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Research Article

Assessing Producers' Knowledge in Good Manufacturing Practices during the Production of a Traditionally Fermented Food (*Ga Kenkey*) in the Ho Municipality, Ghana

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Good manufacturing practice (GMP) is the primary sanitary and processing requirement necessary to ensure the production of safe foods. It ensures that the production facilities and processes have the necessary conditions to prevent potential hazards from contaminating foods. However, little is known about its application in the production of a traditionally fermented and well-patronized food like the *Ga kenkey*. This study was therefore designed to evaluate the knowledge and practices of *Ga kenkey* producers in GMPs. A self-administered questionnaire was prepared and used to recruit 42 *Ga kenkey* producers using convenient sampling techniques. Out of the 42 producers, 83.3% were females, between 18 and 33 years (61.9%) and single (42.9%), and have been in the business for about 0 to 5 years (69.1%). A significant number of producers had neither GMP, food safety nor HACCP training. The producers have inadequate knowledge of GMPs since majority of them do not use gloves and consider wearing them unnecessary. Even though the producers agreed that GMPs improve product qualities, the establishment of reputation, and customer satisfaction and identify problems within the production process, they however did not pay attention to any form of hazards during the production process. Therefore, since education, training, and experience had a significant ($P \leq 0.05$) positive influence on the producers' knowledge and practices, sufficient training in GMPs coupled with regular supervision should be provided to the producers for the hygienic and safe production of this commonly patronized food.

1. Introduction

Ga kenkey is a typical Ghanaian dish made from fermented corn by the people of Ga in Southern Ghana. It is one of the major staple foods prepared and consumed across all the sixteen regions of Ghana [1]. It is also referred to as *komi* (Ga), *dokono* (Twi), *dokon* (Fante), and *tim* in Ewe. Ghana's neighboring countries such as Togo, Benin, and Côte d'Ivoire are also engaged in the production and consumption of *Ga kenkey*. It is now exported to several countries including Jamaica.

In order to produce *Ga kenkey*, maize has to be sourced, cleaned, soaked for 2 to 3 days, milled to obtain what is known as corn dough, and then allowed to ferment for 2 to 3 days under ambient temperature (i.e., 25–30°C) [2]. The sourdough is then cooked, molded into sizeable balls, and wrapped in corn husks. The kenkey balls together with the husks are boiled for about 3 to 4 hours. Thereafter, the *Ga kenkey* is ready for consumption, which is then served with hot pepper and tomato sauce or black pepper sauce (*shito*) and fish [3]. *Ga kenkey* is very nutritious as it contains high amounts of carbohydrates and fiber but is low in protein and

fat. It also contains vitamins such as vitamins A, C, E, K, and B vitamins; riboflavin, thiamine, niacin, and folates, as well as minerals [3]. The *kenkey* has an impressive combination of antioxidants and phytochemicals which helps to protect the body from oxidative stress or the ravages of free radicals, which, in turn, protects the body from heart diseases, diabetes, and cancer [3].

However, the conditions and the environments in which *kenkey* is manufactured leave much to be desired. Hence, we need to conduct this study as a basis to correct and sanitize the production chain. During the production, the *kenkey* can be physically, chemically, and biologically contaminated. The sources of food contamination can be broadly categorized into microbial, physical, and chemical hazards [4]. Microbial contaminants such as bacteria, viruses, yeast mold, and parasites may produce toxins in the food which poses threat to human health [5]. According to Kpodo et al. [6] and Amoa-Awua et al. [4], the major problems with *kenkey* production include aflatoxins and other mycotoxins contaminations, which come from maize grains and corn husks used in the processing, and the survival and proliferation of bacterial pathogens during steeping and fermentation of the dough. Amoa-Awua et al. [4] stated that pathogenic microorganisms are major safety concerns for the food industry. The vast majority of outbreaks of food-related illness are due to bacterial pathogens, rather than chemical or physical contaminants.

