

Food Safety and Hygiene: Knowledge, Attitude and Practices among Food Handlers

Thandeka Nyawo

School of Tourism and Hospitality, College of Business and Economics, University of Johannesburg, South Africa, Email, thandekan@uj.ac.za

Hema Kesa

School of Tourism and Hospitality, College of Business and Economics, University of Johannesburg, South Africa, Email, hemak@uj.ac.za

Eridiong Onyenweaku*

School of Tourism and Hospitality, College of Business and Economics, University of Johannesburg, South Africa, Email, eridiongo@uj.ac.za

**Corresponding Author*

How to cite this article: Nyawo, T., Kesa, H. & Onyenweaku, E. (2021). Food Safety and Hygiene: Knowledge, Attitude and Practices among Food Handlers. African Journal of Hospitality, Tourism and Leisure, 10(2):547-558. DOI: <https://doi.org/10.46222/ajhtl.19770720-117>

Abstract

The National School Nutrition Programme (NSNP) aims at supplying nutritious supplementary meals to schoolchildren in order to improve education outcome by elevating learning ability, school attendance, and punctuality. However, in South Africa there is an increasing number of food poisoning reports, especially in schools under the NSNP. This study seeks to assess knowledge levels of food safety and hygiene practices among NSNP food handlers in Gauteng. A qualitative research approach employing a semi-structured individual interview process was used for data collection. The results showed that lack of education and knowledge was one of the reasons behind food handlers' non-adherence to food safety and hygiene practices. The findings also revealed that training should be a requirement for food handlers under the NSNP, in order to prevent foodborne diseases and reduce pathogen spread (cross contamination) during food preparation. The findings of this study recommend that the NSNP strengthens training programmes, evaluation and monitoring measures as these are crucial for food safety.

Keywords: Food safety, hygiene practices, knowledge, school feeding, South Africa

Introduction

Food safety issues related to foodborne diseases are important because of the direct health and economic burdens imposed, and the indirect impact on the development and productivity of people. Foodborne illnesses tend to create extensive cost to the food industry and the economy at large; hence, food safety and hygiene practices continue to be a matter that requires attention (Egan, Raats, Grubb, Eves, Lumbers, Dean & Adams, 2007). Campos, Cardonha, Pinheiro, Ferreira, Azevedo and Stamford (2009) assert that providing effective training could assist with increased awareness of food safety and hygiene practices particularly in the areas of cross-contamination, temperature control, storage, and personal hygiene that will guarantee food safety and quality. Equipping food handlers with training on food safety and hygiene practices is crucial as this knowledge has a significant role in decreasing and hopefully avoiding food poisoning through production and distribution of safe food (Lazarevic, Stojanovic, Bogdanovic & Dolicanin, 2013). Sibanyoni, Tshabalala, and Tabit (2017) alleged that the South African Department of Health reported about 2,560



foodborne epidemics, diseases, and illnesses in 2011; approximately 1,700 were transmitted between elementary and secondary school learners. In 2017-2018, there was an outbreak of Listeriosis in South Africa with Gauteng having the highest number of cases at 581; the outbreak recorded 674 patients, of which 183 died (World Health Organisation 2015). These outbreaks raise several concerns, one of which relates to the level of awareness and knowledge of food handlers on good hygiene practices and the importance of food safety. A study conducted in Accra, Ghana, revealed that food handlers can undergo training and found may have acceptable knowledge on hygiene and food practices, but the knowledge gained is not always practised (Annor & Baiden, 2011).

Another similar concern is whether the NSNP ensures that their food handlers comply with the hygiene practices; Seaman and Eves (2010) states that managers working in food service outfits have a significant responsibility in encouraging food handlers to put into practice procedures related to food safety and hygiene practices. In addition, a study conducted by Sani and Siow (2014) also revealed that supervision of individuals that handle food will ensure compliance with the necessary hygiene procedures. The NSNP supervisors and managers have to provide an environment that promotes safe food handling through the display of posters and notices. Choudhury, Mahanta, Goswami and Mazumder (2011) discovered that different training methods, like demonstrations and videos, can also be a strategic move towards ensuring and educating food handlers and can change their food handling practices. Another WHO study reported that children under five years of age are more susceptible to foodborne diseases. This is because of their lack of control over food preparation and behavioral tendencies that increase risk, such as eating stones, soil and animal faeces therein. Children are also more vulnerable to the consequences of infection because of their developing immune system, small body size, lower levels of stomach acid and other predisposing factors (Grace, Alonso, Roesel, Covic & McDermott, 2016). Consequently, the main objective of the study was to assess the food safety and hygiene practices embarked upon by the NSNP food handlers in selected schools in Gauteng. This research also sought to evaluate the food handlers' knowledge levels in relation to food safety and hygiene practices with the aim of improving food hygiene practices and reducing the occurrence of foodborne diseases.

