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Food allergies and intolerances: How prepared are restaurants in downtown Lisbon?

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Abstract: Food allergies (FA) and food intolerances (FI) affect a considerable part of the world population and have a major impact on the daily lives of susceptible individuals. The present study aims to assess the knowledge and preparation of restaurant staff in downtown Lisbon regarding the needs of consumers with food allergies and/or intolerances.

This study was an observational analysis that consisted of visits to restaurants and was attended by 34 employees, belonging to 17 restaurants. The employees answered a questionnaire, in digital format, containing questions about allergens, the concepts of FA and FI and cross-contamination.

Among the respondents, 91% said they had never had any training about FA/FI. Regarding allergens, more than 90% of the employees considered egg to be an allergen, though 74% did not believe the same about celery. The concepts of FA and FI raised more doubts in the participants, with 24% and 21%, respectively, answering “I don’t know” when asked to evaluate factual statements about both.

It can be concluded that, in these restaurants in downtown Lisbon, the staff has little training on FA/FI. Because of these demonstrated gaps in their knowledge, there is a need to invest in training on this topic to prevent the occurrence of adverse reactions in patrons.

Keywords: allergens; food allergies; food intolerances; Lisbon; restaurants

1 Introduction

Adverse food reactions affect a considerable portion of the world’s population and have a major impact on the daily lives of susceptible individuals. They can be divided into two categories according to the type of response triggered by the body: food allergies (FA), which are mediated by the immune system, and food intolerances (FI), which are not mediated by this system (Gargano et al., 2021; Flanagan, 2025).

Due to the significant impact of FAs on the daily lives of susceptible individuals, they are considered a public health issue (Cosme-Blanco, 2020). They result from an immune response of the body to components of the ingested food that are known as allergens (Cianferoni, 2020; Valenta et al., 2015). This occurs whenever an allergic individual comes into contact with an allergen, and in extreme cases, it can have fatal consequences (Yu et al, 2016). It is estimated that FA affect about 8% of the paediatric population worldwide, while in the adult population the prevalence is 5% (Pádua et al., 2016).

Reports of food intolerances in the general population have also increased, so establishments should be concerned about being able to respond equally to the needs of consumers (Lomer, 2015; Konstantinou et al., 2025; Singh, 2026; Wen, 2025). Intolerances are predominantly characterized by an exacerbated reaction from the body after ingesting a certain food, but, unlike allergic manifestations, they are not triggered by an immune response (Manuyakorn & Tanpowpong, 2019). Most reported adverse food reactions are food intolerances, with an estimated 15–20% of the world’s population suffering from such conditions (Skypala & Vlieg-Boerstra, 2014).

Food avoidance is a crucial form of prevention that entails the reading of labels on packaged foods to be consumed so that there is no accidental ingestion of any constituent that may trigger a reaction (Nunes et al., 2012; Estevão & Aguiar, 2016; Lee & Wei, 2024). However, in the case of unpackaged foods, all ingredient, auxiliaries or derivatives of a substance capable of causing FA or FI that

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are part of the manufacture or preparation of a given food product, and that remain in the finished product, even in modified form, must be identified (European Parliament and the Council of the European Union, 2011). In this sense, establishments must make all possible information available to the consumer in a mandatory way that allows the consumer to make informed and conscientious choices.

Another major concern regarding catering establishments is related to the likelihood of cross-contamination, which can endanger consumer health. Cross-contamination can occur through direct contact between foods, but it can also be caused by poor personal or equipment hygiene, which can cause the prepared food to be “contaminated” by unintended allergens (Pádua et al., 2016).

Under the provisions of paragraph 1 of Article 1 of Decree-Law No. 168/97 of July 4 (Diário da República, 1997a), a catering establishment is understood to be any establishment “intended to provide, for remuneration, meals and drinks to be consumed on the premises or outside of it,” regardless of its name. These establishments may also use, in accordance with Regulatory Decree No. 38/97 of September 25 (Diário da República, 1997b), the “designation ‘restaurant’ or any other designation that is nationally or internationally recognized by the customs of the activity, namely ‘seafood restaurant’, ‘tavern’, ‘pizzeria’, ‘snack bar’, ‘self-service’, ‘drive-in’, ‘take-away’ or ‘fast food’” (Diário da República, 1997a; Diário da República, 1997b).