Furthermore, maize sold in the open market is often contaminated with pathogenic microorganisms including mycotoxin-producing mold species such as *Aspergillus flavus* and *Aspergillus parasiticus*, and *Penicillium citrinum* which produce aflatoxins and citrinin, respectively [7, 8]. Even though boiling *the kenkey* for 3 or more hours at a higher temperature to some extent denatures certain mycotoxins like citrinin, aflatoxins on the other hand are heat-stable and survive the process [6]. Moreover, other dangerous contaminants such as pins, broken blades, stones, pieces of metals, as well as cleaning detergents, earrings, and necklaces could easily contaminate the dough and create severe medical conditions in the life of the consumers.

Good manufacturing practices (GMPs) are the primary sanitary and processing requirements necessary to ensure the production of safe foods. It is employed to ensure that the establishment has the necessary conditions to prevent potential hazards from contaminating foods and food products [9]. It is part of quality assurance which ensures that products are consistently produced and controlled to the quality standard suitable to their intended use [10]. It requires a quality approach to manufacturing, enabling companies to minimize or eliminate instances of contamination, mix-ups, and errors and protect the consumer from purchasing hazardous products [11]. Again, GMPs help prevent cross-contamination and profit loss [9] and also focus on the key requirements for all aspects of commercial food production, storage, and distribution to ensure product conforms to all food safety, food quality, and consumer attributes. *Ga kenkey* producers, therefore, need to have sufficient knowledge of GMPs in order to apply the standard protocols before, during, and after the production (packaging and transportation). Hence, this research sought to assess the producers' knowledge level in GMPs as quality measures to ascertain whether the consumers are protected through safe *kenkey* production.

2. Materials and Methods

2.1. Research Design. Qualitative and quantitative methods were employed for the study using a self-administered structured questionnaire for data collection in Ho Municipality, located in the Volta Region of Ghana. Snowballing was used to identify the producers, while a convenient sampling technique was used to recruit forty-two (42) producers, forming 70% of the total population of 60 producers targeted.

2.2. Questionnaire Administration. The self-administered questionnaire was piloted among *Ga kenkey* producers in and around Ho Technical University, and questions and other issues raised were addressed, and the final questionnaire was validated and rolled out for data collection. The final questionnaire was structured into five sections, including demographic characteristics (gender, age, education, marital status, type of training attended, and experience) for section 1, knowledge in storage handling with 7 questions for section 2, knowledge in quality control (11 questions) for section 3, knowledge in GMPs in theory (4 questions) for section 4, and knowledge in GMPs in practice (observation) with 16 questions for section 5. A scoring system used by Madilo et al. [12] was adopted. Respondents were given a score of 1 for each correctly answered, with a maximum possible score of 5; a high score indicated better participants' knowledge. Data acquired from the administered questionnaire were sorted out for statistical analysis.

2.3. Data Collection. The producers were visited in the municipality, and the questionnaire was administered to them to fill. Before then, they were briefed on the aims of the study. The inclusion criteria included all the producers of only *Ga kenkey* and not *Fante kenkey*. The questionnaires were designed in English and then interpreted by the administrators into two local languages *Ewe* or *Twi* where necessary.

2.4. Statistical Analysis. Overall data were analyzed using Microsoft Excel 2013 to generate figures while Statistical Package for Social Sciences (SPSS) version 20 was used for descriptive statistics (the demographic, practices, and knowledge). Pearson's correlation coefficient was used to compute the association between training, experience, and demographic against knowledge and practice.

3. Results and Discussion

3.1. Sociodemographic Characteristics. The results of the demographic of the *Ga kenkey* producers who were recruited for the study are presented in Table 1. The results

Table 1: Sociodemographic characteristics of *Ga kenkey* producers.

