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Effects Of Health Education On Food Safety Practices Among Public Secondary School Students In Owerri Education Zone I, Imo State, Nigeria

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ABSTRACT

This study focused on the effect of health education on food safety practices among secondary school students in Owerri education Zone. This study used a quasi-experimental pretest-posttest design. The population of this study consisted of all the public secondary schools in Owerri Education Zone I, Imo State. The sample size for this study consisted of 397 students. A Food Safety Practice Achievement Test (FSPAT) was used as instrument for data collection. The instrument (FSPAT) comprised 40 multiple-choice questions addressing each cluster. The Instrument, Food Safety Practice Achievement Test (FSPAT), was validated and reliability of the instrument (FSPAT) was established by administering the instrument once on thirty (30) students from Enyiogugu secondary school Aboh Mbaise using Kudar-Richardson which yielded a reliability coefficient index of 0.97. Data were analysed using mean and standard deviation while Analysis of Covariance (ANCOVA) was used to test the hypotheses at $p < 0.05$. The finding of the study revealed a significant difference between proper hand washing before food handling ($p= 0.000$) and use of clean water in cooking and food preparation through health education programme (HEP) ($p= 0.000$). It also showed a non significant difference between using non-contaminated food in the kitchen through health education programme (HEP) ($p= 0.867$), food storage conditions through health education programme (HEP) ($p= 0.044$), food safety practices through HEP ($p= 0.172$) class ($p= 0.918$). Based on the findings of this study, it was concluded that Health Education Programmes significantly enhance students' understanding and practices regarding proper hand washing before food handling, use of clean water in cooking and food preparation, using non-contaminated food in the kitchen, and food storage conditions. These improvements are essential for ensuring food safety and preventing forborne illnesses. However, there was no significant difference in the mean achievement scores of students exposed to food safety practices through HEP based on age, and class level. Therefore, there is need to put in place special programmes that will enhance knowledge and positive attitude towards food safety among young ones.

Keywords: Food Safety Practice, health education, secondary school students

INTRODUCTION

It is an indisputable fact that eating a healthy and balanced diet is one of the best ways to prevent food borne diseases. Access to sufficient and safe food is a basic human need. Everyone is exposed to foodborne health risks (WHO, 2013). Foodborne and waterborne diarrhoea diseases killed an estimated

2.2 million people annually, most of whom are children (Fleliry et al. 2008). Diarrhoea is the most common foodborne illness caused by pathogens. According to WHO (2013), food poisoning caused by pathogenic bacteria still occurs at unacceptably high frequencies in industrialized nations and developing countries. The year 2008 recorded an unprecedented incidence of foodborne disease in the African regions including, anthrax in Zimbabwe, typhoid fever in Uganda and chemical poisoning due to consumption of seed beans and maize in Kenya and Nigeria. Foodborne diseases not only adversely affect people's health and well-being, but also have negative economic consequences for individuals, families, communities and businesses (Ewuzie, 2016). It was further stated that these diseases impose a substantial burden on health-care systems, trade and tourism, markedly reduce economic productivity and threaten livelihood.

Food is made up of vital substances that originate from plants and animals that contain nutrients needed by the body, such as carbohydrate, fats, protein, vitamins or minerals (Encyclopedia Britannica, 2012). Food is necessary for human survival. However; it could be a source of ill health to human if it is contaminated by microbes like E Coli, salmonella, shigella, campylobacter and S. aureus. As important as food is to humans, it is necessary to be careful of what one consumes to ensure safety by avoiding the intake of contaminated food substances that puts one at risk of foodborne diseases. Common experience shows that a lot of people eat whatever foods that come their way, without minding the quality and safety status of such edible substances. Most people are not even aware of the danger consuming pathogen-infested foods poses to their health. More so, some individuals do not know that they are suffering from food-borne diseases, because they do not show signs of having the disease, or that they are asymptomatic carriers. There is need, therefore, for increasing awareness of food safety in Nigeria through the health education programs focused on the consumer.