Literature review

The issue of poverty, food insecurity, and malnutrition is perhaps the most widely researched area in nutrition yet, it is still a predominant challenge faced in most developing countries in Sub-Saharan Africa, including South Africa (Afoakwa, 2008; Dei, 2014). Knowing the prevalence of communities living in poverty and the state of the country at large, the procedure of learning in schools is likely to be negatively influenced due to hunger and malnutrition (Kulild, 2014). In an attempt to alleviate this situation, the government of South Africa introduced the Primary School Nutrition Programme (PSNP) in schools in 1994 (Sanfilippo, Neubourg & Martorano, 2012). It was seen as a successful initiative and strategic move launched to provide meals to the most disadvantaged learners from low-income families and communities. Due to this success, it was rolled out to secondary schools and the programme was renamed the National School Nutrition Programme (NSNP). The NSNP has a responsibility to offer safe and clean food to learners at various schools as well as to assure that food handlers comply with the hygiene practices when handling food. Food safety is a crucial matter in schools, as not only does it develop learner's health, but also the country's economy (Sanfilippo et al., 2012). Research evidence suggests that inappropriate hygiene practices result from lack of knowledge, ignorance as well as negligence of food handlers at



schools; and this has led to an increased outbreak of foodborne illnesses (Afolaranmi, Hassan, Bello & Misari, 2015; Da Cunha, Stedefeldt & De Rosso, 2012).

However, many countries in Africa have been undergoing modernization of their food safety systems in the last decades. This has often included developing coordination mechanisms across Ministries and Departments with mandates for food safety, establishing standard bureaus, upgrading laboratory facilities, updating and harmonizing standards and strengthening export capacity. Although many African countries subscribe to Codex Alimentarius standards, resource challenges have limited their enforcement. Furthermore, food safety is not prioritised in developing countries; consequently, millions of people get sick, and hundreds of thousands die from consuming food that is unsafe (Fung, Wang & Menon, 2018).

Several studies have also been conducted in various parts of the world on the issue of food safety and hygiene especially pertaining to food contamination. These data emphasize the role of safety measures applied by consumers in the prevention of foodborne diseases. However, reports show that consumers are unaware of their domestic contribution to risks of food contamination (Losasso, Cibin, Cappa, Roccato, Vanzo, Andrighetto & Ricci, 2012) since they are more concerned about hygiene standards outside the home setting (Eves, Bielby, Egan, Lumbers, Raats & Adams, 2010; Miles, Brennan, Kuznesof, Ness, Ritson & Frewer, 2004). Proper education and training on the basic principles of food safety are emphasized in International literature since they could contribute to reducing the incidence of foodborne illnesses if the messages are specifically targeted at consumers' needs and habits (Altekruse, Yang, Timbo & Angulo, 1999). Previous studies have focused on effective strategies for improving consumer behaviour in the food hygiene context (Miles et al., 2004; Redmond & Griffith, 2003) but inadequate research has been conducted on school-based food safety education. Food safety education of schoolchildren is thought to be essential but adequate training in food hygiene practices of food handlers is also very important as children seldom prepare their meals on their own.

Therefore, food safety and hygiene are vital for the prevention of food contamination which results in food poisoning. Good hygiene practices are known as the prerequisite methods and procedures whereupon the safety of food and the management quality systems are formed. These practices are essential for personnel handling food as they need to ensure that food is safe for ingestion. This requires that everyday food handlers must guarantee that the food is hygienic and safe throughout the preparation stages. Ramful (2017) alleged that good hygiene practices ensure that food handlers keep the highest level of personal hygiene, and wear appropriate protective clothing. These include head covering, appropriate footwear, regular hand washing, frequent glove changes, no jewellery, watches, or any other items in the food handling areas. Thigeel (2010) asserted that knowledge of preparation and good hygiene practices of individuals that directly handle food (both preparation and serving), plays a vital role in avoiding most foodborne diseases.

Methods

The targeted population was NSNP food handlers and the sample size was 20 schools i.e. 10 primary and 10 secondary schools from the five districts in Gauteng, which amounted to 20 food handlers interviewees. Twenty food handlers interviewees were selected via the employment of purposive and random sampling strategy. The rationale behind this technique was that a purposive sampling technique is ultimately deployed in a qualitative study and can be described as choosing units such as (individuals, groups of individuals, schools) grounded on particular purposes related with fulfilling the research study objectives. Creswell (2015) encouraged the use of random sampling as it increases credibility of the sample when the



