

Strengthening Food Safety Using Nurse-Led Training Among Handlers and Pupils in Schools

Author(s), SODIMU Jeminat Omotade,
OKAFOR, Ngozi Anthonia (RN, RM, RPHN, PhD, Assoc. Prof.),
Prof. AJAO, Ezekiel O. (RN, RNT, RRNN, PhD, FWACN),

Abstract:

The present research conducted and tested the effectiveness of nurse-led training on food safety among primary school pupils and food handlers in Ogun State. The study adopted a quasi-experimental design incorporating pre-test and post-test non-randomised control group. Using multistage sampling procedure to select 500 pupils and food handlers, the researcher embarked on random assignment of the Schools to each of the treatment groups with intact class containing Primary 5 pupils and food handlers in each school participating in the study. Food Safety Questionnaire (FSQ) was constructed and validated by the researcher to gather relevant data on food safety. A treatment package whose contents were developed validated using the Delphi approach, was prepared by the researcher to serve as a guide for research assistants administering the treatment. Descriptive statistics was used to answer research questions while the hypotheses, were analysed using Analysis of Covariance (ANCOVA). Significant difference was observed among the pre- and post-test mean score differences of pupils and handlers in different treatment and certification groups as well as in different types of schools on food safety ($F_{3, 483} = 18.220$; $p < .05$). It was recommended among others that concerned authorities should incorporate nurse-led training into enhancing food safety in schools through organizing of periodic trainings conducted by nurses or allied personnel for both learners and pupils in schools.

Keywords: Food Safety, Nurse-led Training, Handlers, Pupils,

IJMNHS

Accepted 15 February 2023
Published 28 February 2023
DOI:10.5281/zenodo.7757279



About Author

Author(s): SODIMU Jeminat Omotade

Ogun State College of Nursing Sciences, Abeokuta, Ogun State, Nigeria.
sodimu0233@pg.babcock.edu.ng

OKAFOR, Ngozi Anthonia (RN, RM, RPHN, PhD, Assoc. Prof.)

Department of Public/Community Health Nursing,
School of Nursing Science,
Babcock University, Ilishan-Remo, Ogun State, Nigeria.
okafor@babcock.edu.ng

and

Prof. AJAO, Ezekiel O. (RN, RNT, RRNN, PhD, FWACN)

School of Nursing Science,
Babcock University, Ilishan-Remo, Ogun State, Nigeria.
lasun_ajao@yahoo.com



Introduction

Nutrition is of vital importance in the physical, emotional and intellectual development of children for retarded academic performance is not the only risk of lack of good food; various health risks that may deform the body system or result in sickness or death are obviously also, not unconnected to consumption of foods devoid of safety. Provision of safe foods to children is key to the achievement of the sustainable development goals by 2030 (UNICEF, 2019), and it is in this quest and the tremendous educational and health benefits of safe foods (Wang & Fawzi, 2020) that schools particularly in low and medium income countries like Nigeria now superintend over or have a stake in the feeding of learners (Drake et al., 2017; WFP, 2013).

Be that as it may, foods served or sold to children in schools are sometimes of unsafe to satisfy the aesthetic or nutritional needs of learners (Okojie & Isah, 2014) which have grave consequences for the physical growth, health status (Jaffee et al., 2018) and academic development of learners (Cupertino et al., 2022). This shows the need to train and monitor food handlers on food safety (Nordhagen et al., 2022) if their services are not to be discontinued in schools.

Food safety is a core preventive measure against food-borne diseases. Though, it has been variously defined but the crux of food safety is resident in the ability of served or consumed food to portend no health risks due to preparatory handling, storage and exposure to micro-organisms or other forms of contamination. The safety of what children consume is of paramount importance as feeding is directly linked to the physical growth, health status, academic outcomes, economic viability and future progress of children (WHO, 2019).

Food safety is connotative of the universal term which portrays the absence of harmful, dangerous or deadly substances from consumable edible materials. As food is a requirement for survival by all, so, is its safety an important aspect of human right. This is further amplified by the fact the scale of global damage which food-borne diseases portend on human life and its quality. Billions of the world populations are affected by unsafe food out of which countless millions are at the risk of falling sick just as hundreds of thousands annually following the consumption of unsafe food (Funget al., 2018). The danger in food safety challenges is reflected in the speed and universality of its spread among nations and different products. Funget al., (2018) reported the cases of grievous outbreaks of food-borne diseases which transverse and migrated across continents. Accordingly, the 2008 contamination of infant formula with melamine which occurred in China, affected 300,000 infants and young children, out of whom 51, 900 were hospitalized and 6 dead.