Health education is a specialized education intended to have a positive impact on people's health behaviours. It is an education concerning prevailing health problems and the methods of preventing and controlling them. Health education may be intentionally directed towards knowledge levels, attitudes or specific behaviours like food safety practices (Dignan & Carr, 2018). Food safety is influenced by many environmental factors, such as poor knowledge of food safety measures, poor food hygiene and poor attitudes of food vendors towards food safety, socio-cultural beliefs and trust (Thilde, 2008). Azanaw et al. (2019) suggested that lack of basic sanitary facilities/infrastructures, poor knowledge and practice of hygiene and sanitation among food handlers in food service establishments, and negligence in safe food handling are major reasons of poor food safety. Food safety is cognate to food hygiene and this encompasses a whole range of issues that must be addressed to ensure the safety of ready to eat foods. Food hygiene therefore put too much emphasis on cleanliness while food safety requires much more than a clean premises (World Health Organisation, 2017). Food safety refers to the conditions and practices that preserve the quality of food to prevent contamination and foodborne illness (Medeiros et al. 2004). It is necessary to point out that healthy practices should extend to food handling in order to prevent foodborne illness. Thisis because mishandling of food as well as unhygienic or unsanitary conditions may result in food poisoning, leading foodborne disease outbreaks (Tavonga, 2014). Increasing the knowledge of food vendors and consumers in safety matters, therefore, has been recommended as means of improving food handling practices and safety of food (WHO/FAO, 2009).

Kilander (2005) opined that practice is the actual application of habit, behaviour, conduct, actions or work response, which ensures good health. Practicing good health will protect one from physical, social, emotional and other health hazards (Edwin, 2003). Rapport (2003) asserted that practice is a way of carrying out performance of an act habitually or contentedly. Therefore, food safety practices are attitudes towards food handling, which ensure that food consumed by people do not harm them or pose risk to their healthy. Adhering to safe food handling practice is essential as poor food safely practice can introduce hazards into the food through cross contamination such as storing raw and cooked foods together. Rane (2011) reported in a study conducted in Spain that some food handlers self-reported that they had mixed containers loaded with raw materials and those with cooked food. This could introduce hazards through cross contamination between the raw material and prepared food, therefore WHO (2006) advises that raw

materials should be separated from processed foods in order to reduce the risk of cross contamination. For the same reason, they further advised that equipment and utensils used for handling raw foods and prepared foods should be separated, and that food should be kept in separate containers to avoid contact between cooked and raw food. WHO (2006) ascertained that poor food safety practice such as those related to inadequate preparation and improper cooking of food, insufficient processing, poor hygiene and re-use of leftovers are responsible for causing 14% of foodborne disease. Since food borne illness can be serious or even fatal, it is important for adolescents to know and practice safe food handling behaviours to help reduce their risk of accidentally, getting sick from contaminated food. For adolescents to practice safe food handling, adolescents have to observe health promotion.

Food poisoning cases are usually reported among school students that involve in school canteens, hostel kitchens and food prepared under supplementary food programme. The contributing factors in these outbreaks of food poisoning are improper storage or holding temperature and poor personal hygiene. This agrees with the study of Raji et al. (2021). There are many studies about the knowledge and practices of food safety which was done on different groups (Dong, 2015). But that of effects of health education on food safety practices is yet unknown because there is no empirical work existing in this area that is known to the researcher.

In Owerri Education Zone I Imo State where there is rural and urban migration, the level of food hygiene practices is behind the standard of hygiene recommendations. Several health problems traceable to food-borne diseases or infectious diseases were reported from children around the age of secondary level which was a result of poor compliance to safety and hygiene standards in schools and home. It was observed that the increase level of food wastage causes food insecurity due to low level of knowledge and negative practices may leads to health outcome. The needs for intervention to reduce the dwindling issues affecting the health and safety of children before they attain the adulthood. The introduction of health education programme would be able to increases and encourage good practices of food safety hygiene. In the light of this, the study sought to carry out effects of health education on food safety practices among secondary school students in Owerri Education Zone I Imo State, Nigeria.