purposive sample is enormous. A semi-structured questionnaire was used to interview the participants. This study adopted a qualitative research approach in harmony with the interpretivist paradigm, which incorporates a widespread theoretical standpoint (McEvoy, 2006). Content analysis was also employed in this research, which is an approach grounded on text data content interpretation via the use of the systematic categorisation procedures through which themes and coding are chosen (Zhang & Wildemuth, 2009). Semi-structured individual interviews were used for data collection and the rationale behind interviews was because gaining an understanding of NSNP food handlers knowledge level with regards to food safety and hygiene practices is sensitive issue, and detailed data was necessary in this regard. Informed consent and Data Privacy: Respondents were asked to carefully read and understand the content summary first before proceeding to the questionnaire. During the informed consent process, survey participants were assured all data would be used for research purposes only. Permission was obtained from the participants after the study's objectives were explained and discussed completely, truthfully and straightforwardly at the interview. Interviewees were issued the consent form which they signed to indicate their agreement to participate in the study. The interviewee was guaranteed privacy and were promised anonymity.

Questionnaire design and administration: A semi-structured questionnaire was designed to gather information from food handlers (interviewees). The questionnaire was structured to gather socio-economic data, information on food safety, hygiene practices and compliance and also a section to evaluate the food safety/hygiene knowledge levels of the interviewees. The research questions were based on previous research publications, which guaranteed that the research concept was harnessed to deliver results that achieve the research objectives. The questions were phrased in such a way that the participants did not become confused by similarly phrased questions or make errors in responses, which ensured reliability. It was a one-on-one physical interview with the food handlers which made it easy for questions to be explained. The interview questions were piloted in five schools under the NSNP. Schools that were piloted were excluded in the final data analysis, thus assuring the validity of the report.

Descriptive statistics such as frequencies, percentages and tables, were used to define the proportion of responses for each question and the total distribution in the total score of each question. Qualitative data analyses frequently employ thematic analyses to formulate two or more themes that are crucial to the contextual description. Data obtained from participants were transcribed and analysed through the software tools required for qualitative data analysis. Themes were generated with the use of ATLAS.ti (version 8) for this research study, and three narrative themes were: (i) Food safety (ii) Good Hygiene practices (iii) Knowledge levels of food safety and hygiene practices. The thematic evidence indicated in Table 1 presents collected transcribed interviews using open coding. Moreover, the table entails the themes' descriptions and forms the foundation in the planned framework for practicing food safety and hygiene. Consequently, the evidence from the thematic analysis originated from open coding themes. The analysis of the interviews was made from three theme notions and 16 codes. For clarity on how the food handlers and coordinators from different districts responded to the questions, the participants were grouped together according to district, and the different schools were referred to as schools 1, 2, 3, 4 and 5 according to district.

- i. District A represents Tshwane, school A1 is primary school 1, school A2 is primary school 2, school A3 is secondary school 1, school A4 is secondary school 2, and school A5 is secondary school 3.
- ii. District B represents Johannesburg, school B1 is primary school 1, school B2 is primary school 2, school B3 is primary school 3, school B4 is secondary school 1 and school B5 is secondary school 2.



- iii. District C represents Ekurhuleni, school C1 is primary school 1, school C2 is secondary school 1, school C3 is secondary school 2.
- iv. Districts D represents Vereeniging (DC42), school D1 is primary school 1, school D2 is primary school 2, school D3 is primary school 3 and school D4 is secondary school 1.
- v. District E represents Randfontein (DC48), school E1 is primary school 1, school E2 is primary school 2 and school E3 is secondary school 1.

TABLE 1: Thematic evidence derived from open coding themes

Themes	Descriptions
Food Safety	Food Safety Approaches
	<ul style="list-style-type: none"> • Cooking procedures • Temperature controls • Preservations and storage • Food handling and preparation • Food disposal
	Healthy Food Regulatory Act
	<ul style="list-style-type: none"> • Handwashing and gloves • Head covering and footwear • Protective clothing
	Good Hygiene Practices
Hygiene Practices & Compliance	<ul style="list-style-type: none"> • Clean and neat environment • Clean cooking facilities, utensils
	Health Surveillance
Knowledge of Food Safety and Hygiene Practices	<ul style="list-style-type: none"> • Medical examination • reporting of illnesses and Symptoms • Awareness • Food handlers' knowledge level • Exposure and experience • Basic education

Results

Socio-demographics characteristics of the interviewees

The socio-demographic characteristics of the surveyed population (20 schools) is presented in Table 2. The research sample included 20 food handler interviewees, which comprised one food handler per school, amounting to 20 food handlers from 10 primary schools and 10 secondary schools in the five districts selected in Gauteng. There were 20 female food handlers (100%), no males. This might be associated with the NSNP's aims to reduce the unemployment rate (especially among women) in poverty-stricken communities. Regarding age, the highest number of participants fell between 36 and 45 years (50%), followed by the age group of 46 and 55 years (30%). Ethnicity revealed that 90% (N=18) of food handlers were black, only one was Indian and the other one was coloured. There was no white food handler. The responses for years in current job showed that all the food handlers (100%) have been working on the current job for more than a year. Regarding the highest educational qualification, the results revealed that over half (55%) had obtained Grade 11 and lower grades, 40% had obtained Grade 12, and 5% (N=1) had obtained a National Diploma. None of the participants had a Bachelor degree.

