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Assessment of Knowledge, Attitudes and Practices on the Risks of Food Poisoning in Collective Restaurants in the Kloto 1 Municipality, Togo

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Abstract

Collective food toxiinfections (CFTI) are frequent accidents, formidable by their health and economic consequences. They usually result from the consumption of food contaminated with microorganisms or chemical toxins. The objective of our study is to evaluate the knowledge, attitudes and practices of food product handlers in Kloto 1 municipality in order to guarantee food safety. To do this, we carried out a survey using google form whose questions were based on knowledge of foodborne diseases, good hygiene practices, good manufacturing practices, cross-contamination, wearing jewelry during handling, waste management... As a result of the study, It shows that during the years 2018, 2019 and 2020, the frequencies of toxiinfections recorded at the PHC of Kpalimé are respectively 33.09%, 41.84%, and 25.06%. To access risk factor about this high case of food poisoning in this area, 197 food handlers (FH) were interviewed and of these, 54.4% were women, 51.3% are between 15 and 25 years old, 67.2% have secondary education, and 68.7% have not received training on food safety. In terms of the level of knowledge, attitudes and practices, 10.7% of FH have insufficient knowledge about food safety, 98.0% have negative attitudes and 100.0% have insufficient food safety practices. Also, it shown that there is a strong positive correlation between knowledge and attitudes ($r_s = 0.267$; $p = 0.000$), between knowledge and practices ($r_s = 0.182$; $p = 0.011$), between attitudes and practices ($r_s = 0.253$; $p = 0.000$), and between knowledge about foodborne illness and practice ($r_s = 0.189$; $p = 0.008$). In short, the majority of FH have insufficient knowledge, practice and negative attitudes to avoid cases of CFTI because of the lack of training in food safety.

1. Introduction

The socio-economic situation and rapid urbanization in developing countries, particularly Togo, have facilitated the emergence of new consumption patterns. With the exception of the home, collective catering services are the busiest places of consumption (Abdi et al., 2020). The formal sector, characterized by a much more modern catering industry in hotels, restaurants and canteens where people of a high standard of living, living and working in the cities, often feed themselves. In the informal sector, food consumed is prepared and distributed practically on the street-by-street vendors and peddlers in streets and public places (Alemayehu et al., 2021). Regardless of the sector, food can be contaminated with microorganisms if manufacturing or production hygiene conditions are not met (Amegah et al., 2020). Several factors such as raw materials, environment, humans and animals,

equipment and methods can contribute to food contamination (Disanto et al., 2020). Thus, the consumption of contaminated food becomes the cause of infections, in particular digestive infections qualified as collective food toxiinfections (TIAC) such as gastroenteritis and diarrhea (Moghnia et al., 2021). Generally, TIAC are caused by *Salmonella sp*, *Escherichia coli*, *Staphylococcus sp*, *Clostridium sp*, *Campylobacter sp*, *Listeria sp*, and *Vibrio cholerae* (Hamed and Mohammed, 2020; Hartard, 2017). According to WHO (2015), Africa is the most affected continent with more than 91 million cases of food poisoning each year, including 137000 deaths. The lack of a mechanism for recording TIA cases in Africa is said to explain the lack of data on these conditions. But nevertheless, some studies have revealed cases of food toxiinfections in many countries such as Ethiopia (Azanaw et al., 2021; Abdi et al., 2020; Alemayehu et al., 2021; Amenu et al., 2020; Lema et al., 2020), Sénégal (Chengat Prakashbabu et al., 2020; Dewey-Mattia et al.,

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2018), Égypte (Hamed and Mohammed, 2020) and Ghana (Amegah et al., 2020; Ayim-Akonor et al., 2020). In Togo, a few cases of TIAs recorded in the Yearbooks of Health Statistics in 2003 and 2005 amounted to 393 in 2002 and 49 with 6 deaths in 2003. In 2005, there were 139 reported cases with 32 deaths. Also, confirmed cases of TIAC were reported during the demonstrations that marked the 40th anniversary of the BOAD (West African Development Bank) in Lomé (Soncy, 2015). Similarly, in a school in Lomé (in April 2016), six students were hospitalized for stomach aches and vomiting, after consuming rice confined to their canteen (Soncy, 2015). What about foods sold in collectives' restaurants in Klotto 1 municipality, fourth city in Togo after Lomé, Sokodé and Kara? The aim of this study was to evaluate the risks of toxi-infections incurred by consumers of all ages and all social categories (residents and tourists) frequenting formal and informal restaurants in Klotto 1 municipality, especially by evaluating the knowledge, attitudes and practices of catering staff on food toxi-infections.