METHODOLOGY

This study was conducted in Owerri Education Zone I of Imo State, Eastern Nigeria. This study used a quasi-experimental pretest-posttest design. The population of this study consisted of all the public secondary schools in Owerri Education Zone I, Imo State. The sample size for this study consisted of 397 students. A Food Safety Practice Achievement Test (FSPAT) was used as instrument for data collection. The instrument (FSPAT) comprised 40 multiple-choice questions addressing each cluster. The Instrument, Food Safety Practice Achievement Test (FSPAT), was validated and reliability of the instrument (FSPAT) was established by administering the instrument once on thirty (30) students from Enyiogugu secondary school Aboh Mbaise using Kudar-Richardson which yielded a reliability coefficient index of 0.97. The pre-test was administered on the participant one day before the treatment started. Immediately after the treatment period, the same instrument was administered to the same students as post-test. All the research questions were answered using mean and standard deviation while Analysis of Covariance (ANCOVA) was used to test the hypotheses at $p < 0.05$.

RESULTS

Table 1: Mean difference in the achievement scores of students exposed to proper handwashing before food handling through HEP and those not exposed to it

Group	N	Test Type	Mean	SD	Gain	Mean Diff
Experimental	208	**Pre-test**	44.7	7.673	20.2	
		Post-test	64.9	7.883		4.0
Control	189	**Pre-test**	43.0	9.497	17.9	
		Post-test	60.9	9.937		

From Table 1, experimental group had a pre-test mean score of 44.7 with SD of 7.673 and a post-test mean *achievement* score of 64.9 with SD of 7.883 (mean gain = 20.2) while control group had a pre-test mean score of 43.0 with SD of 9.497 and post-test mean achievement score of 60.9 with SD of 9.937 (mean gain = 17.9) given a mean difference of 4.0 in favour of the experimental group. This indicates that exposing secondary school students to proper hand washing before food handling through health education programme is very effective on students' achievement.

Table 2: Mean difference in the achievement scores of students exposed to the use of clean water in cooking and food preparation through HEP and those not exposed to it

Group	N	Test Type	Mean	SD	Gain	Mean Diff
Experimental	208	**Pre-test**	51.8	10.001	20.1	
		Post-test	71.9	11.267		9.8
Control	189	**Pre-test**	51.8	10.014	10.3	
		Post-test	62.1	11.378		

From Table 2, experimental group had a pre-test mean score of 51.8 with SD of 10.001 and a post-test mean achievement score of 71.9 with SD of 11.267 (mean gain = 20.1) while control group had a pre-test mean score of 51.8 with SD of 10.014 and post-test mean achievement score of 62.1 with SD of 11.378 (mean gain = 10.3) given a mean difference of 9.8 in favour of the experimental group. This indicates that exposing secondary school students to the use of clean water in cooking and food preparation through health education programme is very effective on students' achievement.

Table 3: Mean difference in the achievement scores of students exposed to using non-contaminated food in the kitchen through HEP and those not exposed to it

Group	N	Test Type	Mean	SD	Gain	Mean Diff
Experimental	208	**Pre-test**	54.7	4.315	9.8	
		Post-test	64.5	6.157		0.1
Control	189	**Pre-test**	54.9	4.394	9.6	
		Post-test	64.4	6.257		

Table 3 shows experimental group had a pre-test mean score of 54.7 with SD of 4.315 and a post-test mean achievement score of 64.5 with SD of 6.157 (mean gain = 9.8) while control group had a pre-test mean score of 54.9 with SD of 4.394 and post-test mean achievement score of 64.4 with SD of 6.257 (mean gain = 9.6) given a mean difference of 0.1. This indicates that exposing secondary school students to using non-contaminated food in the kitchen through health education programme may not affect students' achievement.