Table 2: Socio-demographics characteristics of the surveyed population

Demographic variables		Frequency (N)	Percentage (%)
Gender	Female	20	100
	Male	0	0
	Total	20	100
Age Group	25-35	3	15
	36-45	10	50
	46-55	6	30
	56 and older	1	5
	Total	20	100



Demographic variables		Frequency (N)	Percentage (%)
Ethnicity	Black	18	90
	White	0	0
Employment Level	Indian	1	5
	Coloured	1	5
	Total	20	100
Years worked in current job/position	Coordinator	0	0
	Food Handler	20	100
	Other	0	0
	Total	20	100
Highest educational qualification	Less than 1 year	0	0
	1-3	20	100
	Total	20	100
	Total	20	100
Highest educational qualification	Grade 10 – 11	11	55
	Grade 12	8	40
	National diploma	1	5
	Other	0	0
	Total	20	100

Food safety

The findings showed that the 20 food handlers in all five (5) districts adhered to some food safety measures when food was being handled and prepared, to ensure that food is safe for ingestion. A food handler from District A, briefly described the food safety practices and principles she adhered to when handling and preparing food, “I always ensure that I store food properly, wash my hands after going to the toilet”. Districts B food handlers in addition, confirmed that they follow most principles of food safety and hygiene during the process of food handling and preparations. Food handlers from district B highlighted that practicing food safety and hygiene includes personal hygiene, ensuring that you come to work clean, cover hair all the time, wash hands often, and work in a clean environment. Moreover, District C, D and E food handlers supported this by stating that they wear the proper uniform, cover their hair, keep their nails short, do not use nail polish, and they keep the kitchen and their cooking utensils clean. A majority of the food handlers from all the district pointed out that, they ensure food is stored appropriately. However, with regard to storage facilities in all five Districts, food handlers maintained that the schools had no storage facilities, the kitchen is used for cooking and as a storeroom; in addition, they reported that they have basic knowledge on how to store the food properly to avoid food being exposed to bacteria. Furthermore, the results reveal that most of the interviewees seem to lack education with regard to temperature controls and how food can be adequately preserved. They seem to be uninformed and unaware of the different temperatures that food should be cooked and cooled at, and of various methods of food preservation. District A, B, C, D and E food handlers all pointed out that the schools lacked resources to execute some of the food safety measures.

Good hygiene practices

The main responses to the questions regarding hygiene practices and compliance are from 20 food handlers from selected schools in Gauteng; all participants were asked the same questions. The findings revealed that food handlers had an understanding of how important it is to practice hygiene when in direct contact with food, and they also complied with some hygiene practices when handling and preparing food. Food handlers from District A were in agreement that it is important to comply with hygiene practices, since it assists in ensuring that learners do not get sick from eating contaminated food, it prevents cross-contamination, and it reduces the chances of spreading bacteria. A food handler from district A said, “It is very important, especially for us, because we cook for sensitive individuals, so we need to ensure that food is safe and clean for consumption”. District B food handlers concurred that practicing good hygiene is very significant, especially, when handling and preparing food,



and considering the fact that they cook for children that might have weak immune systems. The food handler from district B asserted that it is very important to comply with hygiene practices as it assists them to pay attention when handling and preparing food. Food handlers from District C asserted that it is vital to practice good hygiene practices when working and preparing food because it minimises growth of harmful bacteria on the food. The food handler from District C said, “It very important to practice hygiene because it helps us to be aware of how we handle and prepare food and how can we minimise bacterial growth”. District D and E food handlers also confirmed that good hygiene practices assist in ensuring that learners eat clean and safe food. With regard to personal hygiene practices compliance, food handlers from District A, B, C, D and E maintained that they observed hygiene practices all the time when handling and preparing food. This ensured that food is protected all the time and that they comply with personal hygiene practices such as reporting to work clean, and wearing protective clothing. Furthermore, these practices include washing hands when handling food, covering hair all the time, wearing no jewellery when handling and preparing food, wearing no nail polish, and ensuring that they always have short nails. Food handlers from Districts A, B, C, D, and E confirmed that good hygiene practices guarantee safety and cleanliness of food for ingestion, minimising the spreading of bacteria.

