Food toxico-infection TIAC: Results of 10 years of cross-sectional studies (2012-2022) and determinations of contributing factors by ACM, in Kenitra, Morocco

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ABSTRACT

Background

Food poisoning is a common health problem caused by consuming contaminated food. This study aimed to investigate the characteristics of food poisoning in the Kenitra region between 2012 and 2022, including age, gender, contamination sources, treatment outcomes, types of food involved, and preparation methods.

Methods

Data on food poisoning cases were collected, and statistical analysis, including multiple correspondence analysis (MCA), was performed to identify factors contributing to food poisoning. Cronbach's alpha was calculated to assess the internal consistency of the MCA variables.

Results

Children aged 5 to 15 accounted for nearly half of the reported food poisoning cases (48.9%), with a higher prevalence among females (59%) compared to males (40%). Food poisoning incidents were more prevalent in rural areas (63.4%) than in urban areas (36.6%). Canned products were responsible for 40% of the cases. Main dishes of animal origin, including snails, turkey, fish, chicken, and minced meat, were the most commonly involved food category (88.9%). The majority of patients sought medical attention within 5 hours of contamination (77.1%), and most experienced positive outcomes (92.7%).

Conclusion

This study provides valuable insights into the factors contributing to food poisoning in the Kenitra region. Multiple correspondence analysis revealed that the type of food, place of contamination, and preparation method significantly influenced the contamination rate and treatment outcomes. These findings emphasize the importance of preventive measures and appropriate management strategies to mitigate food poisoning cases.

Keywords

Food poisoning; health problems; multiple correspondence analysis (MCA) ; Kenitra ; Morocco.

INTRODUCTION

When two or more individuals who have consumed the same food get the same symptomatology—usually gastrointestinal—food poisoning is considered communal. This kind of incident needs to be reported in order to conduct investigations, identify the contaminated food, and then put the appropriate preventive and corrective measures in place[1,2].

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In 1959, Morocco experienced one of the health disasters, with 20,000 people affected by debilitating paralysis. This crisis aroused great concern and mobilization, because the cause of this mysterious illness remained unknown for almost a year. Health authorities and researchers have undertaken extensive investigations to identify the source of this devastating disease. Finally, after much effort, the cause was revealed. It turned out that the illness was linked to food poisoning. In-depth analyzes revealed that contaminated oils were the cause of the paralysis. This tragic experience served as a lesson and reinforced the importance of food safety and food surveillance in Morocco[3,4].

Since then, Morocco has taken significant steps to prevent food poisoning and ensure food safety[5]. Strict regulations have been put in place to ensure food control and quality, as well as awareness campaigns to inform the public about good eating practices. The health disaster of 1959 left a lasting imprint on Morocco's collective memory, highlighting the crucial importance of food safety and continued vigilance to prevent food poisoning and protect the health of citizens. According to data from the national epidemiological surveillance and health information system published in the latest Bulletin of Epidemiology and Public Health of the Ministry of Health, it is estimated that between 1,000 and 1,600 cases of food poisoning occur in average annually in the country. In addition, the hospitalization rate linked to these cases varies from 30 to 45%. These figures highlight the high prevalence of food poisoning in Morocco and underline the importance of understanding their epidemiological profile.

The main objectives of this retrospective cohort study were:

- To describe the epidemiological characteristics of mass food poisoning in the Garb-Charalda-Buni-Hassen region from 2012 to 2022.

- Identify the main risk factors associated with these incidents.

- develop recommendations to strengthen foodborne disease prevention and control strategies in the study area;

The hypothesis was that the epidemiological profile would include differences in age, location of contamination, living environment and type of food preparation as major risk factors.

STUDY ENVIRONMENT AND METHOD

This cross-sectional studies was conducted in the city of Kenitra, Morocco, from 2012 to 2022.

The main objective was to describe the epidemiological characteristics of food poisoning in this region.

Organizational context: The study was carried out at the provincial hospital of Kenitra.

The data was collected from the SIAAP register of local health delegations and covered a 10-year period from January 1, 2012 to December 31, 2022.

If collective food poisoning is detected by the attending physician during the research period.

Variables: Variables of interest include sociodemographic characteristics (age, gender), clinical symptoms, time of symptom onset, meal times, and food consumed.