2. Material and methods

2.1 Study design and setting

This study was conducted in Klotto 1 municipality between January 2021 and December 2020.

Klotto 1 municipality, located at 120 km north-west of Lomé and 20 km from the Ghanaian border. It's an area of various discoveries through the rich natural region of the plateau. The surrounding landscapes are considered to be the most beautiful in the whole country and the climate is mild, even refreshing. The prefecture of Klotto is very visited by Togolese and foreigners, often because of its tourist attractions, including the Pic of Agou and the Kpimé waterfall. We find in the Municipality of Klotto 1, artists and craftsmen who exhibit their art everywhere. It also include the PHC (Prefectural Hospital Center), numerous private and public administrative institutions, the prefecture's large shopping center and numerous restaurants (hotel or not) serving various dishes (local or foreign) to the population.

2.2 Authorization

This study was authorized by the mayor of the municipality of Klotto 1 into Plateaux Region of Togo under the number No. 790/2020/MATDDT/RP/PK/CKL1-SG.

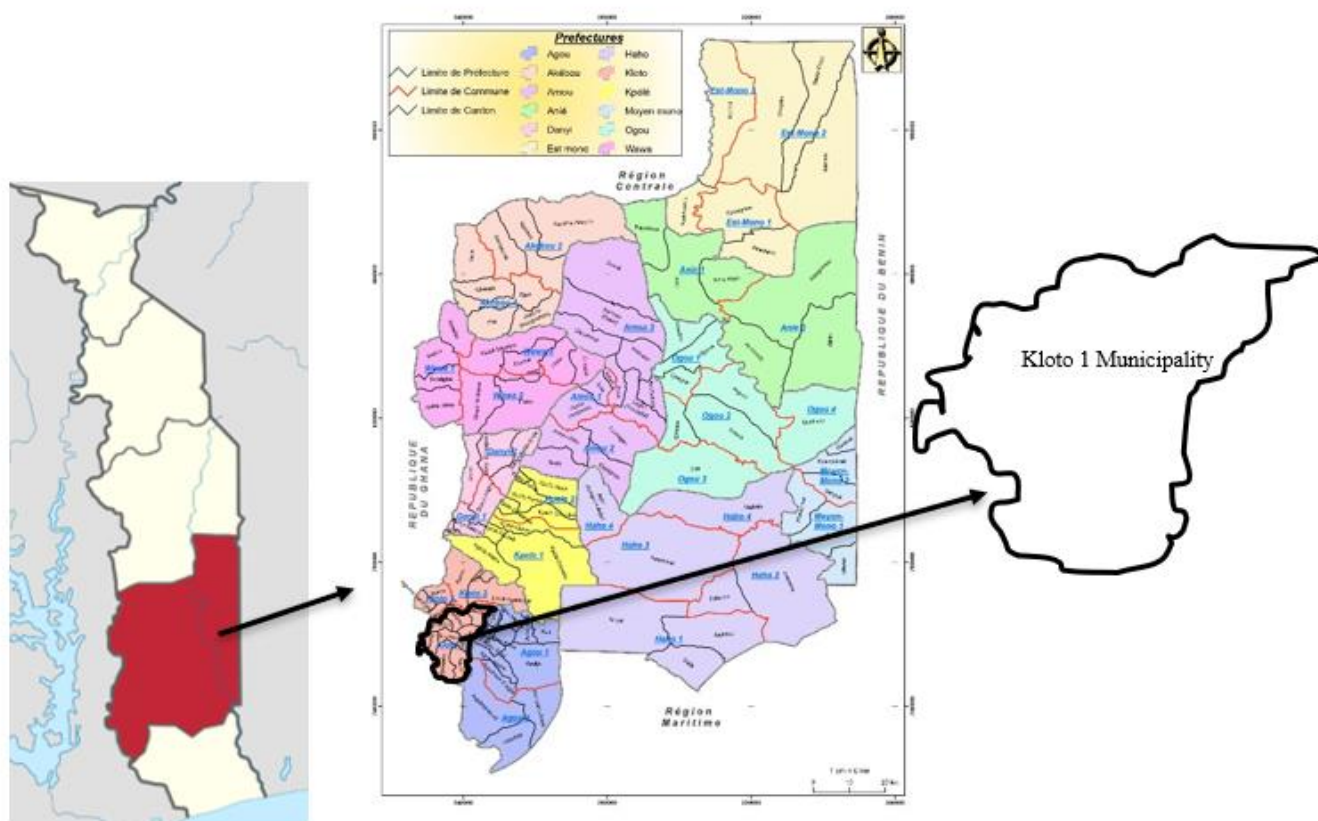


Figure 1 Area of the study : Klotto 1 municipality of the Plateau Region in Togo

2.3 Data collection sheet of cases of poisoning at the Prefectural Hospital Center (PHC) of Kpalimé

The data were collected using a data entry sheet and the register of food poisoning cases managed at the Kpalimé PHC.