Knowledge level of food safety and hygiene

The main responses to the questions regarding food safety and hygiene practices knowledge are from 20 food handlers from selected schools in Gauteng. All participants were asked the same questions. The findings showed that food handlers from all the Districts seemed to have some basic understanding of food safety and good hygiene practices. Food handlers from school District A, briefly defined food safety as how food should be handled, prepared, and stored in such a way that it will not be exposed to bacteria. The food handler from district A said, “Food safety is handling and preparing food in a way that won’t expose it to germs, storing food in a way that it won’t be contaminated while in the storeroom”. Regarding good hygiene practices, food handlers defined good hygiene practice as assuring that you work in a clean environment, you use clean utensils when handling and preparing food; they all highlighted that personal hygiene is important when handling food. Pertaining to knowledge levels of terminologies often used when handling food, food handlers from Districts A, B, and D seemed to lack knowledge on terminologies that are often used when working with food, such as cross contamination and foodborne diseases. The food handlers from District B, admitted that they lacked knowledge with regard to terminologies often used when working with food. However, food handlers from District C and E seemed to be aware of and familiar with some terminologies that are used when handling food. The food handlers defined cross-contamination as food that is contaminated with a certain substance that might cause foodborne disease outbreaks, or food that is not stored properly. Concerning hygiene education, most food handlers admitted that no training was provided to them related to food safety and hygiene practices, nor do they have qualifications associated food safety and hygiene practices. The food handlers from District D pointed out that hygiene education can assist in ensuring that individuals that work directly with food have the level of knowledge required for food safety and hygiene practices that they need to adhere to, to ensure that food is not exposed to bacteria.

Discussion

The first objective of the study was to determine food safety measures followed by food handlers during meal preparation in schools. These measures determined the cooking procedures that food handlers adhered to when handling and preparing food. The findings



revealed that participants from selected primary and secondary schools across the five districts in Gauteng were aware of few cooking procedures they need to adhere to when handling and preparing food. However, they lacked knowledge on adequate cooking procedures that affect food safety, such as cooking duration and temperatures at which food should be cooked and cooled; hence, they did not adhere to temperature controls. This report agrees with the findings of Sibanyoni et al. (2017) which showed that majority of the NSNP food handlers in Mpumalanga had no knowledge of proper food handling procedures, lacked trainings on food safety and did not have adequate sanitizing nor food storage facilities. They further stated that they lacked resources to practice food safety measures like thermometers for checking cooked food's internal temperature. The findings revealed that the current food safety standard approaches are relevant to most part of the food production. Irrespective of how good, practicable, controlled, and checked the food system is, food safety is not guaranteed (Janjić, Katić, Ivanović, Bošković, Starčević, Glamočlija, Jianu & Chiş, 2012). However, Moghaddam, Khoshnevisan, Bondarianzadeh, Mohammadi and Abkenar (2014) argued that contributors to the problem can be identified and are controllable by adhering to proper procedures for food safety assurance. Therefore, practicing food safety measures is important to guarantee that food is safe, and prevent food from being contaminated and causing food poisoning.

The second objective of the study was to explore hygiene practices that food handlers adhere to when handling and preparing food. Michigan Department of Agriculture and Rural Development: Food and Dairy Division (2012) advised that food handlers should keep personal cleanliness at the highest level, comply with good hygienic practices throughout work times thereby reducing the spread of bacteria when handling and preparing food. Tan et al. (2013) claimed that it is important that food handlers practice good personal hygiene at all times, as there is a possibility that they can transmit microorganisms onto food or food contact surfaces. The findings revealed that food handlers from all five districts indicated that they are aware of the personal hygiene that they need to adhere to, and they do adhere to some personal hygiene practices. Food handlers from Districts A, B, C, D, and E maintained that they follow and practice personal hygiene such as reporting to work clean and wearing protective clothes; the Health Act insists that no individual be permitted to prepare and handle food if they not wearing appropriate protective clothing. Baş et al. (2006) suggested that a food handler's poor personal hygiene can play a part in spreading foodborne diseases; poor personal hygiene includes hands not being washed between handling raw food and preparing ready-to-eat food. All food handlers from Districts A, B, C, D, and E conformed with this requirement; washing their hands when handling and preparing food. The SABS (2001) asserted that hands must be washed, prior to starting work, before or after every break; after every toilet visit; after blowing their noses, after touching their perspiration, hair, nose, or mouth; after using or touching a handkerchief, money or waste bins; after handling and preparing raw vegetables and fruit, eggs, meat or fish, as well as before touching food that is ready-to-use. No food handlers mentioned the use of gloves when working and preparing food. This is in consonance with the report of Sibanyoni et al. (2017) where 97% of the food handlers reported not wearing gloves nor face masks when handling food. The usage of gloves is not mandatory in many food service establishments (Tan, Bakar, Karim, Lee & Mahyudi, 2013). This could be because, gloves can also become a source of contamination through contact with raw foods and food contact surfaces if they are not used properly (Todd, Michaels, Greig, Smith & Bartleson, 2010).