Variable	Frequency	Percent
Gender		
Male	7	16.7
Female	35	83.3
Respondent's age		
18–25	16	38.1
26–33	10	23.8
34–40	5	11.9
41–48	2	4.8
49–56	6	14.3
Educational level		
Non-Formal Education	5	11.9
Senior High School	16	38.1
Basic Education	17	40.5
Tertiary	4	9.5
Marital status		
Single	18	42.9
Married	2	4.8
Divorced	2	4.8
Widow/Widower	20	47.6
How long have you been producing *Ga kenkey* (experience)?		
0–2	16	38.1
3–5	13	31.0
6–10	11	26.2
11–15	2	4.8

show that the majority of the respondents were female (83.3%) and were between the ages of 18 and 25 years (38.1%). Most of the respondents could only complete Junior High School (40.5%) followed by Senior High School (38.1%), were single (41.9%), and were in the business for about 0 to 2 years (38.1%). This very enterprise is full of youngsters simply because the production process is very laborious and demands sufficient energy. Moreover, it does not need any special production skills and equipment, as the production and vending processes begin at home with little capital [2]. In addition, most of the respondents had no food safety, GMP, or HACCP training (Figure 1). Most times, the *kenkey* producers gain their production skills from the experienced producers by helping them. Issues of the safety of the products are not so much of concern to them. Halm et al. [13], Amponsah [14], and Oduro-Yeboah [15] indicated that processes involved in *kenkey* production are predominantly family-based vocation.

A number of research studies have reported similar results; Obodai et al. [16] and Asiedu-Addo [17] stated that the majority of *kenkey* producers in their survey areas were dominated by females who were between the ages of 20 and 50 years and could only complete Junior High School. da Cunha et al. [18] and McIntyre et al. [19] added that most of their respondents had low education backgrounds. In response to the inability of the producers to have food safety or GMP training, da Cunha et al. [18] indicated in their study that these types of training are the most influential factors in ensuring quality in the food manufacturing system. Hence, the producers must be trained before commencing the food service business.

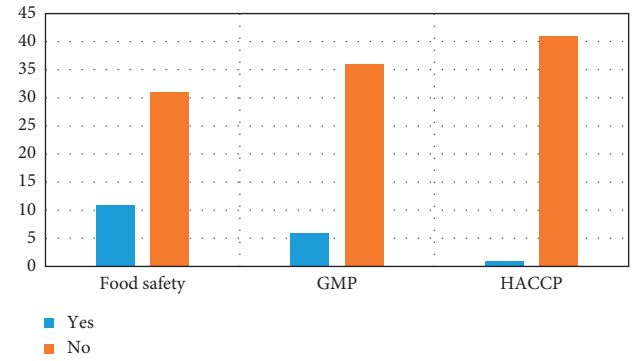

Figure 1: Types of training or workshop by the *Ga kenkey* producers.

3.2. Knowledge in Storage Handling. Several questions were asked to determine whether or not the respondents have sufficient knowledge in good storage handling of the raw materials in particular. The results were summarized in Table 2. The results reveal that a significant number of the producers bought the raw materials in bulk and stored them in jute sacks (73.8%) and polythene bags (72.4%). The best material for storing maize is the hermetic bag (38.1%) as it has an inner lining rubber to prevent air and moisture from the environment from entering or leaving the sack, and it is also well treated with insecticides which kill any insect that is trapped in the bag or trying to enter. Most importantly, the majority of the producers had not been fumigating the storeroom regularly (72.4%) or using pest control practices. Although they have sufficient knowledge as they reserved rooms purposely for storage of the raw materials (71.4%) and practiced the principles of stock rotation procedures (73.8%), they exhibited inadequate knowledge as the majority of the producers confirmed that they had not been keeping the bags of the raw materials on pellets in the storerooms but placed them on sacks arranged on the floor (57.1%) and also kept them in basins left in the storerooms (78.6%). The raw materials kept in sack bags and left on the floor for a very long time would generate heat and accumulate moisture which becomes an environment for molds to proliferate and cause spoilage. As a result, there will be financially lost to the producers as the shelf life of the product is reduced. Golian et al. [20] reported similar results in which about 26% of the respondents could follow proper storage handling procedures.