This involved collecting data on sex, age of patients, date of entry and exit to PHC, symptoms, type of analysis and specimen collection, physician confirmation and conclusion.

This is a retrospective study that consisted of recording data on patients admitted at PHC of Kpalimé due to food poisoning

because they presented symptoms such as gastroenteritis and diarrhea after obtaining administration authorization.

With regard to the suspected food, the origin of the food, the agent responsible or suspected of food poisoning were not obtained because they had not been entered in the register.

2.4 Determination of knowledge, attitude, and hygiene practices on food safety

The surveys were carried out among collective catering actors operating in Klotto 1 municipality area commonly frequented by employees, shopkeepers, tourists, pupils and students.

The questionnaire was administered to food handlers present at food premises through an interview. Food handlers (FH) were categorized in relation to their socio-professional situation (level of education, age, marital status, duration in the activity, position, graduate). Thus, in addition to socio-professional information on manipulators and their level of knowledge on hygiene and food-related diseases; the survey also assessed attitudes related to the risks of contamination. The questionnaire took into account the management of solid waste as liquids at the point of sale, the washing and disinfection of hands, the maintenance of nails and work equipment etc...

A pre-survey was conducted and identified 80 restaurants in Klotto 1 municipality. The choice of restaurants to visit was made on condition of being very busy and having at least 5 employees in the food restaurant.

After the choice of restaurants, we had carried out a pre-test with 10 food handlers in selected restaurants and then validated. Before starting, the respondents were informed of the purpose of the study, and also reassured about the anonymity and confidentiality of the survey results.

2.5 Statistical analysis

The capture and statistical analysis of data on food poisoning cases registered at PHC of Kpalimé were carried out using the Excel 2019 spreadsheet and IBM Statistical Package for Social Sciences (SPSS Inc., Chicago, USA; <https://www.spss.com>) version 26 software. Categorical variables were expressed as frequency and percentage. The disparity between categorical variable groups was verified using the Fisher exact or chi-square test where appropriate and multicomponent analysis were used to assess correlation.

With regard to the assessment of knowledge, attitudes and practice, the respondents were given scores following the interview according to their response to the questions, attitude and practices. A good answer is worth two points and a bad one or I don't know is worth zero points. Thus, respondents were classified as having "sufficient" knowledge or practices if their total score was greater than or equal to 70% of the maximum possible score. Attitudes were classified as "negative" if the total score was less than 70% of the maximum possible score and "positive" if they were $\geq 70\%$ (Table 1). This rating system has been adapted from a similar study (Kunadu et al., 2016, Sani and Siow 2014).

Survey data from food handlers were entered directly onto an Android Smart phone and saved on google form used to collect the data. The statistical analyses were performed with SPSS v26 software. Descriptive statistics were used for quantitative variables. The link between knowledge, attitudes and practices was assessed through the calculation of the correlation coefficient (rs) and the P value with a confidence interval of 95% and 5% error.

3. Results

Cases of food poisoning at Prefectoral Hospital Center of Kpalimé:

Socio-health data

Out of 423 cases of food poisoning recorded at the PHC of Kpalimé from January 2018 to December 2020 (table1), women

(59.34%) are the most represented with a sex ratio (F/M) of 1.46. The patients of 61 years and over (22.93%) are the most represented, followed by 16–20-year-olds (17.97%).

Frequency of cases of food poisoning recorded at the Prefectoral Hospital Center of Kpalimé

Table 2 shows the number of cases of food poisoning recorded at PHC of Kpalimé from 2018 to 2020. The highest number of cases of food poisoning (177 cases or 41.84%) was recorded in 2019 and the lowest number (106 cases or 25.06%) was registered in 2020.

Diseases related to food poisoning and their diagnostic flash

Out of 423 patients admitted at PHC of Kpalimé from 2018 to 2020, 70.2% of them presented digestive infections as showed results reported in table 3. Zero-point nine percent (0.9%) were dead. The case cured are 87.7% of cases with 0.9% of deaths. Stool samples are 70.2% samples use for microbiological diagnostic and *Escherichia coli* is in 55.3% of case the causative agent of infection.