Table 4: Mean difference in the achievement scores of students exposed to food storage conditions through HEP and those not exposed to it

Group	N	Test Type	Mean	SD	Gain	Mean Diff
Experimental	208	**Pre-test**	49.0	10.558	12.4	
		Post-test	63.4	9.639		0.7
Control	189	**Pre-test**	48.3	8.879	14.4	
		Post-test	62.7	8.568		

Table 4 shows experimental group had a pre-test mean score of 49.0 with SD of 10.558 and a post-test mean achievement score of 63.4 with SD of 9.639 (mean gain = 12.4) while control group had a pre-test mean score of 48.3 with SD of 8.879 and post-test mean achievement score of 62.7 with SD of 8.568 (mean gain = 14.4) given a mean difference of 0.7 in favour of the experimental group. This indicates that exposing secondary school students to storage condition through health education programme is very effective on students' achievement.

Table 5: Mean difference in the achievement scores of students within the ages of 10 – 13 years and 14 – 17 years exposed to food safety practices through HEP

Group	N	Mean Pre-test	Mean Post-test	Mean Gain Score	SD Pre-test	SD Post-test
10-13 years	208	49.4	62.8	13.4	8.203	9.224
14-17 years	189	49.8	63.5	13.7	7.910	8.833

Table 4 shows that secondary school students within the age of 10-13 years had a mean achievement score of 45.4 and SD of 8.203 in the pre-test and mean of 62.8 and SD of 9.224 in the post-test while students within the age of 14-17 years had a mean achievement of 49.8 and SD of 7.910 in the pre-test and mean of 63.5 and SD of 8.833 in the pos-test with mean gain of 13.4 and 13.7 respectively. These gave mean difference in achievement score of 0.3 in favour of the students within the age of 14- 17 years. This indicates that exposing secondary school students to food safety practices through health education programme is very effective on students' achievement within the age of 14-17 years than students within the age of 10-13 year.

Table 6: Mean difference in the achievement scores of secondary school students (JSS 2 and JSS 3) exposed to food safety practices through HEP

Group	N	Mean Pre-test	Mean Post-test	Mean Gain Score	SD Pre-test	SD Pre-test
JSS 2	208	45.2	125.5	80.3	7.747	14.114
JSS 3	189	46.2	113.4	67.2	9.295	12.491

Table 6 shows that JSS1-3 students had a mean achievement score of 45.2 and SD of 7.747 in the pre-test with mean of 125.5 and SD of 14.114 in the post-test with mean gain of 80.3 while JSS 3 students had mean of 46.2 and SD of 9.295 in the pre-test with mean of 113.4 and SD of 12.491 in the post-test with mean gain of 67.2. These gave mean difference in achievement score of 12.1 in favour of the JSS 3 students. This shows that HEP slightly improved the achievement scores JSS 3 students than JSS 2 students. This indicates that exposing secondary school students to food temperature control through health education programme is more effective on JSS 3 students' achievement than the JSS 2 students.

Table 7: ANCOVA result on the significant difference in the mean achievement scores of experimental and control groups.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	27918.020a	16	1744.876	130.608	.000	.846
Intercept	8021.480	1	8021.480	600.425	.000	.612
Pre-test	18608.016	1	18608.016	1392.850	.000	.786
Method	**282.220**	**1**	**282.220**	**21.125**	**.000**	**.053**
Gender	356.041	1	356.041	26.650	.000	.066
Age	40.050	1	40.050	2.998	.084	.008
Class	19.428	1	19.428	1.454	.229	.004
Error	5076.675	380	13.360			
Total	1610074.000	397				
Corrected Total	32994.695	396				

From the result of the ANCOVA test as shown in Table 7, the statement of hypothesis 1 is rejected; implying that there is a significant difference in the mean achievement scores of students exposed to personal hygiene of food handlers through health education programme (HEP) and those not exposed to it. This is because, the p-value (Sig. = 0.000) is less than 0.05 alpha level. This shows that the exposing students to proper hand washing before food handling through HEP is very effective.

