being observed; they may alter their actions to align with what they believe is a more appropriate practice, even if they do not consistently perform it in their daily routines [51]. However, despite this potential discrepancy, reported behaviors serve as a valuable means to assess the knowledge of food handlers, offering insights into their understanding of proper practices, even if these practices are not consistently implemented in real-life situations. This can be instrumental in gauging their overall training level [53].

3.4. Personal Hygiene Knowledge Assessment

Food handlers are potential sources of food contamination, and 88.5% ($n = 100$) of meat handlers and 96.3% ($n = 26$) of fish handlers were aware of this fact (Table 6). Similar results have been reported in previous studies, with over 60% of the food handlers answering this same question correctly [16,18,38].

Table 6. Results of the personal hygiene knowledge assessment.

Requisites	Correct Answer		
	Butchers	Fishmongers	
	<i>n</i> (%)	<i>n</i> (%)	
Food handlers are an important source of food contamination.	100 (88.5%)	26 (96.3%)	
If you wear gloves, there is no need to wash your hands.	103 (92%)	27 (100%)	
Hand sanitizing using an alcohol-based solution can replace handwashing with soap and water.	96 (85.8%)	26 (96.3%)	
What is the optimal hand drying method?	108 (95.6%)	27 (100%)	
What symptoms should prevent us from handling food?	Vomiting/diarrhea	97 (85.8%)	27 (100%)
	Inflammatory processes of the mouth. eyes. ears. skin	93 (82.3%)	22 (81.5%)
	Runny nose	79 (69.9%)	14 (51.9%)
What bacteria are usually in our noses that pass into food through our hands?	30 (26.5%)	8 (29.6%)	

In response to “If you wear gloves, there is no need to wash your hands” (Table 6), all food handlers in fish shops and 92% ($n = 103$) of food handlers in butcher shops stated that the use of gloves does not eliminate the need for hand sanitization, which is in accordance with the observed practices and procedures, and with previous studies [19,46,48].

Most individuals included in the study provided the correct response to “Hand sanitizing using an alcohol-based solution can replace handwashing with soap and water” (85.8%; $n = 92$ in butchers and 96.3%; $n = 26$ in fishmongers). This awareness is likely attributed to the information disseminated during the pandemic, emphasizing the use of hand sanitizer. Regarding the symptoms that could prevent them from performing food handling tasks, 53% ($n = 62$) of meat handlers and 40% ($n = 11$) of fish handlers indicated all three symptoms, namely vomiting/diarrhea, inflammatory processes, and runny nose. These answers might constitute evidence that these food handlers underwent training on health risks, in accordance with food hygiene code of practice [24] and legal

requirements [13]. Similar results were reported for food handlers working in cafeterias and restaurants in Saudi Arabia, Bangladesh and the United Arab Emirates [14,16,33].

Concerning the optimal hand drying method (Table 6), every food handler working as a fishmonger affirmed using paper. In butcher shops, 95.6% of food handlers indicated using “paper”, 2.7% opted for “air” drying, and 0.9% ($n = 1$) chose “towel” for drying their hands. Only 15.2% of the meat handlers assessed in the study by Gomes-Neves et al. (2011) reported that hand drying was performed using disposable paper [38]. In this study, the food handlers who answered “paper” were not only able to correctly identify the best drying method but were also able to explain their choice. This result was very positive, in that choosing an inappropriate medium for hand drying can compromise the entire previous procedure.

About half of the handlers in butcher shops (58.4%; $n = 66$) and fishmonger shops (55.6%; $n = 15$) did not associate *Staphylococcus aureus* with the human nasal cavity, while about 30% of food handlers in both establishments were able to identify the *Staphylococcus aureus* transmission route to food. *Staphylococcus aureus* is a bacterium that can be present in the nasal cavity, nasopharynx, or oral cavity of humans, usually asymptomatic, that is potentially pathogenic and can be transmitted through food [41].