Knowledge, attitude, and hygiene practices on food safety: Socio-professional profile of food handlers in collective restaurants

Table 4 shows the socio-professional profile of the respondents. From this table, it appears that women are the most represented (54.4%) with a sex ratio (Female/Male) of 1.2. The majority age group is 15 to 25 years old (51.3%). The most represented level of education among the respondents is the secondary level (67.2%). Of the 195 respondents, 48.2% are manufacturers and 68.7% have not received training on food safety. The majority of FH have 1 to 5 years as experience in the field (84.6%), 72.8% worked in 3 to 4 processing units and 49.7% spent 3 to 4 years in a food processing unit. Nevertheless, despite the experience and the number of units experienced, 47.7% do not have a health record.

Knowledge, attitudes and practice on food quality and safety

According to the rating scale, Table 5, 6, 7, 8 and Fig. 2a, b, c and d, present the summary statistical analysis concerning the knowledge, attitudes and practices of FH staff in the Klotto 1 municipality. The average knowledge score is 73.3 ± 6.4 with a minimum and maximum score of 32 and 84 respectively. Only 21 (10.7%) FH had insufficient knowledge about food security (Table 6). The average score for attitudes was 15.1 ± 2.2 with 10 and 20 points as the respective minimum and maximum score and 193 (98.0%) had negative attitudes (Table 7). The average practice score was 22.1 ± 3.0 with a minimum score of 14 and a maximum of 28 points with 100.0% of FH who had insufficient food safety practices (Table 8). Figure 2 shows the FH during the transformation. It shown in Fig2a, a dish protected against contaminants, on Fig2b the FH not wearing a glove but handle the ready-to-eat dishes. Fig2c, we observe an FH handling food without shallots or gloves with the presence of beards that can be a source of food contamination. Fig2d, shows a team of FH in culinary preparation respecting the conditions of good hygiene and manufacturing practice.

Table 1 General presentation of survey results

	LABELS	GENDER		TOTAL (%)
		FEMALE (%)	MALE (%)	
FOOD TOXI- INFECTION SYMPTOMS	DIARRHEA	67 (26.7)	63 (36.6)	130 (30.7)
	ABDOMINAL PAIN	75 (29.9)	47 (27.3)	122 (28.8)
	FEVER	6 (2.4)	4 (2.3)	10 (2.4)
	NAUSEA	31 (12.4)	14 (8.1)	45 (10.6)
	VOMIT	72 (21.9)	44 (25.6)	116 (27.4)
	TOTAL	251 (59.34)	172 (40.66)	423 (100)
AGE RANGE	≤15	2 (0.8)	0 (2.3)	2 (0.5)
	16 - 20	46 (18.3)	30 (17.4)	76 (17.97)
	21 - 25	0 (0.0)	0 (0.0)	0 (0.0)
	26 - 30	20 (8.0)	24 (14.0)	44 (10.4)
	31 - 35	26 (10.4)	19 (11.0)	45 (10.6)
	36 - 40	35 (13.9)	13 (7.6)	48 (11.35)
	41 - 45	18 (7.2)	8 (4.7)	26 (6.1)
	46 - 50	18 (7.2)	12 (7.0)	30 (7.1)
	51 - 55	14 (5.6)	16 (9.3)	30 (7.1)
	56 - 60	12 (4.8)	13 (7.6)	25 (5.9)
	> 60	60 (23.9)	37 (21.5)	97 (22.93)
	Total	251(59.34)	172(40.66)	423(100)

Table 2 Frequency of food poisoning cases from 2018 to 2020.

years	Number of cases, N = 423 (100,00%)	Number of hospitalize, N = 48 (11.35%)	Number of deaths, N = 4 (0.95%)
2018	140 (33.09%)	6 (4,29%)	2 (1,43%)
2019	177 (41,84%)	36 (20,34%)	2 (1,13%)
2020	106 (25.06%)	6 (5,66%)	0 (0,00%)