Jaffee et al. (2018) implementing nutritional guideline which involved training programme that focused on behaviour, identification of eating difficulties and knowledge, observed that this kind of nurse-led training impacted on individuals 'food choices which subsequently removed under-nutrition and its attached risk. This behaviour-changing interventions led by nurses have been documented by various studies to lead to learning of healthy feeding habits, better food choices, improved risk factors and to relatively behavioural change (Cheng et al., 2017). As part of routine care, community or school nurses with adequate knowledge of nutrition can also train children in schools and handlers of their food in order that healthy,



nutritious and palatable diet may become fundamental to meal plans and what is subsequently offered in schools (Jaffee et al., 2018).

Due to low-level of education and lack of professionalism, food handlers have been mostly responsible for food contamination (Leslie et al., 2021). This is not unconnected to the previous studies which have focused on training of food handlers and the need for monitoring and provision of highly qualitative food, without factoring-in the pupils who are the major consumers. This has done a major disservice because it has not improved safety practices. Due to this exclusion factor, pupils that will likely reject buying things within the school, will be persuaded or coerced to do so. It is in this view that this present study seeks to conduct and test the effectiveness of nurse-led training and safety compliance monitoring on safety among primary school pupils and food handlers. The objectives of the present study were to:

1. assess the pre- and post-test mean score differences of pupils and handlers in different treatment groups on food safety;
2. assess the pre- and post-test mean score differences of pupils and handlers in private and public schools on food safety; and
3. assess the pre- and post-test mean score differences of pupils and handlers in certified and uncertified handlers' groups on food safety.

Research Questions

1. What are the pre- and post-test mean score differences of pupils and handlers in different treatment groups on food safety?
2. What are the pre- and post-test mean score differences of pupils and handlers in private and public schools on food safety?
3. What are the pre- and post-test mean score differences of pupils and handlers in certified and uncertified handlers' groups on food safety?

Research Hypotheses

H₀₁: There is no significant difference among the pre- and post-test mean score differences of pupils and handlers in different treatment groups on food safety

H₀₂: There is no significant difference between the pre- and post-test mean score differences of pupils and handlers in private and public schools on food safety;

H₀₃: There is no significant difference between the pre- and post-test mean score differences of pupils and handlers in certified and uncertified handlers' groups on food safety;

Research Methods

This study adopted a quasi-experimental design incorporating pre-test and post-test non-randomised control group. The population for this study comprises all Primary 5 pupils as well as food handlers in all public and government-approved private primary schools in Ogun State, Nigeria. This is because Primary 5 pupils have already spent appreciable number of years in the primary school which gives the research the opportunity to observe with ease, the informed assessment of the subjects on food, as important variable of the study. Also, the fact that these students have one more year to spend can give ample opportunity to the researcher for follow-up if necessary.

All the public and government-approved primary schools in Ogun State were involved in the study except those ones whose pupils were yet to get to Primary 5. For a school to participate in the study, it must be government-approved and in possession of at least one food



vendor/handler. Multistage sampling technique was used to select the sample for the study. First, using cluster sampling technique, each of the four blocs, Remo, Ijebu, Yewa and Egba in Ogun State was taken as a cluster. Second stage involved using stratified random sampling technique to divide each of the 4 clusters in stage 1 into public and government-approved private schools, making each of the 4 clusters to contain 2 strata. Therefore, there will be 8 strata in all, 4 of which contained public primary schools and the remaining 4 government-approved private schools. The third stage involved the use of random sampling technique to select 2 school from each of the resulting eight strata. This implies 16 schools (8 private and 8 public) in all. The last stage was the random assignment of the Schools in each cluster to each of the 4 treatment groups, allowing only the intact class containing Primary 5 pupils as well as food handlers in each school to participate in the study.