Table 8: ANCOVA result on the significant difference in the mean achievement scores of experimental and control groups

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	31286.940a	16	1955.434	44.123	.000	.650
Intercept	3826.131	1	3826.131	86.334	.000	.185
Pre-test	31100.228	1	31100.228	701.755	.000	.649
Method	**203.083**	**1**	**203.083**	**4.582**	**.033**	**.012**
Gender	38.025	1	38.025	.858	.355	.002
Age	48.783	1	48.783	1.101	.295	.003
Class	170.750	1	170.750	3.853	.050	.010
Error	16840.757	380	44.318			
Total	1587368.000	397				
Corrected Total	48127.698	396				

From the result of the ANCOVA test as shown in Table 8, the statement of hypothesis 2 is rejected; implying that there is a significant difference in the mean achievement scores of students exposed to the use of clean water in cooking and food preparation through health education programme (HEP) and those not exposed to it. This is because, the p-value (Sig. = 0.033) is less than 0.05 alpha level. This shows that exposing students to the use of clean water in cooking and food preparation through HEP is very effective.

Table 9: ANCOVA result on the significant difference in the mean achievement scores of experimental and control groups

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3763.839a	16	235.240	7.810	.000	.247
Intercept	1701.604	1	1701.604	56.497	.000	.129
Pre-test	3615.774	1	3615.774	120.052	.000	.240
Method	**.844**	**1**	**.844**	**.028**	**.867**	**.000**
Gender	22.459	1	22.459	.746	.388	.002
Age	.081	1	.081	.003	.959	.000
Class	1.288	1	1.288	.043	.836	.000
Error	11445.018	380	30.118			
Total	1665216.000	397				
Corrected Total	15208.856	396				

From the result of the ANCOVA test as shown in Table 9, the statement of hypothesis 3 is accepted; implying that there is no significant difference in the mean achievement scores of students exposed on using non-contaminated food in the kitchen through health education programme (HEP) and those not exposed to it. This is because, the p-value (Sig. = .867) is greater than 0.05 alpha level. This shows that exposing students on using non-contaminated food in the kitchen through HEP was not very effective.

Table 10: ANCOVA result on the significant difference in the mean achievement scores of experimental and control groups

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1918.232a	16	119.889	1.622	.060	.064
Intercept	68411.423	1	68411.423	925.712	.000	.709
Pre-test	79.184	1	79.184	1.071	.301	.003
Method	**302.316**	**1**	**302.316**	**4.091**	**.044**	**.011**
Gender	214.045	1	214.045	2.896	.090	.008
Age	50.139	1	50.139	.678	.411	.002
Class	61.252	1	61.252	.829	.363	.002
Error	28082.534	380	73.901			
Total	1610864.000	397				
Corrected Total	30000.766	396				

From the result of the ANCOVA test as shown in Table 10, the statement of hypothesis 4 is rejected; implying that there is a significant difference in the mean achievement scores of students exposed to food storage conditions through health education programme (HEP) and those not exposed to it. This is because, the p-value (Sig. = 0.044) is less than 0.05 alpha level. This shows that exposing students to food storage conditions through HEP is very effective.

Table 11: ANCOVA result on the significant difference in the mean achievement scores of students within the ages of 10-13 years and 14-17 years exposed to food safety practices through HEP

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1842.041a	16	115.128	9.342	.000	.282
Intercept	4375.130	1	4375.130	355.019	.000	.483
Pre-test	1241.184	1	1241.184	100.716	.000	.210
Method	17.500	1	17.500	1.420	.234	.004
Gender	20.595	1	20.595	1.671	.197	.004
Age	**23.069**	**1**	**23.069**	**1.872**	**.172**	**.005**
Class	.131	1	.131	.011	.918	.000
Error	4682.985	380	12.324			
Total	1589534.500	397				
Corrected Total	6525.026	396				

From the result of the ANCOVA test as shown in Table 11, the statement of hypothesis 5 is accepted; implying that there is no difference in the mean achievement scores of students within the ages of 10-13 years and 14-17 years exposed to food safety practices through HEP. This is because, the p-value (Sig. = .172) is greater than 0.05 alpha level.