3.3. Knowledge in Quality Control. Table 3 presents the results of the respondents' knowledge of quality control practices during *Ga kenkey* production. The results show that respondents have inadequate knowledge of food hygiene and safety as they grossly disagreed or had not been practicing the food safety and hygiene protocols in most cases. Most importantly, the results revealed that they have not been using gloves during the production (59.5%) and they did not think it was necessary to use them (64.3%). The use of pair of gloves during food production and preparations is very important as they prevent cross-contamination, particularly during the critical control points such as

Table 2: Producers' knowledge in storage handling.

Issues observed	AK	IAK
Do you buy the raw material (maize) in bulk?	33 (78.6)	9 (21.4)
If yes, how do you store the maize?		
In jute sacks	11 (26.2)	31 (73.8)
In polythene bags	12 (28.6)	30 (72.4)
In hermetic bags	16 (38.1)	26 (61.9)
Do you have a storeroom purposely for the raw materials?		
In sacks on pallets	15 (35.7)	27 (54.3)
In sacks on floor	18 (42.9)	24 (57.1)
In basins	9 (21.4)	33 (78.6)
Do you fumigate the storeroom regularly?	12 (28.6)	30 (72.4)
Do you have a pest control practice?	25 (59.5)	17 (40.5)
Do you use stock rotation procedures during storage?	31 (73.8)	11 (26.2)

AK = adequate knowledge; IAK = inadequate and knowledge; ±SD = standard deviation.

Table 3: Producers' knowledge of food quality management in the production chain.

Issues observed	AK	IAK
Do you use a thermometer during the cooking of the *kenkey*?	4 (9.5)	38 (90.5)
Do you use gloves when producing *kenkey*?	17 (40.5)	25 (59.5)
To what extent do you consider wearing gloves necessary?	15 (35.7)	27 (64.3)
At what stage do you use gloves when preparing *kenkey*?.		
Mashing	6 (14.3)	36 (85.7)
Molding	9 (21.4)	33 (78.6)
Packaging	12 (28.6)	26 (61.9)
Identify the critical control points (CCP) during *Ga kenkey* production?		
Sorting of grains	30 (71.4)	12 (28.6)
Mashing	17 (40.5)	25 (59.5)
Milling	13 (31.0)	29 (69.0)
Molding	16 (38.1)	26 (61.9)
Packaging	11 (26.2)	31 (73.8)
Boiling	21 (50.0)	21 (50.0)
The following can contaminate *kenkey* during milling, mashing, molding, and packaging?		
Metal	42 (100.0)	0 (0.0)
Glass	6 (16.7)	35 (83.3)
Stones	22 (52.4)	20 (47.6)
Jewelry	8 (19.0)	34 (81.0)
Wood	18 (42.9)	24 (57.1)
Plastic	7 (16.7)	35 (83.3)
During *kenkey* production, when do you consider handwashing important? Tick all that apply.		
Before starting work	41 (97.6)	1 (2.4)
After using the toilet	42 (100.0)	0 (0.0)
After touching your hair, ear, nose, and mouth	42 (100.0)	0 (0.0)
After sneezing, coughing scratching	42 (100.0)	0 (0.0)
Before mashing, molding and packaging	42 (100.0)	0 (0.0)
Before leaving or returning to work station	16 (38.1)	26 (61.9)
After handling garbage and cleaning up	37 (88.1)	5 (11.9)
After touching the mobile phone or door handle	12 (28.6)	30 (71.4)
After handling money	17 (40.5)	25 (59.5)
Do you use the following during mashing, molding, and packaging?		
Hat or proper hair restraint	31 (73.8)	11 (26.2)
Necklaces	38 (90.5)	4 (9.5)
Wrist watch	41 (97.6)	1 (2.4)
Earing	15 (35.7)	27 (64.3)
Wedding rings or other rings	33 (78.6)	9 (21.4)
Long fingernails	39 (92.9)	3 (7.1)
Apron	28 (66.7)	14 (33.3)

AK = adequate knowledge; IAK = inadequate and knowledge; ±SD = standard deviation.