Food allergies and intolerances have been increasingly reported by the population worldwide, constituting a real public health problem that affects the quality of life of those who suffer from them (Costa et al, 2012). Eating meals outside the home is part of the daily lives of many people for a variety of reasons (leisure, work, etc.), and the impact that food allergies and intolerances can have on the social lives of consumers is substantial, since they may be deprived of enjoying a meal outside the home for fear that establishments are not prepared to receive them (Warren et al., 2020; Figueroa-Gómez et al, 2022; Schaefer, 2025; Vicentini et al., 2026). It is therefore crucial to ensure the safety of food provided to consumers — especially individuals with food allergies/intolerances — to prevent unwanted reactions that may, in extreme cases, put lives at risk (DunnGalvin et al., 2015).

For safety to be ensured, it is essential to raise awareness and train employees of food service establishments regarding this type of situation, increasing the responsiveness of these establishments and providing a better quality of life for their consumers. To this end, employees must be properly informed and trained on these types of health issues so that there can be an effective response, ensuring, above all, the safety of the consumer (McAdams et al., 2018).

There are few studies that address this topic in the context of restaurants, particularly in Portugal, with no known research in the downtown Lisbon area, which deserves special attention in the context of food allergies and intolerances as a highly touristic and busy area. The present work aims to evaluate the knowledge of employees and the preparedness of restaurants in downtown Lisbon regarding the needs of consumers with food allergies or intolerances.

2 Methodology

This study consisted of an observational analysis supported by a questionnaire that was developed specifically for this purpose, as no existing instrument was identified that could adequately assess restaurants’ preparedness to meet the needs of consumers with food allergies and intolerances. The questionnaire was designed in alignment with the research objectives, as well as the relevant scientific literature and applicable public policy.

To this end, visits were made to a total of 25 restaurants located in downtown Lisbon between May and June 2023, eight of which did not consent to participate in the study. The restaurants were selected from a list of establishments located in downtown Lisbon, via simple random sampling, with the selection aiming to cover the widest possible geographic area from Rua Augusta to Rua das Portas de Santo Antão, including the adjacent streets, in the downtown area of Lisbon. Only full-service restaurants were considered; establishments without table service (e.g., fast-food, snack bars, pastry shops) were excluded.

Subsequently, two employees from each selected restaurant were randomly chosen to participate in the study using the same procedure. All eligible employees were assigned a number using a random number generator, and two were selected, guaranteeing an equal probability of selection for all eligible employees.

To collect the data, a questionnaire was applied with the objective of evaluating the employees’ knowledge and practices regarding food allergens. The first section of the questionnaire covered questions related to the function they performed and its duration; the year of opening of the establishment; and the receipt of training about food allergies/intolerances. The second asked section ascertained knowledge about the types of allergens that must be reported as established by law; the concepts of food allergies and intolerances and the differences between the two; and knowledge and practices around cross-contamination. Participants classified the statements in the questionnaire as “true,” “false,” or “I don’t know.”

The questionnaire was applied to two employees for each establishment visited, with a total of 34 employees interviewed. The anonymity of the participants, as well as that of the restaurants, was preserved throughout the data collection process, based on the concept of informed participant consent set forth in the Declaration of Helsinki (Shrestha & Dunn, 2020).

The analysis of the collected data including creating descriptive analyses of the categorical variables and presenting the results as percentages. All statistical analyses were performed using version 29.0 of the Statistical Package for Social Sciences software.

3 Results

This research involved 34 employees from a total of 17 restaurants located in downtown Lisbon. The average respondent age was 38.4 (SD: 14.0) years.

The general characteristics of the sample in relation to the functions performed by each employee are presented in Table 1. Of the 34 employees interviewed, 71% were waiters, 12% were managers, 12% were cooks, and 5% were kitchen assistants. Respondents had been performing their duties for a total average of 104 (SD: 123.92) months (approximately eight years). Among the interviewees, 91% stated they had not received any training on FA/FI.