Table 12: ANCOVA result on the significant difference in the mean achievement scores of secondary school students (JSS 2 and JSS 3) exposed to food safety practices through HEP

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1842.041a	16	115.128	9.342	.000	.282
Intercept	4375.130	1	4375.130	355.019	.000	.483
Pre-test	1241.184	1	1241.184	100.716	.000	.210
Method	17.500	1	17.500	1.420	.234	.004
Gender	20.595	1	20.595	1.671	.197	.004
Age	23.069	1	23.069	1.872	.172	.005
Class	**.131**	**1**	**.131**	**.011**	**.918**	**.000**
Error	4682.985	380	12.324			
Total	1589534.500	397				
Corrected Total	6525.026	396				

From the result of the ANCOVA test as shown in Table 12, the statement of hypothesis 6 is accepted; implying that there is no significant difference in the mean achievement scores of students in junior secondary school (JSS 2) and junior secondary school (JSS 3) exposed to food safety practices through HEP. This is because, the p-value (Sig. = .918) is greater than 0.05 alpha level.

DISCUSSION

From the findings of the study, it was revealed that using Health Education Programme (HEP) is very effective on students' achievement in proper handwashing before food handling. The study's findings underscore the significant impact of Health Education Programmes (HEP) on students' knowledge and practices related to proper hand washing, particularly for food handlers. There is a significant difference ($p<0.05$) in the mean achievement scores of students exposed to proper handwashing before food handling through health education programme (HEP) and those not exposed to it. This by implication goes to show that integrating HEP into the curriculum, students demonstrated marked improvements in understanding and implementing proper handwashing before food handling. This is crucial as food handlers play a pivotal role in preventing foodborne illnesses. Improved proper handwashing before food handling among students can reduce contamination risks, fostering a safer food preparation environment both in schools and at home. This implies health education has a high positive effect on hygiene of food handlers, this was expected because health education aims at altering attitude of people to ensure healthy choices. This was corroborated by the study of Ejomarie and Achalu (2022) which showed health education had significant effect on food vendor's behaviour towards food safety, this was buttressed by an intervention study where more vendors started keeping their fingernails clean after the intervention. The reviewed studies highlight the effectiveness of health education as an intervention in controlling hygienic practices among food vendors. According to a study by Ghaffari et al. (2020) on the effectiveness of a health intervention based on WHO food safety manual in Iran using a quasi-experimental design with an intervention and control group, the result showed that while the two groups showed no statistically significant difference in the pretest. In the post-test, the mean scores for all variables were higher in the intervention group than the control, and this difference between the two research groups was statistically significant. This simply implies health education as an intervention strategy was effective in promoting hygiene among food handlers. While food vendors may still not be operating at the required standards set by federal ministry of health even with health education as shown by Singh et al. (2016) where there was no significant improvement in overall score of vendors. However, scores in domains of personal habits, hygiene and food handling practices improved significantly after intervention. This leads to the conclusion that health education alone can only partly improve food safety practices of street vendors but greatly improves hygiene.

The study revealed that using Health Education Programme (HEP) is very effective on students' achievement in the use of clean water in cooking and food preparation. There is a significant difference ($p>0.05$) in the mean achievement scores of students exposed to the use of clean water in cooking and food preparation through health education programme (HEP) and those not exposed to it. The study highlighted that students who participated in HEP showed a greater propensity to use clean water in cooking and food preparation. This finding is critical, as using clean water in cooking and food preparation is a fundamental aspect of food safety. Cross-contamination from dirty water is a common source of foodborne pathogens. By emphasizing the importance of clean utensils, HEP helps instill lifelong habits that can significantly reduce the risk of foodborne diseases, ensuring better health outcomes for the students and those they serve. Health education as an intervention strategy impacts on the knowledge, attitude and practice of hygiene and general food safety among food handlers. According to Yarrow et al. (2008) and Dudeja et al (2017). There was improvement in knowledge and attitude towards hygiene following health education. This was supported by a quasi-experimental intervention study by Afolaranmi et al. (2014) and Ramezanhkani et al. (2022) who showed the level of knowledge of food safety and hygiene improved significantly after the training. The similarity in the studies may be explained by the fact that health education is an important modifier of knowledge and attitude which influences practice of hygiene, as such more food handlers should be the target of health education programs to improve food safety, the study also recommends the use of WHO food safety handling manual as it has proven to be effective in improving hygiene among food handlers. This finding was corroborated by Tuglo et al. (2021) which showed the odd for good hygiene practice of food safety found among street food handlers who had training on food safety courses was six times more likely compared to those who had not. The impact of health education is seen in hygienic activities adhered to during the cooking process from preparation to serving. According to Monney et al. (2013) food vendors in educational institutions generally adhered to good food hygiene practices, namely, regular medical examination, protection of food from flies and dust; proper serving of food; good hand hygiene; and the use of personal protective clothing. The training of food vendors on food hygiene had a significant association.