mashing and molding of the dough. Microbial pathogens are mostly found in fingers and in fingernails. As a result, when hands are not washed properly and covered with gloves, these pathogens would be transferred into the food, leading to food infections and intoxication after ingestion. In connection with the above, when the respondents were asked to explain how they protect the dough from biological, chemical, and physical contaminations during milling, mashing, molding, and packaging, they left the spaces provided for their responses completely blank. They further added that they did not have any means for treating the water they use for mashing even from nonportable sources. However, they indicated (Figure 2) that the most critical hazards in the production process were biological hazards (83.0%). The treatment of water before use should be one of the surest ways, in addition to the use of pair of gloves, to prevent microbial hazards from contaminating the dough.

Nevertheless, they have shown sufficient knowledge in hand hygiene practices as all (100%) of the producers revealed that they considered washing hands at all times, most importantly, before, during, and after the production of the *kenkey*. These practices are crucial in preventing biological contamination of the food. Unfortunately, the majority of the respondents failed to consider washing hands before leaving or after returning to the work stations (38.1%), after touching mobile phones or door handles (28.6%), and after touching money (40.5%) very important. Mobile phones, money, and door handles are not protected from germs, hence, good sources of bacterial pathogens.

In addressing physical and chemical contaminations, apart from earrings (64.3%) which the producers did not remove and the inability to use hair restraints during mashing, molding, and packaging, the majority of them exhibited adequate knowledge as they have not been using necklaces (90.5%), wrist watches (97.6%), wedding rings (78.6%), and long fingernails (92.9%) but rather wear aprons (66.7%) during production. Furthermore, the producers have shown inadequate knowledge of food safety and hygiene standards as most of them, apart from metals (100%), disagreed with the fact that glass, stones, jewelry, pieces of wood, and plastics could easily contaminate the dough during milling, mashing, molding, and packaging. Hence, they did not consider physical, chemical, and biological aspects and even allergens as important during the production of the *kenkey* (Figure 3). When they were further asked to indicate the critical control points (CCPs) during the production process, it was surprising to notice that majority of the producers only identified sorting of grains (71.4%) as the CCP which only takes care of physical contamination and did not agree that mashing, milling, molding, packaging, and boiling are equally essential CCPs in the *Ga kenkey* production. This ignorance would create an environment for biological and chemical contaminations which may lead to food safety concerns (Table 3). In contradiction to their response above, when they were asked to identify the most important CCP (Figure 4) during the production, they indicated mashing (45.0%). In *Ga kenkey* production, microbial contaminations are considered

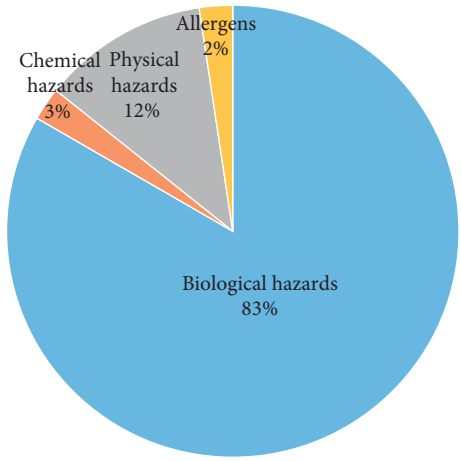

Figure 2: The most critical hazard in *Ga kenkey* production during *Ga kenkey* production.

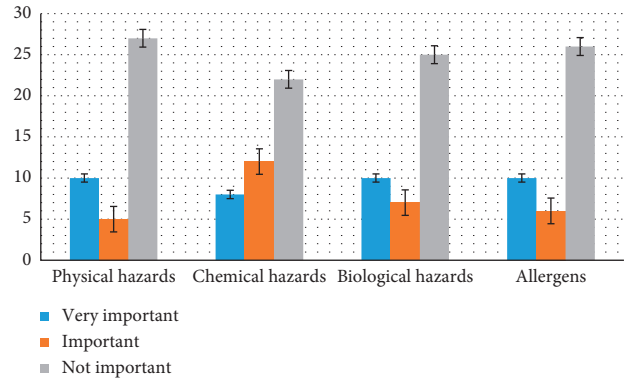

Figure 3: The level of importance attached to hazards during *Ga kenkey* production.