Regarding the employees' knowledge of foods and food products considered allergenic (Table 2), it was found that the majority (91.2%) were aware that eggs and egg-based products are considered allergens, as well as milk and milk-based products (excluding lactose-free products) (97%), although this statement was intentionally altered. Though celery is considered allergenic, 73% of the sample incorrectly deemed this statement false. In the case of mustard and mustard-based products. However, more than half of the respondents correctly considered mustard and mustard-based products to be part of the allergen list (68%). The vast majority of participants also correctly

Table 1: General characteristics of employees according to function performed

	Total sample (n=34)	Manager (n=4)	Cook (n=4)	Waiter (n=24)	Kitchen assistant (n=2)
Age, years*	38.4 (14.0)	44.2 (16.0)	45.5 (10.53)	37.0 (14.38)	29.5 (7.77)
How long have you been performing this function, in months?*	104.1 (123.92)	198.0 (163.5)	141.0 (165.80)	87.0 (111.73)	47.0 (52.3)
Have you ever had any training on food allergies/intolerances? %(n)					
Yes	8.8 (3)	25.0 (1)	0.00 (0)	8.3 (2)	0.00 (0)
No	91.2 (31)	75.0 (3)	100.0 (4)	91.7 (22)	100.0 (2)

*Data expressed as mean and (SD)

Table 2: Frequency of responses regarding employees' knowledge about allergens

	True	False	I don't know
	% (n)		
Which of the following foods/food items are considered allergenic?			
Eggs and egg products	91.2 (31)	8.8 (3)	0.0 (0)
Tomatoes and tomato products	29.4 (10)	67.6 (23)	2.9 (1)
Oregano and products containing oregano.	17.6 (6)	73.5 (25)	8.8 (3)
Milk and milk-based products (except lactose-free products)	97.1 (33)	2.9 (1)	0.00 (0)
Celery and celery-based products	20.6 (7)	73.5 (25)	5.9 (2)
Mustard and mustard-based products	67.6 (23)	26.5 (9)	5.9 (2)

identified as false statements that tomatoes and tomato derivatives, as well as oregano and products containing oregano, were allergens (68% and 74%, respectively).

Respondents' concepts of food allergy and intolerance were assessed in the form of classification questions; 74% classified food allergy as a response of the immune system when exposed to a specific food or food type, and 24% stated they did not know how to answer.

More than half of the respondents (68%) stated that food intolerance does not trigger a response from the immune system, and 53% denied the possibility of an anaphylactic reaction in the context of food intolerance.

More than 90% of the sample recognized that food intolerances manifest mainly through gastrointestinal symptoms and that, unlike allergies, they do not have a potentially fatal outcome, and 53% recognized the relationship between the ability to digest food and the development of food intolerances, and the possibility of food intolerance occurring through different routes such as skin or inhalation.

Regarding the symptoms that can arise from a food allergy, almost 60% of participants stated that they only manifest as gastrointestinal issues. When stated that an individual allergic to eggs could consume only small amounts of this food, 85% of the participants classified the statement as false. However, defining the concepts

of FA and FI raised the most doubts among participants, with 24% and 21%, respectively responding "I don't know" to definition questions. All this information is shown in Table 3.

The responses obtained regarding the employees' knowledge about cross-contamination, as well as best practices to be developed, are shown in Table 4.

Of the total sample, 82% believed that there should be a separate cutting board for preparing food that will be part of FA/FI individuals' meals, and that the table, cutlery, and utensils with which the individual will be in contact should be carefully cleaned (100%). Regarding possible mistakes in preparing a dish for a customer with FA/FI, however, only 38% of employees considered that the allergenic ingredient should not be removed and the dish served again, but rather a completely new one should be prepared. When frying oil was mentioned as a vehicle for cross-contamination, 82% of respondents considered that new oil should be used to fry food that will be consumed by an allergic or intolerant customer. The vast majority of respondents, however, considered that all employees should be aware and take special care in their work practices around customers with FA/FI.