The third objective of the study was to investigate food handler's level of knowledge and awareness of food safety and hygiene practices. Rendall-Mkosi, Wenhold and Sibanda (2003) asserted that since NSNP food handlers are parents, there are high chances that they



might lack the required knowledge on hygiene practices and food safety. The findings disclosed that food handlers from Districts A, B and C seemed to have basic food safety and hygiene knowledge. District D and E food handlers admitted that they lacked adequate knowledge; however, they are aware of what food safety is. Mullan, Wong, Todd, Davis and Kothe (2015) asserted that foodborne illness and disease might be the result of food handlers' lack of information, awareness, and level of knowledge regarding food safety and hygiene practices. Concerning hygiene practices, all food handlers had identical answers regarding hygiene practices. The food handlers did have basic knowledge of hygiene practices, and described hygiene practices as ensuring that they work in a clean environment, personal hygiene, and cooking utensils are kept clean all the time. Veiros, Proença, Santos, Kent-Smith and Rocha (2009) and Thigeel (2010) asserted that knowledge and cleanliness of individuals that have direct contact with food during preparation, cooking, and serving of meals have a significant role in avoiding most foodborne disease and illness. From the findings of this research, most of the handlers in all the districts admitted that they had not received any formal trainings on food safety and hygiene. This differs from the report from the food handlers in Mpumalanga who reported that up to 71% of them were trained in personal hygiene, chemical storage and food allergy safety precautions (Sibanyoni et al., 2017). However, all food handlers indicated that hygiene education could assist in decreasing the incidents of food poisoning outbreaks. In another similar study, up to 91.4% of the respondents indicated that their respective NSNP food preparation facilities did not have a hazard analysis and critical control points (HACCP) programme in place (Sibanyoni et al., 2017). This is not acceptable and many schools are not using this effective tool to reduce the incidence of foodborne diseases (Tomasević, Kuzmanović, Anđelković, Saračević, Stojanović & Djekic, 2016), considering that it is mandatory for any food handling establishments to do so in South Africa (Department of Health, 1972). HACCP is an effective and economic approach to food safety control and a requisite in the global food supply chain to reduce the occurrence of unhealthy effects for consumers (Wilcock, Pun, Khanona & Aung, 2004).

These observations have potential implications that could assist in the development of recommendations to enhance food safety and curtail the occurrence of food poisoning. Grounded on the conclusions presented, it should be noted that most food handlers lack the required food safety knowledge and had not received training. It is therefore recommended that: Food handlers should be compulsorily trained before and during (continuous training) the course of the NSNP. Training should include subjects such as food cross-contamination, temperature controls, food preservation measures, food waste reduction, causes of foodborne disease, food poisoning bacteria, protection of food from bacteria, and proper use of cleaning chemicals/sanitation materials. The NSNP should build relationships with colleges involved in skill development, which could deploy culinary course students to educate food handlers on the significance of nutrition, and food safety and hygiene practices. This could be expanded to include a community engagement project, with weekly sessions on food safety and hygiene practices, and the nutritional value of food.

The Department of Basic Education should provide schools with resources and facilities to ensure that every school that participates in the NSNP has clean food preparation areas, proper food preparation equipment, and adequate food and chemical storage facilities. This will address the problem of schools lacking the required resources and facilities for practicing food safety and hygiene. Regular monitoring/supervisions by NSNP coordinators should be carried out as this could assist in ensuring that food handlers adhere to food safety and hygiene practices in healthy environments. With these measures in place, the safety of



school pupils with regards the school meals they are served will be a lot more guaranteed. This risk of foodborne illnesses will also be highly reduced.

Conclusion

The findings disclosed that most food handlers had not received training on good hygiene practices and food safety, it also revealed that food handlers mostly use their general knowledge from home. This implies that training should be a requirement for food handlers working under the NSNP, in order for food handlers to prevent foodborne disease outbreaks and reduce the spread of food pathogens when handling and preparing food in various work environments. However, the results also revealed that food handlers seemed to understand some of the practices of food safety and hygiene that they need to adhere to, causes of foodborne disease outbreaks, and challenges of noncompliance with hygiene practices. Food handlers also pointed out that provision of adequate sanitary/food safety facilities in addition to continuous on-site training, evaluation, monitoring, and full-time kitchen-based supervision, would play a huge part in ensuring that food safety and hygiene practices are adhered to when handling and preparing food. This is highly recommended based on the findings of this research.