Food Safety Questionnaire (FSQ) was developed by the researcher. It is a Likert-type questionnaire purposefully designed to gather continuous data on the salient constructs of food safety including. It consists of sections A and B. Section A is on personal information about pupils and food handlers in with respect to age, school type, gender and whether they are pupil or food handler in the school. Section B consists of 20 items on food safety.

Proper application of Lawshe's formula was done in this study by giving the instrument to five experts in the field to rate the appropriateness of each of the items in the instrument, after which Lawshe's formula was used in each case to determine the Content Validity Index (CVI) of the instrument.

To determine the reliability of the instruments, a pilot study conducted using 30 subjects similar to, but not present in the real samples that will be engaged later in the study. Using SPSS version 23, the Cronbach Alpha value was computed for FSQ and figures obtained was 0.879 which showed that the instrument was sufficiently reliable.

At the first week of the research, the research instrument, FSQ was administered on participating handlers and pupils to obtain the pre-test measure while at the eight week into the research, the same instrument was readministered to take post-test measures. Nurses, Health and allied Officers were trained by the researcher and they will serve as Research Assistants for administering the treatment packages, and for collecting relevant data. Descriptive statistics like mean and standard deviation were used to answer research questions while all the hypotheses, were analysed using Analysis of Covariance (ANCOVA).

Results

Research Question 1: What are the pre- and post-test mean score differences of pupils and handlers in different treatment groups on food safety?

Table 1: Descriptive Statistics of the Pre- and Post-Test Mean Scores on Food Safety of Participants in the Treatment and the Control Groups

Treatment	N		Post-Test	Pre-Test	Difference
Nurse-Led Training	95	Mean	59.3789	48.6737	10.7053
		Std. Deviation	3.7648	10.0873	
Safety Compliance Monitoring	153	Mean	58.3072	51.2353	7.0719
		Std. Deviation	6.4993	9.111	
Nurse-Led Training and Safety	126	Mean	63.373	55.754	7.619



Compliance Monitoring		Std. Deviation	9.3584	10.3016	
Control	126	Mean	47.6746	50.5397	-2.8651
		Std. Deviation	7.144	3.3242	
Total	500	Mean	57.108	51.712	5.396
		Std. Deviation	9.1687	8.9502	

Table 1 above showed that, the difference between the posttest and pretest mean scores of participants on food safety was 5.396 with the order of decreasing mean difference of 10.7053, 7.619, 7.0719 and -2.8651 for participants in the nurse-led, nurse-led & safety compliance monitoring, safety compliance monitoring and control (treatment) groups. This implied that, except for control group, the mean of participants' food safety scores improved after the reception of treatment.

Research Question 2: What are the pre- and post-test mean score differences of pupils and handlers in private and public schools on food safety?

Table 2 Descriptive Statistics of the Pre- and Post-Test Mean Scores on Food Safety of Participants in Public and Private Schools

School Type	N		Post Test	Pre-Test	Difference
Public	252	Mean	55.7698	49.869	5.9008
		Std. Deviation	8.1173	9.6518	
Private	248	Mean	58.4677	53.5847	4.8831
		Std. Deviation	9.9594	7.7575	
Total	500	Mean	57.108	51.712	5.396
		Std. Deviation	9.1687	8.9502	

It was shown in Table 2 that, the overall mean difference between the posttest and pretest mean scores of participants on food safety was 5.396. However, the difference was higher in public (5.9008) than 4.8831 in private schools. This revealed that, the mean posttest scores on food safety outweigh mean pretest scores in both public and private schools.

Research Question 3: What are the pre- and post-test mean score differences of pupils and handlers in certified and uncertified handlers' groups on food safety?

Table 3: Descriptive Statistics of the Post-Test Mean Scores on Food Safety of Participants in Certified and Uncertified Handlers' Groups

Certification	N		Post-Test	Pre-Test	Difference
Uncertified	210	Mean	51.3857	52.1571	-0.7714
		Std. Deviation	8.3184	8.5577	
Certified	290	Mean	61.2517	51.3897	9.8621



		Std. Deviation	7.3543	9.2252	
Total	500	Mean	57.108	51.712	5.396
		Std. Deviation	9.1687	8.9502	

Table 3 above showed that, the mean difference, the overall mean difference between the scores of participants on food safety was 5.396. The mean difference between posttest and pretest mean scores on food safety for participants in the certified group was 9.8621 while it was negative for participants in uncertified handlers' group (-0.7714). This revealed that, the mean food safety posttest score only outweighed the mean food safety pretest scores for participants in the certified handlers' group while the reverse was the case for uncertified handlers' group.