All respondents believed that they should acknowledge any doubt they have about the presence of any all-

Table 3: Frequency of responses regarding employees' knowledge of the concepts of food allergy and intolerance

Statement presented	True	False	I don't know
	% (n)		
1. A food allergy manifests itself through a response of the immune system when exposed to a specific food/food product.	73.5 (25)	2.9 (1)	23.5 (8)
2. An individual who comes into contact with a food to which they are intolerant may develop an anaphylactic reaction, which can be fatal.	47.1 (16)	52.9 (18)	0.00 (0)
3. An individual allergic to eggs can consume very small amounts of this food.	14.7 (5)	85.3 (29)	0.00 (0)
4. A food intolerance is characterized by an exaggerated reaction of the body to a particular food consumed that does not trigger an immune response.	67.6 (23)	11.8 (4)	20.6 (7)
5. Food intolerances mainly manifest as gastrointestinal symptoms such as nausea, cramps, or diarrhoea, and unlike allergies, they do not have fatal consequences.	94.1 (32)	5.9 (2)	0.00 (0)
6. In food allergies, symptoms appear between a few minutes and two hours after contact with the allergen and include only gastrointestinal manifestations.	58.8 (20)	38.2 (13)	2.9 (1)
7. Food intolerance is related to the body's ability to digest food, while food allergy can occur through different routes, including skin or inhalation.	52.9 (18)	32.4 (11)	14.7 (5)

ergen on the menu and advise a concerned customer to choose another dish. Opinions were divided regarding whether customers with FA/FI should stay away from the kitchen due to the potential inhalation of fumes, with 44% of participants classifying this statement as true, an equal percentage considering the statement false, and 12% choosing to answer “I don’t know”. When asked if their restaurant provided as much information as possible on the ingredients and allergens present in each dish on its menu, 82% of employees answered in the affirmative. Responses were unanimous (100%) regarding the description of all dish ingredients on technical sheets and the accessibility of this information in the absence of the head chef. All employees interviewed also stated that they are alerted whenever there is

a change in the ingredients of any dish listed on these sheets.

4 Discussion

Although individuals susceptible to food allergies should be cautious when going to a food service establishment, always informing staff about their situation and specifying the food(s) or food type(s) involved, specific employee training reduces the risk of potential errors and builds consumer confidence, improving consumers’ quality of life (Carter et al., 2020). In the present study, 91% of participants stated that they had never attended any training on food allergies. Similarly, Seixas (2018) found that more

Table 4: Frequency of responses regarding employees’ knowledge about cross-contamination and best practices to be implemented

Statement presented	True	False	I don’t know
	% (n)		
1. A specific cutting board is not required to prepare food for a customer with allergies/intolerances.	17.6 (6)	82.4 (28)	0.00 (0)
2. Small amounts of allergen are not capable of causing allergies.	11.8 (4)	88.2 (30)	0.00 (0)
3. The table where the customer will be seated, as well as the cutlery and utensils to be used by the customer, must be carefully cleaned.	100.0 (34)	0.00 (0)	0.00 (0)
4. If I detect that there was a mistake in preparing a dish for a customer with allergies/intolerances, I must remove the allergenic ingredient and serve the dish again.	61.8 (21)	38.2 (13)	0.00 (0)
5. Frying oil is a vehicle for cross-contamination and therefore new oil should be used exclusively for frying foods that will be on the plate of a customer with allergies/intolerances.	82.4 (28)	14.7 (5)	2.9 (1)
6. Only kitchen staff should be aware of and exercise special care in their work practices when dealing with a customer with allergies/intolerances.	14.7 (5)	85.3 (29)	0.00 (0)
7. If there is any doubt about the presence of a particular allergen in the menu or food product, the employee should say that they do not know and advise the customer to make another choice.	100.0 (34)	0.00 (0)	0.00 (0)
8. The table designated for customers with allergies/intolerances should, whenever possible, be located away from the kitchen due to the potential inhalation of fumes.	44.1 (15)	44.1 (15)	11.8 (4)
9. The restaurant provides as much information as possible on its menu about the ingredients that make up each dish, as well as any allergens that may be present. Example: “Bacalhau à Zé do Pipo” (cod, mashed potatoes, mayonnaise) contains milk, gluten and egg.	82.4 (28)	17.6 (6)	0.00 (0)
10. The technical specifications contain all the ingredients present in the dish and are duly updated whenever there are changes.	100.0 (34)	0.00 (0)	0.00 (0)
11. Employees are informed whenever there are changes to the ingredients in any dish listed in the recipe cards.	100.0 (34)	0.00 (0)	0.00 (0)
12. In the absence of the Head Chef, the recipe cards are always available for consultation.	100.0 (34)	0.00 (0)	0.00 (0)

than half of the participants also lacked training in this context.