In similar studies, it was reported that 43.4% ($n = 72$) of food handlers identified *Staphylococcus aureus* as one of the bacteria responsible for foodborne illness [53]. In Romania, 31% of food handlers knew that coughing and sneezing are potential sources of *Staphylococcus aureus* contamination [32]. In general, this study confirms some results already reported in the scientific literature. The level of education showed a significant association (p value = 0.01) with theoretical knowledge level. The odds of having good knowledge were around four times higher among people with more education status. The association found between the level of schooling and the level of theoretical knowledge, although rejected in the work of Abdul-Rashid et al. (2012) [54], had been mentioned in the studies of Lee et al. (2017) and Agueria et al. (2018) [6,18]. This seems to be a natural situation, as these are aspects related to thinking and reasoning, among others, where the learning process and the development of theoretical knowledge are necessary and important.

On the other hand, in this study, no significant association was found between practices and the demographic characteristics of respondents (p value = 0.414 for sex, p value = 0.884 for age, p value = 0.355 for educational level, p value = 0.503 for work experience and p value = 0.512 for training). Additionally, no statistically significant association was found between practices and knowledge (p value = 0.405 in Pearson’s Chi-squared test and p value = 0.193 in Fisher’s exact test), between practices and type of establishment (p value = 0.621 in Pearson’s Chi-squared test and p value = 0.691 in Fisher’s exact test) or between knowledge and type of establishment (p value = 0.149 in Pearson’s Chi-squared test and p value = 0.123 in Fisher’s exact test). Similar results have been reported in the works of Wambui et al. (2017) and Agueria et al. (2018) [15,18]. As practices are more action-oriented, it is not surprising that the level of education does not seem to have the same importance as theoretical knowledge.

Finally, this study points to significant differences in sociodemographic characteristics between butcher and fishmonger food handlers, as homogeneity was rejected (p value $< 1 \times 10^{-6}$) (Table 7). Results differed from those expected for the same sociodemographic characteristics, practices and knowledge.

Table 7. Characteristics (in proportions) of workers in butcher shops and fishmonger shops and their expected values in the case of homogeneity between the two types of establishments.

	Good Practices	Good Knowledge	Sex (Male)	Age (Over 45 years)	Educational Level (Basic Level)	Work Experience (Over 25 years)	Training (2019–2021)
Butcher shops	91%	83%	90%	58%	55%	52%	28%
Fishmonger shops	96%	96%	11%	30%	78%	7%	19%
Expected	92%	86%	75%	52%	59%	44%	26%

As with any other study, this work presents limitations that should be acknowledged to guide future research in addressing these potential areas of improvement. These limitations include the reliance on participants' self-reported responses, which may not truly reflect their usual procedures and practices on regular working days. Additionally, the presence of an auditor/researcher in the work environment could potentially influence participants' answers to the questionnaire. This might be due to the tendency of participants to give socially desirable answers, to be viewed as favorable by others. In future studies, to obtain a more accurate depictions of the daily working procedures and practices of food handlers, it would be important to incorporate an observational study involving the observation of food handlers over several days during their regular working hours.

4. Conclusions

This study focused on evaluating specific personal hygiene procedures and practices of food handlers working in traditional small retail establishments, namely butcher and fishmonger shops in Almada, Portugal. The findings reinforce the need to empower the food safety and hygiene culture within small retail establishments with a long-standing tradition. For that, a resolute commitment to continuous and frequent training, essential for transmitting relevant information to food handlers, clarifying concepts, and reinforcing hygienic practices is of utmost importance.

Author Contributions: Conceptualization, I.O. and A.R.H.; methodology, I.O., M.A., J.J.F.G. and A.R.H.; software, I.O. and J.J.F.G.; validation, A.R.H.; formal analysis, I.O., J.J.F.G. and A.R.H.; investigation, I.O., M.A. and A.R.H.; data curation, I.O. and M.A.; writing—original draft preparation, I.O.; writing—review and editing, I.O. and A.R.H.; supervision, A.R.H. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The datasets generated for this study are available on request to the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

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