Table 3 Medical diagnostic of the toxiinfection

LABEL		Number (%)
CLINICAL DIAGNOSTIC	Gastroenteritis	126 (29.8)
	Digestive infection	297 (70.2)
LAB DIAGNOSTIC	Analysis of gastric discharges	126 (29.8)
	Stool analysis	297 (70.2)
MICROBIOLOGICAL ANALYZIS RESULT	<i>Aeromonas</i>	46 (10.9)
	<i>Campylobacter sp.</i>	6 (1.4)
	<i>Cyclospora cayetanensis</i>	8 (1.9)
	<i>Entamoeba</i>	3 (0.7)
	<i>Escherichia coli</i>	234 (55.3)
	<i>Giardia intestinalis</i> Kyst	38 (9.0)
	<i>Ankylostoma duodenale</i> egg	1 (0.2)
	Egg of <i>Necator americanus</i>	1 (0.2)
	<i>Salmonella sp</i>	18 (4.3)
	<i>Shigella sp</i>	23 (5.4)
	<i>Staphylococcus aureus</i>	45 (10.6)
Conclusion	Death	4 (0.9)
	Healed	371 (87.7)
	Hospitalized	48 (11.3)

Table 4 Socio-professional profile of respondents in the catering services in the Kloti 1 municipality

ITEMS		NUMBER OF EMPLOYEES (N = 197)	PERCENTAGE (%)
SEX	FEMININE	108	54.8
	MASCULINE	89	45.2
AGE RANGE (YEARS)	15-25	100	50.8
	26-35	81	41.1
	36-45	15	7.6
	56 AND OVER	1	0.5
LEVEL OF EDUCATION	PRIMARY	52	26.4
	SECONDARY	131	66.5
	UPPER	14	7.1
ROLE INTO THE RESTAURENT	MANUFACTURER'S HELP	49	24.9
	CHIEF	33	16.8
	MAKER	94	47.7
	DISHWASHER	21	10.7
FOOD SAFETY TRAINING(S) RECEIVED	NO	136	69.0
	YES	61	31.0
POSSESSION OF A HEALTH RECORD	NO	95	48.2
	YES	102	51.7
YEARS EXPERIENCES IN THE FIELD OF CULINARY TRANSFORMATION	1 - 5 YEARS	167	84.8
	6 - 10 YEARS	28	14.2
	11 - 15 YEARS	2	1.0
NUMBER OF UNITS EXPERIENCED AS AN EMPLOYEE	1-2	48	24.4
	3-4	142	72.1
	5-6	4	2.0
	7-8	3	1.5
MAXIMUM TIME SPENT IN A MANUFACTURING UNIT AS AN EMPLOYEE (YEARS)	1-2	11	5.6
	3-4	150	76.1
	5-6	28	14.2
	7-8	6	3.0
	9-10	2	1.0

N or n: number

Table 5 Statistical descriptive analysis

	N	MINIMUM	MAXIMUM	AVERAGE	STANDARD DEVIATION
KNOWLEDGE	197	32	84	73.3	6.4
ATTITUDES	197	10	20	15.1	2.2
PRACTICES	197	14	28	22.1	3.0

N = workforce

Table 6 Level of knowledge on food safety

LEVEL OF KNOWLEDGE	FI, N (%)	HP, N (%)	GHP, N (%)	GMP, N (%)	CC, N (%)	TOTAL, N (%)
SUFFICIENT	91(46.2)	180 (91.4)	190 (96.4)	40 (20.3)	194 (98.5)	176 (89.3)
INSUFFICIENT	106 (53.8)	17 (8.6)	7 (3.6)	157 (79.7)	3 (1.5)	21 (10.7)

N = workforce, FI: foodborne illness, HP: personal hygiene, GHP: good hygiene practices, GMP: good manufacturing practices, CC: cross-contamination.

Table 7 Attitudes of Food Handlers

	NUMBER OF FOODHANDLERS (%)
LEVEL OF POSITIVE ATTITUDE	4 (2,0)
LEVEL OF NEGATIVE ATTITUDE	193 (98,0)

Table 8 Practices of food handlers

	NUMBER OF FOODHANDLERS (%)
LEVEL OF SUFFICIENT PRACTICE	0 (0,0)
LEVEL OF INSUFFICIENT PRACTICE	197 (100.0)