The finding of this study also revealed that using Health Education Programme (HEP) is very effective on students' achievement in using non-contaminated food. There is no significant difference in the mean achievement scores of students exposed to environmental sanitation through health education programme (HEP) and those not exposed to it. Environmental sanitation was another area where HEP proved to be highly effective. Students who received education on the using non-contaminated food were more likely to practice good hygiene and sanitation . This includes regular cleaning of food preparation areas, proper waste disposal, and maintaining overall cleanliness. Environmental sanitation is a cornerstone of public health, and instilling these practices in students helps create a culture of cleanliness that can extend beyond the school environment into the wider community. This implies health education has a positive effect on using non-contaminated food among food handlers. This result was expected as health education highlights the importance of using non-contaminated food as non-contaminated food reduces the risk of food poisoning, which can lead to serious health issues such diarrhea and vomiting. Okojie and Isah (2014) which showed of the observed vending sites appeared clean. This good result is attributed to massive health education campaign and frequent environmental inspection, this was shown in an intervention study by Afolararanmi (2011) where majority of the food handlers in the study group had good practice of food safety and hygiene after the training as against who had same before the training, the tidiness of the food premises was also significantly improved by the training. Vectors of these diseases are usually found in a dirty environment, this highlights the need for continuous environmental sanitation. This was highlighted by the study of Marie-Rosette et al. (2017) where health education was employed in the control of a Salmonella typhi outbreak in a Burundian refugee camp in 2016 as most respondents used pit latrines for disposal of feces, hand washing practice before eating and after using the toilet improved by thirty-seven percent. The similarity in the result of the reviewed studies show an

important aspect of health education is using non-contaminated food as the route of transmission for certain infections can be effectively interrupted when food is free from contamination.

Additionally, the study revealed that students educated through HEP were more knowledgeable about food temperature control. There is a significant difference in the mean achievement scores of students exposed to food storage condition through health education programme (HEP) and those not exposed to it. This is a critical component of food safety, as poor food storage condition can lead to the growth of harmful bacteria. By teaching students the importance of proper food storage condition, HEP equips them with the knowledge to prevent foodborne illnesses. This education is particularly relevant in preventing common issues such as improper storage and reheating of leftovers, which are frequent culprits in food poisoning cases. However, effects of health education on food storage condition was found more among those who put perishable foods into the refrigerator as soon as they buy them and among those who eat meat that is well cooked. This implies health education has a positive impact on food storage condition. Proper food storage condition is important to food preservation. This was shown by Syed et al. (2021) where restaurant supervisors had good knowledge about storing food in the freezer and in the refrigerator but had poor knowledge of storage condition in food. Also Radu et al. (2014) showed generally knowledge of food safety was good, however, respondents lacked knowledge about the hazards of reheating cooked food and the safe temperature of cooked food. These studies point out that food handlers have problem with storage condition for hot foods but had good storage condition practice for cold foods. This highlights the gaps in the health education curriculum for food handlers on storage condition. Health education influences attitude towards food safety and food storage, according to Afolararanmi (2011) a positive attitudinal change was produced by the training as majority of the respondent had good attitude towards food safety and hygiene at baseline and at post-intervention in the study group. The similarities in the findings of this study and reviewed studies may be because health education holds immediate and long term benefits to food handlers.