The diagnostic criteria for collective food poisoning were based on standard definitions from regional epidemiological surveillance systems.

Data sources: Data were collected from patient records and the SIAAP registry.

The assessment method was similar for all participants.

Bias: Efforts were made to minimize selection bias by including all cases of collective foodborne illness identified during the study period.

The use of standardized definitions and reliable data sources reduced measurement bias.

Study size: Study size was determined by the 10-year period selected to include all collective food poisoning cases treated at Kenitra Provincial Hospital during this period.

Statistical analysis The descriptive analysis was carried out using SPSS software.

Multivariate analysis, in particular multiple correspondence analysis (MCA), made it possible to explore the associations between the different factors linked to collective food poisoning.

RESULTS

This study analyzed 262 cases of food poisoning treated at the Kenitra hospital center, in Morocco, between June 2012 and December 2022. Table 1 presents Distribution of Foodborne Illnesses by Age, Sex, Environment, and Preparation Method Consultation:

Tableau 1 : Distribution of Foodborne Illnesses by Age, Sex, Environment, and Preparation Method Consultation of the Teaching Hospital in Kenitra, Morocco, between June 2012 and December 2022 (N=262)

Variable	character	Headcount	Percentage (%)
Age	Adolescent	37	14,1
	Adult	88	33,6
	Baby Walker	8	3,1
	Child	128	48,9
	Elderly	1	0,4
Sex	Femelle	157	59,9
	Male	105	40,1
Intoxication Environment	Rural	166	63,4
	Urban	96	36,6
Preparation Method	Preserve	105	40,1
	Cooked	147	56,1
	Raw	10	3,8

The distribution by age group shows that children under the age of 12 are the most affected, representing almost half of the cases (48.9%), followed by adults aged 18 to 64 (33.6%). and adolescents aged 13 to 17 (14.1%). Babies under one year old and people over 65 years old are the least represented groups, with 3.1% and 0.4% of cases respectively.

 two-thirds of cases (63.4%) occurred in rural areas, while 36.6% occurred in urban areas.

women are more affected than men, representing almost 60% of cases (59.9% compared to 40.1% for men). Concerning the location of the poisoning, two thirds of cases (63.4%) occurred in rural areas, compared to 36.6% in urban areas.

Cooked food products are the most commonly affected, representing 56.1% of situations, followed by canned foods (40.1%) and raw foods (3.8%) (Tableau 1).

The locations, evolution of symptoms and incubation period are presented in Table 2. The most frequent places of poisoning or contamination were the home (41.2 cases) and school cafeterias (37.4%).

Table 2: Food Poisoning: Locations, Symptom Evolution, and Incubation Period at the Teaching Hospital Consultation in Kenitra, Morocco, from June 2012 to December 2022 (N=262)

Variable	character	Headcount	Percentage (%)
Place of intoxication or contamination Bare	Bare	1	0,4
	Factory cafeteria	19	7,3
	School cafeteria	98	37,4
	University cafeteria	9	3,4
	Wedding ceremony	8	3,1
	Grocery store	9	3,4
	Home	108	41,2
	Street vendor	4	1,5
	Restaurant	6	2,3
Evolution of the poisoned individuals: POSITIVE PROGRESSIO	Good progress	9	3,4
	Favorable without consequences	10	3,8
	Reassuring	243	92,7
incubation period en H	[0-5[	202	77,1
	[5-10[	25	9,5
	[10-15[	11	4,2
	[15-20[	15	5,7
	≥20	9	3,4

Other places, such as factory cafeterias, grocery stores, universities, wedding halls, restaurants and street vendors.

the majority (92.7%) recorded reassuring symptom changes, but only 3.8% recorded positive symptom changes without consequences.

 This suggests that most cases of food poisoning are treated at this facility.

 the incubation period revealed that the majority of cases (77.1%) presented symptoms within the first 5 hours following ingestion of the contaminated food.