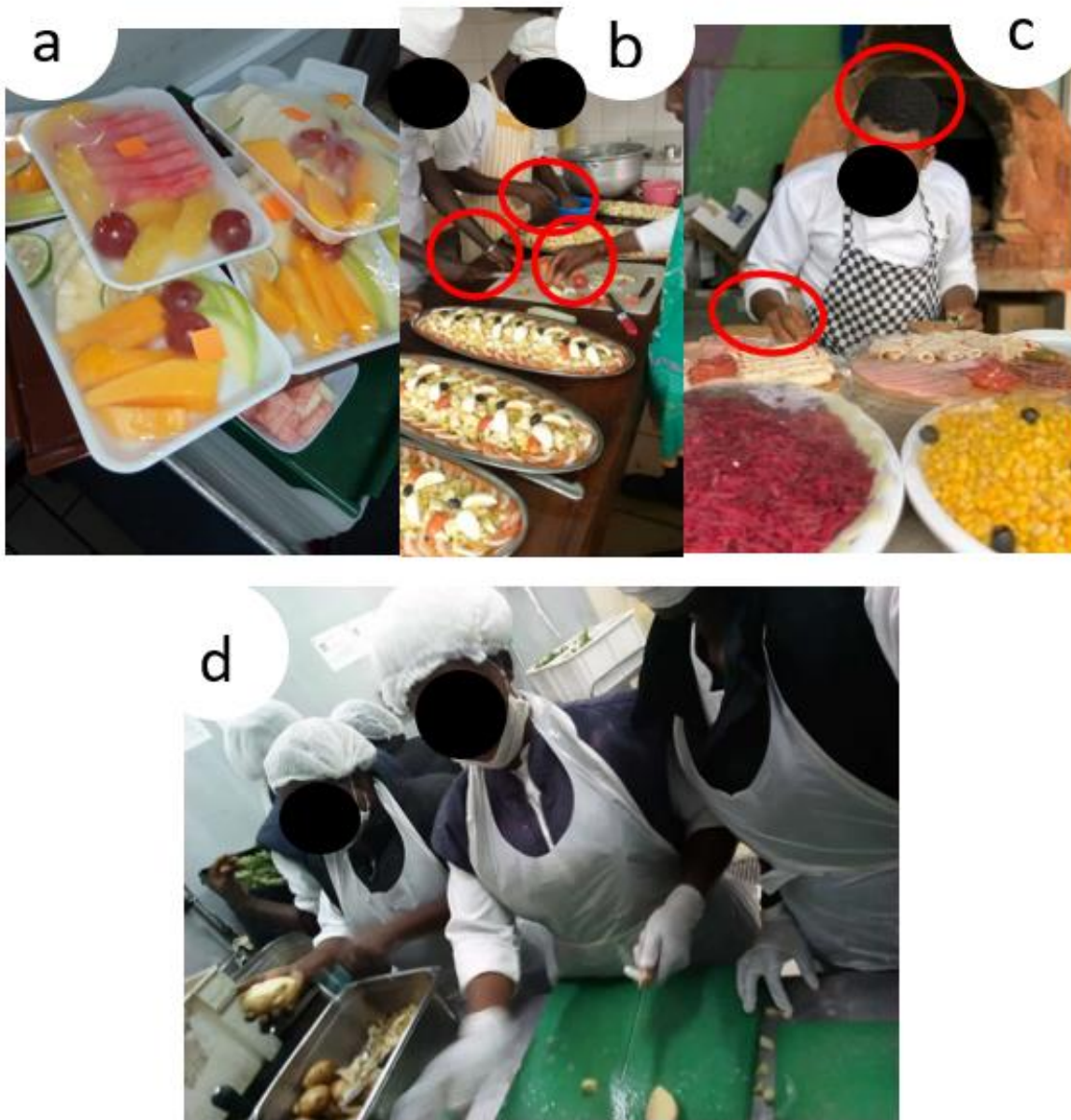


Figure 2 Food handlers in food manufacturing

a: packaged food and plasticizing to avoid contamination, b: catering staff not wearing gloves and jewellery in hand, c: shallot-free catering staff for hair protection, presence of beards and without glove wearing, d: manufacturing team in good attitudes and practices

Table 9 Correlation between the knowledge, attitude and practice of food handlers