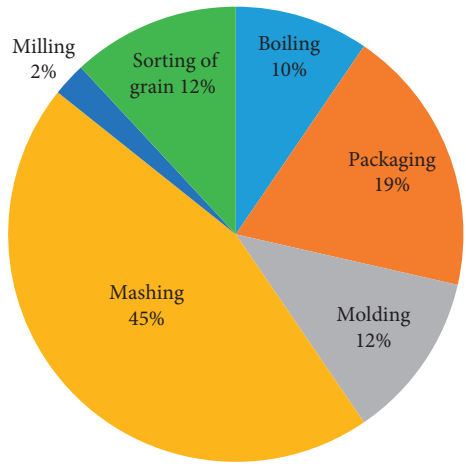

Figure 4: The most critical control points (CCP).

eliminated only if the *kenkey* balls are boiled to the right temperature and duration. However, sorting becomes the most critical since dough contaminated with metals, stones, needles/pins, and plastics before molding and packaging will be difficult to handle as no action thereafter will eliminate it until it gets to the consumer.

Similar studies by Assefa et al. [21] and Ho et al. [22] have reported the presence of several species of microbial pathogens in the hands of food handlers. Both studies concluded that proper adherence to hand hygiene protocols is very crucial to eliminating or reducing the contamination to a minimal level. Studies in Ghana [23], Brazil [24], New Zealand [25], the United States [26], and Hong Kong [27] have shown that foodborne outbreaks in these countries were chiefly a result of the inability of the food handlers to adhere to proper procedures for handling foods.

3.4. Knowledge in Good Manufacturing Practices (GMP) in Theory. According to Malavi et al. [28], one of the main reasons for good manufacturing practices is to ensure that the growth and survival of pathogenic organisms and their toxins are reduced to the safest level. In order to ascertain the level of knowledge of the producers in GMPs, they were taken through a series of questions and their responses are summarized in Table 4. Most importantly, the results revealed that even though the majority of the producers knew that GMP is the surest system to ensuring food safety (92.9%) and therefore agreed that the implementation would go a long way to have positive effects on product quality (88.1%), improve the establishment of reputation (69.0%) and customer satisfaction (76.2%), lead to the identification of problems within the manufacturing process (57.1%), and also meet customer requirements (81.0%), they did not know that compromising food safety and hygiene protocols, particularly, improper handling of the *kenkey* dough, could lead to profit loss (47.6%), increased customer or consumer complaint (52.4%), consumer dissatisfaction (42.9%), and unfavorable publicity (42.9%), just to mention a few.

Ma et al. [29] explained that food handlers did not know that compromising food safety and hygiene standards in the food value chain leads to cross-contaminations and many other disadvantages to both producers and customers. Malavi et al. [28] also confirmed that their respondents had poor knowledge of good GMPs as they did not know that poor sanitation in the food processing plant leads to food poisoning.

3.5. Knowledge of GMP in Practice (Observation). Apart from the questionnaires distributed to test the knowledge of the producers in GMP, an observation tool was also designed to determine whether or not the knowledge they might have is put into practice. The results of the observation in Table 5 show that the producers completely compromised good manufacturing standards at all levels. Nevertheless, the majority of the producers were observed implementing the standards in handwashing (64.7%), wearing of jewelry (82.4%), separation of raw from cooked food during storage (64.7%), and proper storage of reagents (88.2%); however, overall compliance was questionable. For instance, most of the respondents observed washing hands did not use either detergents or disposable towels as recommended by the protocols. Sani and Siow [30] explained that even if the food producers stated they correctly wash hands in theory, it does not show in reality. It is a singular responsibility and incumbent on food handlers to properly wash their hands (with soap and under running warm water) and wear proper and clean working gear when approaching the work stations and before handling foods. In the same vein, the few producers sighted wearing working gear (64.7%) either left stained or did not wash them regularly, and those observed having waste bins in their preparation facilities kept the bins in the facilities to get full before disposing them. In addition, most of the stations visited did not have proper handwashing facilities (88.2%) and first-aid kits (88.2%), sanitize working surfaces before production (88.2%), monitor fridges and freezers for proper functioning (76.5%), and did not have separate work stations in the kitchens (100%). This act of gross disregards to good manufacturing procedures is unacceptable and must be corrected with immediate action since foodborne pathogens cross-contaminate and spread during food preparations. Compliance with food safety standards alone could effectively prevent the spread of foodborne pathogens, particularly during the production stage [31].