Statistical study : The results of the ACM of the study carried out on patients who suffered food poisoning in the Kenitra region over 10 years. It is important to note that the average value of Cronbach's alpha of 0.849 indicates good overall internal consistency of all the

variables included in the MCA.dimension 1 has the largest explained variance (60.733%) and a relatively high discrimination measure mean (fIgure 1,2).
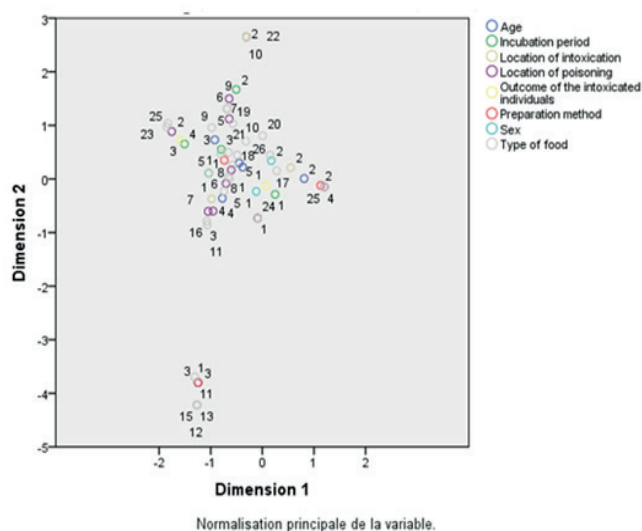

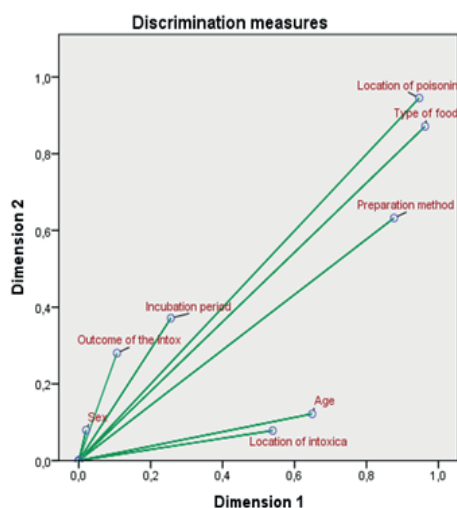**Figure 1: Main normalization of the ACM variable**

Figure 2 : Discrimination measures

DISCUSSION

Age : The data provided in the figure indicates that children (between 5 and 15 years old) are the age group most affected by food poisoning, accounting for almost half of the reported cases, or 48.9% of the total (Table 1). This suggests that children are particularly vulnerable to foodborne infections. It is important to note that children may be more likely to be exposed to contaminated foods

due to their tendency to explore their environment, put objects in their mouths, and have less sanitary eating habits. Additionally, their developing immune systems may be less effective at fighting pathogens. Adults also account for a significant portion of food poisoning cases, with 33.6% of the total.

Adults can be exposed to contaminated foods due to poor hygiene practices, improper food handling, or consumption of undercooked or contaminated foods. Adolescents have lower rates of food poisoning, which may be explained by greater autonomy in selecting and preparing their food, as well as a better understanding of food hygiene practices.

Elderly people have the lowest rate of food poisoning, with only one case reported in the figure. This may be due to several factors, such as greater caution in food selection and preparation, greater knowledge of food hygiene practices, or increased awareness of the risks of food poisoning.

Our study, which is in agreement with that of Bouhi[4], revealed that children aged 5 to 10 cannot master hygiene rules well in this age group, which can lead to contamination of their food. According to the study[5] conducted in the Gharb Chrarda Bni Hssen region in Morocco, adults are the most affected by food poisoning.

Sex : The majority of food poisoning cases studied are women (59.9% of cases) and men (40.1%) (Table 1). This finding demonstrates that gender is not linked to foodborne infection rates. The risk in both sexes is almost identical, according to a similar study conducted by Bouhi[6].

Living environment : These data indicate that among the food poisoning cases studied, the majority of cases occurred in a rural setting, accounting for 63.4% of cases, while cases occurring in an urban setting accounted for 36.6% of cases(Table 1). In rural areas, residents may be more reliant on local food production, particularly domestic agriculture and livestock. This can lead to increased exposure to food poisoning risks linked to lower agricultural health standards. Our study is in agreement with that of Chankor in 2001[7]. However, according to Guilavogui's study, 84% of illnesses originate in urban areas[8].