		Number of units experienced as an employee	Maximum time spent in a manufacturing unit as an employee? (Year)	Knowledge of FI	Knowledge about personal hygiene	Knowledge of good hygiene practices	Knowledge of good manufacturing practices	Knowledge of cross-contamination	knowledge	Attitudes	Practices
Number of units experienced as an employee	rs	1.000	0.015	0.243**	0.048	0.216**	-0.095	0.006	0.222**	0.096	0.148*
	p	.	0.839	0.001	0.499	0.002	0.184	0.938	0.002	0.181	0.037
Maximum time spent in a manufacturing unit as an employee (Year)	rs	0.015	1.000	0.194**	0.103	0.172*	0.038	0.108	0.248**	0.032	-0.030
	p	0.839	.	0.006	0.149	0.016	0.596	0.129	0.000	0.652	0.678
Knowledge of FI	rs	0.243**	0.194**	1.000	-0.074	0.454**	-0.032	-0.116	0.820**	0.329**	0.189**
	p	0.001	0.006	.	0.300	0.000	0.660	0.104	0.000	0.000	0.008
Knowledge about personal hygiene	rs	0.048	0.103	-0.074	1.000	0.131	0.046	-0.052	0.178*	0.074	0.115
	p	0.499	0.149	0.300	.	0.067	0.524	0.470	0.012	0.302	0.109
Knowledge of good hygiene practices	rs	0.216**	0.172*	0.454**	0.131	1.000	0.183*	-0.156*	0.676**	0.195**	0.134
	p	0.002	0.016	0.000	0.067	.	0.010	0.028	0.000	0.006	0.060
Knowledge of good manufacturing practices	rs	-0.095	0.038	-0.032	0.046	0.183*	1.000	-0.007	0.355**	-0.102	-0.037
	p	0.184	0.596	0.660	0.524	0.010	.	0.922	0.000	0.156	0.606
Knowledge of cross-contamination	rs	0.006	0.108	-0.116	-0.052	-0.156*	-0.007	1.000	0.028	-0.096	-0.105
	p	0.938	0.129	0.104	0.470	0.028	0.922	.	0.700	0.180	0.143
knowledge	rs	0.222**	0.248**	0.820**	0.178*	0.676**	0.355**	0.028	1.000	0.267**	0.182*
	p	0.002	0.000	0.000	0.012	0.000	0.000	0.700	.	0.000	0.011
Attitudes	rs	0.096	0.032	0.329**	0.074	0.195**	-0.102	-0.096	0.267**	1.000	0.253**
	p	0.181	0.652	0.000	0.302	0.006	0.156	0.180	0.000	.	0.000
Practices	rs	0.148*	-0.030	0.189**	0.115	0.134	-0.037	-0.105	0.182*	0.253**	1.000
	p	0.037	0.678	0.008	0.109	0.060	0.606	0.143	0.011	0.000	.

** . The correlation is significant at $p = 0.01$. * . The correlation is significant at $p = 0.05$. rs: Pearson correlation, FI : Foodborne illness.

Correlation between knowledge, attitudes and practice on food safety

Table 9, shows the existing correlations between knowledge of FH and their attitudes and practice in the handling of food products. There is a strong positive correlation between knowledge and attitudes of 0.267 with $p = 0.000$, a strong positive correlation between knowledge and practices of 0.182 with $p = 0.011$ and a strong positive correlation ($rs = 0.253$; $p = 0.000$) between attitudes and practices.

Other strong positive correlations were observed between the maximum time spent in a manufacturing unit as FH and knowledge of Food Security ($rs = 0.248$; $p = 0.000$), Knowledge of foodborne illness ($rs = 0.194$; $p = 0.006$), and Knowledge of good hygiene practices ($rs = 0.172$; $p = 0.016$). Other correlation observed are between knowledge about foodborne illness and attitudes ($rs = 0.329$; $p = 0.000$) and practical ($rs = 0.189$; $p = 0.000$), knowledge of good hygiene practices and attitudes (rs

$= 0.195$; $p = 0.006$). There was also a strong correlation between the number of units experimented with and knowledge ($rs = 0.222$; $p = 0.002$) or attitude ($rs = 0.148$; $p = 0.037$).

4. Discussions

The present study shows that during the years 2018, 2019 and 2020, the frequencies of toxiifections recorded at the PHC of Kpalimé are respectively 33.09%, 41.84%, and 25.06%. These recorded cases would probably be serious cases that the city's Social Medical Centers (SMC) and self-medication practices would not be able to diagnose and then treat. This means that the population of the city of Kpalimé is not spared from foodborne diseases like other African cities (Abdi et al., 2020; Romha and Girmay, 2020; Wainaina et al., 2020; Barro et al., 2003; Chauliac et al., 1998). In our study, we observed that regardless of gender, people over 60 years of age are the most