References

- Afoakwa, O. E. (2008). *Enhancing quality of feeding in educational institutions in Ghana. Development and challenges*. Available at <http://works.bepress.com/cgi/viewcontent.cgi?article=1039&context=emmanuelohenefoakwa> [Retrieved January 04 2018].
- Afolaranmi, T., Hassan, Z., Bello, D. & Misari, Z. (2015). Knowledge and practice of food safety and hygiene among food vendors in primary schools in Jos, Plateau State, North Central Nigeria. *E3 Journal of Medical Research*, 4 (2), 16-22.
- Altekruse, S. F., Yang S., Timbo, B. B. & Angulo, F. J. (1999). A multi-state survey of consumer food-handling and food-consumption practices. *American Journal Preventive Medicine*, 16, 216–221.
- Annor, G. A. & Baiden, E. A. (2011). Evaluation of food hygiene knowledge attitudes and practices of food handlers in food businesses in Accra, Ghana. *Food and Nutrition Sciences*, 2 (8), 830-836.
- Baş, M., Ersun, A. Ş. & Kıvanç, G. (2006). The evaluation of food hygiene knowledge, attitudes, and practices of food handlers' in food businesses in Turkey. *Food Control*, 17 (4), 317-322.
- Campos, A. K. C., Cardonha, Â. M. S., Pinheiro, L. B. G., Ferreira, N. R., De Azevedo, R. M. & Stamford, T. L. M. (2009). Assessment of personal hygiene and practices of food handlers in municipal public schools of Natal, Brazil. *Food Control*, 20 (9), 807-810.
- Choudhury, M., Mahanta, L. B., Goswami, J. S. & Mazumder, M. D. (2011). Will capacity building training interventions given to street food vendors give us safer food? A cross-sectional study from India. *Food Control*, 22 (8), 1233–1239.
- Creswell, J. W. (2015). *A concise introduction to mixed methods research*. Thousand Oaks, California : SAGE, ©2015.
- Da Cunha, D. T., Stedefeldt, E. & De Rosso, V. V. (2012). Perceived risk of foodborne disease by school food handlers and principals: The influence of frequent training. *Journal of Food Safety*, 32 (2), 219-225.
- Dei, F. A. (2014). *An Evaluation of the School Feeding Programme: A Case Study of Magog Primary School*. Masters dissertation. University of South Africa, Pretoria. pp. 3 - 4.

Published online: <https://www.scribd.com/document/335625135/Feeding-With-Instrument>

- Department of Health (2003). *Foodstuff, cosmetics and disinfectants act (1972). Regulation 468 relating to the application of the hazard analysis and critical control point system (R 908)*. National Department of Health, South Africa. Available at www.ehrn.co.za/download/reg_haccp.pdf [Retrieved October 06 2016].
- Egan, M. B., Raats, M. M., Grubb, S. M., Eves, A., Lumbers, M. L., Dean, M. S. & Adams, M. R. (2007). A review of food safety and food hygiene training studies in the commercial sector. *Food Control*, 18 (10), 1180-1190.
- Eves, A., Bielby, G., Egan, B., Lumbers, M., Raats, M. & Adams, M. (2010). Food safety : knowledge and behaviours of children (5-7 years). *Health Education Journal*, 69, 21-30.
- Fung, F., Wang, H. S. & Menon, S. (2018). Food safety in the 21st century. *Biomedical Journal*, 41 (2), 88-95.
- Grace, D., Alonso, S., Roesel, K., Covic, N. & McDermott, J. (2018). *Sustained food safety action for improved nutrition and health of Africans*. Background paper prepared for the 9th annual Africa Day for Food and Nutrition Security, Dar es Salaam, Tanzania, 4–5 December 2018. Nairobi, Kenya: ILRI.
- Janjić, J., Katić, V., Ivanović, J., Bošković, M., Starčević, M., Glamočlija, N., Jianu, C. & Chiş, C. (2012). Study on the hygiene knowledge of food handlers working in small and medium-sized companies in western Romania. *Food Control*, 26 (1), 151-156.
- Kulild, V. (2014). *Role of education in ending extreme poverty: Taking a global lead*. Available at <https://norad.no/en/front/about-norad/news/role-of-education-in-ending-extreme-poverty-taking-a-global-lead/> [Retrieved May 18 2019].
- Lazarević, K., Stojanović, D., Bogdanović, D. & Dolićanin, Z. (2013). Hygiene training of food handlers in hospital settings: important factor in the prevention of nosocomial infections. *Central European Journal of Public Health*, 21 (3), 146-149.
- Losasso, C., Cibin, V., Cappa, V., Roccatò, A., Vanzo, A., Andrighetto, I. & Ricci, A. (2012). Food safety and nutrition: Improving consumer behavior. *Food Control*, 26, 252–258.
- McEvoy, P. & Richards, D. (2006). A critical realist rationale for using a combination of quantitative and qualitative methods. *Journal of Research in Nursing*, 11 (1), 66-78.
- Michigan Department of Agriculture and Rural Development (MDARD) Food and Dairy Division (2012). *Michigan food safety*. Available at www.michigan.gov>mdard [Retrieved July 06 2018].
- Miles, S., Brennan, M., Kuznesof, S., Ness, M., Ritson, C. & Frewer, L. J. (2004). Public worry about specific food safety issues. *British Food Journal*, 106, 9–22.
- Moghaddam, A. F., Khoshnevisan, F., Bondarianzadeh, D., Mohammadi, M. & Abkenar, H. B. (2014). Development of a food safety attitude and practice questionnaire for Iranian consumers. *International Journal of Consumer Studies*, 38 (4), 367-373.
- Mullan, B., Wong, C., Todd, J., Davis, E. & Kothe, E. J. (2015). Food hygiene knowledge in adolescents and young adults. *British Food Journal*, 117 (1), 50-61.
- Ramful, K. (2017). *Food safety and good hygienic Practices*. Handbook for Gambian Youth Entrepreneurs. Available at [http://www.intracen.org/uploadedFiles/intracenorg/Content/Exporters/Exporting_Better/Quality_Management/AssetPDF/FINAL%20Food%20safety%20and%20GHP%20-%20Gambia\(2\).pdf](http://www.intracen.org/uploadedFiles/intracenorg/Content/Exporters/Exporting_Better/Quality_Management/AssetPDF/FINAL%20Food%20safety%20and%20GHP%20-%20Gambia(2).pdf) [Retrieved July 23 2018].
- Rendall-Mkosi, K., Wenhold, F. & Sibanda, N. B. (2013). *Case study of the National School Nutrition Programme in South Africa*. PCD, NEPAD, University of Pretoria.