Testing of Research Hypotheses

H₀₁: There is no significant difference among the pre- and post-test mean score differences of pupils and handlers in different treatment groups on food safety

Table 4: N-way Analysis of Covariance for Observed Difference between the Pretest-Posttest-Mean Scores on Food Safety for Participants in Different Treatment Groups, School Types and Certification Profile

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^b
Corrected Model	29354.574 ^a	16	1834.661	70.364	.000	.700	1125.831	1.000
Intercept	13328.511	1	13328.511	511.186	.000	.514	511.186	1.000
Food Safety Pretest	730.777	1	730.777	28.027	.000	.055	28.027	1.000
Treatment	6555.090	3	2185.030	83.802	.000	.342	251.406	1.000
Handlers' Certification	2476.936	1	2476.936	94.998	.000	.164	94.998	1.000
Type of School	662.558	1	662.558	25.411	.000	.050	25.411	.999
Treatment * Handlers' Certification	500.650	3	166.883	6.400	.000	.038	19.201	.968
Treatment * Type of School	123.685	3	41.228	1.581	.193	.010	4.744	.417
Handlers' Certification * Type of School	78.729	1	78.729	3.019	.083	.006	3.019	.411



Treatment * handlers' Certification * Type of School	1425.184	3	475.061	18.220	.000	.102	54.660	1.000
Error	12593.594	483	26.074					
Total	1672610.000	500						
Corrected Total	41948.168	499						

According to Table 4, the calculated F-value of 83.802 was obtained with regard to the difference among the treatment groups. This value is statistically significant since it is greater than the critical value of 2.6234 given at 3 and 483 degrees of freedom, and at 0.05 level of significance. Hence hypothesis one which stated that, 'There is no significant difference among the pre- and post-test mean score differences of pupils and handlers in different treatment groups on food safety' was rejected. Based on this, and as p-value in Table 4 revealed, it was concluded that, 'There is significant difference among the pre- and post-test mean score differences of pupils and handlers in different treatment groups on food safety ($F_{3, 483}=83.802$; $p<.05$)'. To establish which of the treatment groups significantly differed from the other(s) after adjusting for the pretest scores, Pairwise Comparison was carried out as shown in Tables 5 and 6 below:

Table 5: Estimates of Posttest Food Safety Means in Treatment and Control Groups after Adjusting for Covariate

Treatment	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Nurse-Led Training	60.398 ^a	.796	58.834	61.961
Safety Compliance Monitoring	59.054 ^a	.527	58.020	60.089
Nurse-Led Training and Safety Compliance Monitoring	56.230 ^a	.759	54.739	57.720
Control	47.606 ^a	.610	46.407	48.805

Table 6: Pairwise Comparisons for the Difference between Posttest Food Safety Means of Participants in Different Treatment and Control Groups after Adjusting for Covariate

(I) Treatment	(J) Treatment	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
Nurse-Led Training	Safety Compliance Monitoring	1.343	.957	.161	-.538	3.224



	Nurse-Led Training & Safety Compliance Monitoring	4.168*	1.117	.000	1.974	6.362
	Control	12.792*	.999	.000	10.828	14.756
Safety Compliance Monitoring	Nurse-Led Training	-1.343	.957	.161	-3.224	.538
	Nurse-Led Training & Safety Compliance Monitoring	2.825*	.908	.002	1.041	4.608
	Control	11.449*	.809	.000	9.859	13.038
Nurse-Led Training and Safety Compliance Monitoring	Nurse-Led Training	-4.168*	1.117	.000	-6.362	-1.974
	Safety Compliance Monitoring	-2.825*	.908	.002	-4.608	-1.041
	Control	8.624*	.989	.000	6.681	10.567
Control	Nurse-Led Training	-12.792*	.999	.000	-14.756	-10.828
	Safety Compliance Monitoring	-11.449*	.809	.000	-13.038	-9.859
	Nurse-Led Training & Safety Compliance Monitoring	-8.624*	.989	.000	-10.567	-6.681

Table 5 above showed that, the estimated posttest food safety mean for the nurse-led training group is higher than that of safety compliance monitoring than that of combined nurse-led training & safety compliance monitoring and higher than what obtains in the control group. However, the pairwise comparison in Table 6 revealed that the pretest-posttest food safety mean difference in the control group is significantly lower than the one in any of the treatment groups while each of the posttest food safety means for nurse-led training and safety compliance groups is not significantly different from each other but significantly different from and greater than the posttest mean in combined nurse-led training & safety compliance monitoring group. This implied that, each of the treatments (nurse-led training, safety compliance monitoring and combined nurse-led training & safety compliance monitoring significantly increased food safety than normalcy in the control group.