Regarding demonstrated knowledge about mandatory allergens, it was possible to perceive a lack of understanding of which foods and food types are considered allergenic. As also found by Afonso (2020), celery was the food least-often classified as allergenic, with more than half of the participants holding an opinion that it was not allergenic. This is probably due to the fact that celery belongs to the group of vegetables, leading to an assumption that it does not have allergenic properties.

Seixas (2018) found that eggs and milk were among the foods most frequently cited as allergens, with more than half of the participants classifying them as such, similarly to the present study. The fact that most participants in the current research had never had any kind of training regarding FA/FI may be closely related to the lack of knowledge demonstrated regarding allergens and the number of “I don’t know” responses regarding the concepts of FA and FI.

Ajala et al. (2010) found that the statement “small amounts of allergen are not capable of causing allergies,” was classified by more than 80% of employees as false. However, in a study by Radke et al. (2016), more than 11% of the employees surveyed believed that small amounts of allergen can be consumed. Brito et al. (2018) found the same issue among employees of a fast-food chain, only 23% of which provided correct answers.

In order to avoid accidental contamination of food or food products prepared in restaurant and food service establishments, employee training is extremely important (França et al., 2022), and several studies show significant gaps in such training (Pelini & Vieira, 2020; Martins et al, 2012; Santos et al., 2008). Unlike the findings of Pelini & Vieira (2020), the employees in the present study demonstrated mostly satisfactory knowledge regarding cross-contamination and good practices to be maintained.

Employee training appears to be the best way to fill existing gaps in knowledge and good labour practices; other studies have proven the effectiveness of this method by applying the same questionnaire before and after training sessions, demonstrating improvement in the knowledge demonstrated by employees in the latter questionnaire (Pelini & Vieira, 2020; Boaventura et al., 2017).

However, more than acquiring knowledge about a particular subject, it is essential to apply this knowledge to daily work practices — something that was not observed by Morales & Vieira (2020), where it was found that

the answers given by employees did not corroborate how they subsequently performed their duties. The same was found by Akabanda et al. (2017), who sought to evaluate knowledge and attitudes in the context of food safety and hygiene practices maintained by food handlers in institutional food services. The knowledge presented by the participants was mostly satisfactory; however, the practical component of the study fell short of the knowledge demonstrated. The present study did not evaluate employees in the performance of their duties, so the mostly satisfactory responses to the cross-contamination and best practices section do not in themselves allow us to say whether the knowledge demonstrated is effectively exercised in daily practice.

The present study also had some limitations. Namely, the questionnaire was not validated, and because it was somewhat lengthy, it became difficult to apply due to the lack of time and availability of employees at the time of the interview. The sample size also constitutes a limitation of this study, since it only allows us to consider the results for the population in question. Additionally, no questions were asked regarding good personal hygiene or facility hygiene practices, which are also significant contributors to potential contamination.

5 Conclusions

The study found a considerable gap in the training of these restaurant employees in the downtown of Lisbon, with more than 90% stating that they had never received training on FA/FI. It also found a lack of knowledge among employees regarding the topic addressed.

These results point to a need to invest in training for employees on FA/FI in order to increase knowledge and awareness of the topic. In this way, these professionals can have on the health of consumers, giving them greater confidence and consequently improving their quality of life.

In order to improve consumer safety and reduce the risk of adverse reactions, It is recommended that restaurants adopt standardized allergen management protocols and provide regular staff training on food allergies and intolerances supported by public health authorities.

Further studies on this topic are needed, as these are increasingly frequent situations in the population and deserve special attention in terms of public health.

Bionotes

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