These observations have been confirmed by several studies [32–35]. Wohlgenant et al. [35] indicated that kitchens in North and South Carolina did not comply with food safety standards. Mgqibandaba et al. [36] stated that the majority of the kitchens used for school feeding programs were not standard, and proper safety protocols were also not followed by the women in the kitchen. The observation studies of Castro et al. [33] revealed that respondents hardly maintain a general hygiene environment in the kitchen environment during food preparation and hardly wash their hands as they move from one activity to another.

3.6. Effects of Training, Experience, and Sociodemographics on Producers' Knowledge in GMP. da Cunha et al. [18] argued that theory in food safety and hygiene does not always reflect in practice and suggested the producers need not only to be trained but also to be supervised to make sure that training reflects in daily food handling activities. Hence, the researchers wanted to know whether or not the producers' experience, training, and demographic characteristics have any relationship with their knowledge of GMPs. The results of these studies are reported in Tables 6 and 7. The results in Table 6 reveal that training had greatly influenced the knowledge the respondents had in quality control ($P = 0.037$) and GMP ($P = 0.012$). On the other hand, the producers' experience had positively influenced the producers' knowledge of GMP ($P = 0.050$) but, surprisingly, had no effect on their knowledge of quality control and storage handling $P > 0.05$). This revelation is an indication that the longer the producers stay in business and the more training they have, the more and better attention they would pay to the food as it passes through the value chain. Again, Table 7 shows that education and gender have strong negative control over the respondents' knowledge of quality control and GMPs, respectively ($P \leq 0.02$), while the rest of the demographic characteristics have not in any way influenced the food safety knowledge of the producers ($P > 0.05$). This is to explain the fact that the respondents

Table 4: Producers' knowledge of good manufacturing practices (GMP) in theory.

Issues observed	AK	IAK
What are the results of improper handling of *kenkey* during production?		
Consumer illness or dissatisfaction	28 (66.7)	14 (33.3)
Consumer emotional trauma	10 (23.8)	32 (76.2)
Customer dissatisfaction	18 (42.9)	24 (57.1)
Unfavorable publicity	18 (42.9)	24 (57.1)
Increased customer & consumer complaints	22 (52.4)	20 (47.6)
Loss of profits	20 (47.6)	22 (52.4)
Lawsuits and criminal	2 (4.8)	40 (95.2)
Prosecution (legal and court costs)	3 (7.1)	39 (92.9)
High insurance costs	2 (4.8)	40 (95.2)
GMP is the sole responsibility of:		
All the employees	26 (61.9)	16 (38.1)
Manufacturers	18 (42.9)	24 (57.1)
The employer	6 (14.3)	36 (85.7)
The supplier	14 (33.3)	28 (66.7)
GMP is a system to ensure food safety	39 (92.9)	3 (7.1)
The main reason for implementing GMP in your *kenkey* processing facility.		
To improve the product quality	37 (88.1)	5 (11.9)
To improve establishment reputation	29 (69.0)	13 (31.0)
To improve customer satisfaction	32 (76.2)	10 (23.8)
To identify problems within the production process	24 (57.1)	18 (42.9)
To meet customer requirement	34 (81.0)	8 (19.0)

AK = adequate knowledge; IAK = inadequate and knowledge; ±SD = standard deviation.

Table 5: Producers' knowledge in GMP in practice (observation).