H₀₂: There is no significant difference between the pre- and post-test mean score differences of pupils and handlers in private and public schools on food safety

To determine whether this observed difference was of statistical significance, ANCOVA was carried out as shown in Table 4 above. According to Table 4, there is significant difference between the pre- and post-test mean score differences of pupils and handlers in private and public schools on food safety ($F_{1, 483}=25.411$; $p<.05$).



H₀₃: There is no significant difference between the pre- and post-test mean score differences of pupils and handlers in certified and uncertified handlers' groups on food safety

To determine the significance of the observed difference, ANCOVA was carried out as shown in Table 15 above. According to Table 4, there is significant difference between the pre- and post-test mean score differences of participants on food safety in uncertified and certified handlers group ($F_{1, 483}=94.998$; $p<.05$).

Discussion of Findings

Accordingly, research question one which sought for the pre- and post-test mean score differences of pupils and handlers in different treatment groups (nurse-led training, safety compliance monitoring, combined nurse-led training and safety compliance monitoring and control) on food safety has shown different mean differences for different treatment groups which implied that, except for control group, the mean of participants' food safety scores improved after the reception of treatment with the highest level of improvement in the nurse-led treatment group, followed by nurse-led & safety compliance monitoring group, and then, the safety compliance monitoring group. This outcome is in agreement with the earlier findings of Susanna et al. (2020) which found that compliance with vital guidelines is a sure preventive approach against food borne diseases, and a gateway to engendering the safety of what is consumed. The submission of Onyeaka et al., (2021) which stated that, to enshrine food safety, the consumer and producers cum handlers of food must have a shared culture of what is safe or qualitative about food is also superimposable on the current finding. As counseled by the cited authors, having been tutored and monitored to have a new culture and resolution on the elemental grains of safety, pupils and handlers tend to involuntarily shift from foggy ideals of food safety to pursue what is genuinely safe.

In addition the outcomes from research question two which showed that the mean posttest scores on food safety outweigh the mean pretest scores in both public and private with public having higher difference what obtains in private schools is a simple confirmation of workability, efficiency and efficacy of nurse-led training, safety compliance monitoring and a combination of the two as an efficient intervention for improving food safety in primary schools. Earlier, Kabasakal et al. (2021) had concluded that, through nurse-led intervention, school nurses can attend to nutrition and self-care needs in their schools (whether public or private). Corroborating this evidence as reaffirmed by this current empirical observation, Holly et al. (2018) concurred that, as part of routine care, community or school nurses with adequate knowledge of nutrition can also train children in schools and handlers of food in order that healthy, nutritious and palatable diet may become fundamental to meal plans and what is subsequently offered in schools. Within these sound propositions, it goes without saying why and how nurse-led training and compliance monitoring approach adopted by this present research made a positive change in both public and private schools.

The results obtained from research question three indicated that, the mean food safety posttest score only outweighed the mean food safety pretest scores for participants in the certified handlers' group while the reverse was the case for uncertified handlers' group. This finding is congruent to the earlier observations of Lema et al (2020) and Cardenas-Fuentes et al (2021). Accordingly, Lema et al. (2020) observed that, certification and level of education of food handlers are factors that determine the assimilation and possible application of any



training on food safety while Cárdenas-Fuentes et al., (2021) reported an empirical link between the eating habit or the tendency of a child to yield to modeled eating etiquette with the educational level of the mother or her substitute. It therefore, becomes obvious why generally; the treatment package used in this study did not have positive effect where food handlers were without the right certification.