- Available at http://hgsf-global.org/en/component/docman/doc_details/404-case-study-of-the-nationalschool-nutrition-programme-in-south-africa [Retrieved June 24 2016].
- Redmond, E. C. & Griffith, C. J. (2003). Consumer food handling in the home: A review of food safety studies. *Journal of Food Protection*, 66, 130-161.
- SABS (South African Bureau of Standards) (2001). Code of Practice: Food Hygiene Management. 3rd Edition. Pretoria: SABS.
- Sanfilippo, M., De Neubourg, C. & Martorano, B. (2012). *The impact of social protection on children: A review of the Literature*. Working Paper 2012-06, UNICEF Office of Research, Florence. pp. 24-28.
- Sani, N. A. & Siow, O. N. (2014). Knowledge, attitudes and practices of food handlers on food safety in food service operations at the University Kebangsaan Malaysia. *Food Control*, 37 (1), 210-217.
- Seaman, P. & Eves, A. (2010). Perceptions of hygiene training amongst food handlers, managers and training providers – A qualitative study. *Food Control*, 21 (7), 1037-1041.
- Sibanyoni, J. J., Tshabalala, A. & Tabit, F. T. (2017). Food safety knowledge and awareness of food handlers in school feeding programmes in Mpumalanga, South Africa. *Food Control*, 73 (B), 1397-1406.
- Tan, S. L., Bakar, F. A., Karim, M. S. A., Lee, H. Y. & Mahyudi, N. A. (2013). Hand hygiene: knowledge, attitudes and practices among food handlers at primary schools in Hulu Langat district, Selangor (Malaysia). *Food Control*, 34, 428-435.
- Thigeel, H. A. (2010). *Listeria Control and Safe Food Training for Dietary Managers*. Doctoral dissertation. Fort Collins, CO: Colorado State University. pp. 28.
- Todd, E. C., Michaels, B. S., Greig, J. D., Smith, D. & Bartleson, C. A. (2010). Outbreaks where food workers have been implicated in the spread of foodborne disease. Part 8. Gloves as Barriers to Prevent Contamination of Food by Workers. *Journal of Food Protection*, 73 (9), 1762-1773.
- Tomasević, I., Kuzmanović, J., Anđelković, A., Saračević, M., Stojanović, M. M. & Djekic, I. (2016). The effects of mandatory HACCP implementation on microbiological indicators of process hygiene in meat processing and retail establishments in Serbia. *Meat Science*, 114, 54-57.
- Veiros, M. B., Proença, R. P. C., Santos, M. C. T., Kent-Smith, L. & Rocha, A. (2009). Food safety practices in a Portuguese canteen. *Food Control*, 20 (10), 936-941.
- WHO (World Health Organization). Food Safety: What You Should Know (2015). Available at http://www.searo.who.int/entity/world_health_day/2015/whdwhat-you-should-know/en/ [Retrieved July 06 2018].
- Wilcock, A., Pun, M., Khanona, J. & Aung, M. (2004). Consumer attitudes, knowledge and behaviour: a review of food safety issues. *Trends in Food Science and Technology*, 15 (2), 56-66.
- Zhang, Y. & Wildemuth, B. M. (2009). *Qualitative Analysis of Content. Applications of Social Research Methods to Questions in Information and Library Science*. Portland, Oregon: Book News.