The finding of this study showed that exposing secondary school students to food safety practices through health education programme is very effective on students' achievement within the age of 14-17 years than those within the age of 10-13 years. There is no difference in the mean achievement scores of students within the ages of 10-13 years and 14-17 years exposed to food safety practices through HEP. This corroborates the findings of Faremi et al. (2020) and Afolararanmi (2011) who reported similar results. According to Radu et al. (2014), knowledge of food safety differed significantly ($p<0.05$) by age groups. These results show that health education was associated with more safety practice with older age, but age may not be sufficient factor influencing safety practice, other factors should be considered in the relationship with safety practice as shown by Ejomarie and Achalu (2022) where health education had no significant effects on food vendor's behaviours towards food safety based on gender, age, class level and location. Also according to Samuel and Amini (2020), there is no significant relationship between food safety knowledge and practice and socio-demographic characteristics such as age, level of education, marital status, religion and years of experience. The difference in the result between this study and reviewed studies may be due to other factors besides age influencing safety practice among food handlers.

Also, the study revealed that exposing secondary school students to food temperature control through health education programme is more effective on SSS1-3 students' achievement than the JSSI-III students. There is no significant difference ($p>0.05$) in the mean achievement scores of students in junior secondary school (JSSI-III) and senior secondary school (SSSI-III) exposed to food safety practices through HEP. The result showed that of respondents who were in JSSI-III and who were in SSI-III had high effects of health education on food safety practices. This implies health education had more positive effect for those in the lower class, although the difference was small. The finding of this study does not agree with that of Jayarajah et al. (2019) which showed senior students had higher combined KAP and knowledge (K) on hand hygiene and equipment hygiene compared to junior students. However, they had lower KAP and P scores on attire hygiene. Also Almansour et al. (2016) posited that knowledge levels was less in primary school students compared to high school students. Attitude level was high in primary school students compared to intermediate school students. No significant difference ($p>0.05$) was

observed between groups with regard to practice levels. Those with higher education are exposed to more information and are expected to make more quality decisions concerning food safety, this was demonstrated in the study by Tuglo et al. (2021) which showed that street food handlers with secondary education were 4 times good at hygiene practices of food safety compared to those with no education and Okojie and Isah (2014) which also showed respondents with tertiary education, vended food in environment with good hygiene status compared to those with secondary. According to Odo and Onoh (2018), more than half of those who have primary education had good knowledge about food hygiene while majority of those who have secondary education had good knowledge of food hygiene. There was no significant difference in the level of food hygiene knowledge possessed by food handlers based on level of education. There was no significance difference in the food hygiene practices of food handlers based on level of education. the reviewed studies show those in higher classes had significantly more knowledge about safe food handling, although there was no significant difference in the practice of food safety between the classes, this suggests other factors determine practice of food safety.

CONCLUSION

Based on the findings of this study, it was concluded that Health Education Programmes significantly enhance students' understanding and practices regarding proper hand washing before food handling, use of clean water in cooking and food preparation, using non-contaminated food in the kitchen, and food storage conditions. These improvements are essential for ensuring food safety and preventing forborne illnesses. By embedding these critical health practices in educational curricula, HEP not only improves immediate student health outcomes but also fosters long-term public health benefits. The success of HEP in these areas suggests that expanding such programmes could have far-reaching positive effects on community health standards. However, there was no significant difference in the mean achievement scores of students exposed to food safety practices through HEP based on age, and class level. Therefore, there is need to put in place special programmes that will enhance knowledge and positive attitude towards food safety among young ones.

RECOMMENDATIONS

In view of the findings of this study, the following recommendations were made:

1. Policy maker and curriculum developers should integrate comprehensive HEP into school curricular to ensure that students receive essential knowledge and skills related to proper handwashing before food handling.
2. Class room teachers should establish hand washing routines before meals and snacks in the classroom.
3. Parents should inculcate their children on the use of clean water for cooking and food preparation.
4. Curriculum planners should incorporate food safety practices focused on food storage into regular school curricular.

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