recorded cases of food toxoinfection at PHC of Kpalimé. This high number of cases of the elderly is due to the weakness of their immune system and their physiological state as demonstrated by the epidemiological work carried out by **Scallan et al. (2011)**, **European Food Safety Authority (2015)** and **WHO (2015)**. These authors felt that these people often have altered defenses against infectious processes. Vomiting and diarrhea are the most common symptoms of patients admitted at PHC of Kpalimé. These are the signs whose persistence and high frequency are of greater concern to the population to the point of encouraging them to come and seek consultation. In addition, the high number of digestive infections is linked to a strong infectious power, a great capacity for multiplication and toxin production of bacteria that constitute, according to **Lango-yaya (2020)**, the microorganisms most responsible for toxoinfection, unlike other germs such as parasites (**Marteau et al., 2001**). Whatever the disease diagnosed, the low level of deaths recorded at CHP Kpalimé confirms the results of other studies on food toxoinfections carried out in the United States (**Scallan et al., 2011**) and in Africa (**WHO, 2015**) where the cured are often much more numerous than the deaths because they are mild infections but in the long term can lead to serious complications or even death. The larger number of women listed among the FH (54.82%) would be related to the fact that there are many more of them in trade activities. To do this, they would be more important daily in the commercial area, included in commune 1 of the city, than men to prepare and/or eat in restaurants. In terms of the age of the FH, it also appears that women aged 15 to 25 are the most active in the sector. This importance of women in the sector has also been demonstrated by the work of **Tuglo et al. (2020)** in Africa. According to the Ishikawa cause and effect diagram applied to the contamination of food by pathogenic microorganisms (**Hatard, 2017**) and the studies of **Dervin (2001)**, labour is the parameter that conditions the other "M" and would therefore be the main cause of the occurrence of these cases. The knowledge, attitude and practices of the FH will condition the prevalence of food toxoinfections in the city. Knowing a disease requires the control of its cause, its clinical manifestations and measures to combat it. Unfortunately, the level of knowledge of the diseases of most FH (46.2%) is insufficient. Therefore, during the food manufacturing process, the risks of contamination incurred could not be fully understood especially since many of these FH also have insufficient levels of knowledge in terms of good manufacturing practices (79.7%).

Poor hygiene and sanitation practices are one of the main routes of transmission of food-borne diseases (**Alemayehu et al., 2021**; **Hashanuzzaman et al., 2020**). To reduce/prevent the burden of foodborne illness, special attention is expected from the agencies concerned on improving food hygiene and sanitation practices. For this reason, this study provides an understanding of the state of food hygiene practices among food handlers working as part of the study. The study shows that only 46.2% and 20.3% respectively have sufficient knowledge about foodborne illness and good manufacturing practices. Levels of deficiency can be explained by the lack of food safety training (68.7%) although the fact that more than 70.0% have a primary education level. Similar studies show that the level of education of FH could contribute to the mastery of good hygiene practices, however the results of our study are superior to the studies conducted in Ghana (38.1%) by (**Abdi et al., 2020**)

However, it is noted that more than 90% of FH have sufficient knowledge about staff hygiene, good hygiene practices and cross-contamination. This can be explained by the level of education of FH, the time spent in a manufacturing unit and the number of units experimented. In our study the level of practice and attitude is superior to other similar studies (**da Vitória et al., 2021**; **Li et al., 2020**; **Nkhebenyane and Lues, 2020**)

In order to know the different parameters influencing the knowledge, attitudes and practice of FH in food security, the study of correlations revealed a strong positive correlation between knowledge and attitudes ($r_s = 0.267$, $P=0.000$), between knowledge and practices ($r_s = 0.182$, $p = 0.011$) and between attitudes and practices ($r_s = 0.253$, $p = 0.000$). This means that the parameters sought with a strong positive correlation evolve in the same direction, so the mastery of knowledge positively influences the attitudes and practice of the FH. Then, the sufficient Knowledge and the insufficient Pratique or negative Attitude of FH observed in this study may be due to the fact that FH has not had food safety training and/or have sufficient knowledge on food safety that neglects the implementation of attitudes and practices as time passes or because of the lack of quality manager and food quality management in the restaurant (**Azanaw et al., 2021**; **Disanto et al., 2020**).

In this study, the socio-professional profile revealed that more than half food handlers (FH) are women (54.4%), have 15- and 25-year-old (51.3%), and having a secondary education (67.2%). No correlation was observed between the level of education and the knowledge of FH food safety, practice and attitudes. This means that the level of study does not guarantee mastery of good hygiene and manufacturing practices or knowledge about food safety (**Amegah et al., 2020**; **Ayim-Akonor et al., 2020**).

5. Conclusion

The majority (68.7%) of food handlers have not received training in food safety. Of the 197 respondents, 89.3% of FH have sufficient knowledge about food safety, 98.0% have negative attitudes and 100% have insufficient food safety practices. There is a strong positive correlation between knowledge and attitudes ($p = 0.000$), between knowledge and practices ($p = 0.000$). This testifies to the importance of the training of the FH of the Kloti 1 municipality in food safety in HACCP, microbiological and physicochemical quality controls of the dishes cooked in the restaurants in order to guarantee and monitor episodes of food poisoning.

Conflict of Interest

The authors declare no conflict of interest.

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