Method of preparation : 40% of food poisonings were caused by canned products (Table 1). Canned foods can become contaminated during the canning process or due to improper handling or poor sealing of

containers. Several studies, such as Zhang[9] and Pan[10], have demonstrated the negative impact of canned foods on health.

56.1% of cases are cooked preparations. However, it is important to note that even cooking does not always guarantee complete elimination of pathogens, and errors in handling or storage can still lead to subsequent contamination. Our study is in agreement with Belomaria[7], which demonstrates that 70% of food poisoning reported in the Gharb Chrarda Bni Hssen region took place in a family home between 2001 and 2006.

Place of contamination : The household represents the largest proportion of cases, with 41.2% (Table 2). This suggests that many cases of food poisoning occurred among people in their own homes, perhaps due to food preparation or handling at home.

The school canteen also represents a significant proportion of cases, with 37.4%. This may be due to hygiene or food handling problems in school canteens.

Other places such as factory canteens, university canteens, wedding ceremonies, grocery stores, street vendors and restaurants account for smaller proportions of food poisoning or contamination cases

Foods incriminated: The most common category is that of main dishes of animal origin (Snails Turkey, Fish, Preserved Fish, Chicken, Meat, Minced Meat) representing 88.9% of cases (Table 2).

This suggests that the majority of food poisoning cases are linked to the consumption of meat, fish, poultry or other animal products. These results are consistent with the findings of previous studies carried out by Anses in 2011[11,12] and Zemouri in 2017[13], which also identified main dishes of animal origin as the main culprits of food poisoning.

Incubation period : The most frequent category is that of cases where the arrival at the hospital occurs less than 5 hours after contamination, representing 77.1% of cases (Table 2). This suggests that the majority of poisoned people go to the hospital relatively quickly after being contaminated.

Evolution of contamination : The most frequent category is that of reassuring cases, representing 92.7% of cases (Table 2). This suggests that the vast majority of poisoned people had a reassuring outcome, meaning that they recovered without significant after-

effects. Cases with good progress represent 3.4% of cases, indicating that these people have experienced a satisfactory improvement in their state of health.

Statistical study : The variables that contribute the most to the discrimination of individuals in this dimension are «Type of food» (0.963), the method of preparation (0.877) and the place of intoxication (0.947). Analysis of the attached point diagram makes it possible to classify all the modalities into two distinct groups (Figure 1). This study supports Hascoët[14]. The results of the discrimination measure show that the type of food, the place of poisoning and the method of preparation are all crucial in the context of food poisoning (Figure 2).

It seems that these parameters play an important role in the contamination rate as well as in the evolution of treatments in patients.

Identifying these factors linked to food poisoning in the Kenitra region can provide crucial information to better understand this condition. It becomes possible to implement more targeted prevention, control and treatment measures in the region by understanding the specific patient characteristics related to food poisoning.

CONCLUSION

By examining the characteristics of poisoned individuals, contributing factors and associated health outcomes, our study aimed to deepen our understanding of collective food poisoning in the Kenitra region. We hope that the results of this study will help prevent and manage food poisoning incidents more effectively and protect public health in the region[15].

What is known about this topic

- The widespread health issues known as food intoxications are brought on by consuming tainted food. They are caused by harmful agents like bacteria, viruses, and parasites, and in order to prevent them from appearing, special attention must be paid to food hygiene.

What this study adds

- The Kenitra region's foodborne illness features and contributing variables are better understood thanks to this study, which will help guide management and preventative actions.

Competing interests

The authors declare no competing interests.

Authors' contributions

- Asmae Elkhal is responsible for the creation and implementation of the team, data collection, analysis, writing the article and revising the text.

- Benaisa Attrassi: responsible for supervising and revising the texts.

- Samira Jayche: collect information.

- Abdelkader Chibania and Hafsa El Hamidi : gathering information.

- Sadek Sanae and Badreddine Dahou : study of biostatistical data and production of the text.

Nabila Aujjar: research methodology.

Tables and figure

Tableau 1 : Distribution of Foodborne Illnesses by Age, Sex, Environment, and Preparation Method.

Tableau 2: Intoxication: Lieux, évolution des symptômes et période d'incubation.

Figure 1: Main normalization of the ACM variable.

Figure 2 : Discrimination measures.

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