Statements	Percentage (%)		
	Yes	No	Comment
Food handlers wash their hands	64.7	35.3	Compromised standards
Food handlers use gloves during mashing	0.0	100.0	Did not exist
Food handlers wear proper gear during food production	35.3	64.7	Compromised standards
Food handlers wear jewelry during food preparation	82.4	17.6	Complied with standards
Food handlers wear hair restraints	47.1	52.9	Compromised standard
Water used for production is from a safe source	41.2	58.8	Compromised standard
Proper handwashing facilities are present in the preparation facility	11.8	88.2	Compromised standard
The kitchen has separate workstations	0.0	100.0	Did not exist
Food handlers sanitize work surfaces regularly	11.8	88.2	Compromised standard
Separation of raw foods from cooked foods during storage	64.7	35.3	Compromised standard
Fridges and freezers are monitored for good working conditions	23.5	76.5	Complied with standards
Food handlers have enough food storage facilities	76.5	23.5	Compromised standard
Fermenters are properly cleaned, dried, and stored	47.1	52.9	Complied with standards
Cleaning reagents are properly stored away from the processing areas	88.2	11.8	Complied with standards
Production wastes are properly disposed of from the cooking facility	29.4	70.6	Compromised standard
There is a first-aid kit in the processing area	11.8	88.2	Some not fully resourced

Table 6: Effects of training and experience on producers' knowledge of food safety.

Knowledge level	Pearson correlation	Sig. (2-tailed)
Storage handling vs training	0.296	0.057
Quality control vs training	0.323*	0.037
GMP vs training	−0.246	0.012
Storage handling vs experience	−0.162	0.305
Quality control vs experience	−0.143	0.365
GMP vs experience	0.304	0.050

*Correlation is significant at the 0.05 level (2-tailed).

Table 7: Effects of respondents' demographic characteristics on their food safety knowledge.

Knowledge level	Pearson correlation	Sig. (2-tailed)
Storage handling vs age	−0.254	0.104
Quality control vs age	−0.112	0.482
GMP vs age	0.067	0.675
Storage handling vs education	−0.006	0.968
Quality control vs education	−0.416**	0.006
GMP vs education	0.003	0.987
Storage handling vs gender	−0.069	0.662
Quality control vs gender	0.061	0.702
GMP vs gender	−0.336*	0.020

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

need more education for accurate implementation of the food safety protocols. This result is also not surprising simply because females are often trained to handle activities in the kitchen including preparing foods and, hence, are able to handle GMPs to some extent.

Asiegbu et al. [37] supported our findings by indicating that it is the responsibility of food safety officials to provide sufficient training for food handlers as it would help them put into practice acceptable food safety and hygiene standards. Asiegbu et al. [37] added that training and supervision by far improve food safety and hygiene knowledge and awareness.

4. Conclusion

Good manufacturing practices are the most important and effective food safety and hygiene tools designed and established to correct wrongs in the food value chain. However, the producers of *Ga kenkey* in Ho Municipality in the Volta Region of Ghana were aware of the existence of GMPs and acknowledged some of their importance; they did not think it was necessary for them to get trained and put the standards into practice. This is however very unfortunate and could lead to food safety concerns.

During the observation studies, it was realized that the producers compromised the handwashing protocols while none of them was observed wearing gloves, particularly during the mashing and molding of the aflata. Bacterial pathogens hidden in their fingers and in their nails might be released into the aflata causing health complications to the consumers, most essentially when the *kenkey* balls are not boiled to the right temperature and durations. Again, few of the producers who were observed performing other hygiene practices such as cleaning working surfaces and wearing working gears also compromised the standard protocols, attesting to their claims of not having training in GMP or food safety.

We conclude by recommending that food safety and hygiene authorities in the country should take immediate steps to organize training sections for the producers and supervise them regularly as the results in Tables 6 and 7 suggest that education, training, and experience have a positive influence on knowledge and practices.

Data Availability

The data used for the findings of this study are included within the article. All the study data are available on request.

Conflicts of Interest

The authors declare no potential conflicts of interest.

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