Hypothesis one which revealed that, there is significant difference among the pre- and post-test mean score differences of pupils and handlers in different treatment groups on food safety. This empirical outcome, showing significant mean difference between the control and other treatment groups is in line with the findings of earlier studies like Zanin et al (2017) which concluded that, training remained the first step to food safety after which other treatment options might be decided to bring about the desirably enduring change. Further probes into hypothesis one which unraveled the fact that, the pretest-posttest food safety mean difference in the control group was significantly lower than the one in any of the treatment groups while each of the posttest food safety means for nurse-led training and safety compliance groups is not significantly different from each other but significantly different from the pretest-posttest mean difference in combined nurse-led training & safety compliance monitoring group is reflective of earlier research trends like the ones conducted by Nkosi and Tabit (2021), Alrobaish et al. (2021) and Liang et al. (2021) which all unanimously observed positive linkage between treatment options and food safety.

Hypothesis two which revealed that, there is significant difference between the pre- and post-test mean score differences of pupils and handlers in private and public schools on food safety, with the pre- and post-test mean score difference of public school participants on food safety being higher than the mean difference for private schools was partly indicated in previous studies but the direction of change was not well established empirically. The studies of Cheng et al. (2017), Oldroyd et al (2020), Prescott et al. (2019) and Young et al. (2020) all showed that, type of school is an implicit predictor of food safety characteristics. However, that the pre- and post-test mean score difference of public school participants on food safety is higher than the mean difference for private schools might be the result of well-established and practices governmental presence, rules and regulations in public schools than what obtains in private schools. Nkosi and Tabit (2021) once suggested that, legislation and existence of rules can strengthen or compel compliance to safety.

Analysis of hypothesis three which showed that, there is significant difference between the pre- and post-test mean score differences of participants on food safety in uncertified and certified handlers group has obviously given credence to existing research reports that pointed out the necessity of requisite qualifications for handlers' of public system of feeding. As a matter of emphasis, Lema et al. (2020) observed that, certification and level of education of food handlers are factors that determine the assimilation and possible application of any training on food safety. Similarly, Cárdenas-Fuentes et al. (2021) observed an empirical link between the eating habit or the tendency of a child to yield to modeled eating etiquette with the educational level of the mother or her substitute. By this, food safety is more assured under certificated handlers than the risk which uncertified handlers portend to themselves and the public that they serve. This standpoint has thus, been confirmed by the present observation that ascertained higher pre- and post-test mean score difference for participants



in certified handlers' group on food safety than the observed food safety mean difference for uncertified handlers' group.

Conclusion

Food safety appeared to be a function of behaviour-modifying training, guidance or monitoring which food handlers and consumers received. Similarly, that the test of the relevant hypothesis affirmed that, there was significant difference among the pre- and post-test mean score differences of pupils and handlers in different treatment groups on food safety revealed that, based on available treatment, the food safety characteristics, dispositions and traits of children and food handlers could be amended or predicted to a certain degree of certainty.

Recommendations

From the various outcomes of this research, the following suggestions become sacrosanct:

1. Concerned authorities should incorporate nurse-led training into enhancing food safety in schools through organizing of periodic trainings conducted by nurses or allied personnel for both learners and pupils in schools. Only in places where nurse-led training is unachievable or impracticable due to inadequate number of nurse and allied personnel should safety compliance monitoring be used for food safety enhancement in any school.
2. The Ministry of Health should embark on massive but qualitative certification of food handlers either exclusively or by collaborating with relevant agencies. Ministry of Education should be counseled to jettison the practice of only checking the health certificates of schools at inception, it must do this from time to time while the Ministry of Health should recommend a minimum professional certificate for food handlers in this wise.
3. Collaboration is necessary between the Ministry of Education and Health to decide on the method of effecting food safety in schools, rather than encouraging duplication of efforts.

References

- Cárdenas-Fuentes, G, Homs, C, Ramírez-Contreras, C, Juton, C, Casas-Esteve, R, Grau, M, Aguilar-Palacio, I, Fitó, M, Gomez, S.F and Schröder, H (2021). Prospective Association of Maternal Educational Level with Child's Physical Activity, Screen Time, and Diet Quality. *Nutrients*, 14(1), 160.
- Cheng, Y, Zhang, Y, Ma, J and Zhan S (2017). Food safety knowledge, attitude and self-reported practice of secondary school students in Beijing, China: A cross-sectional study. *PLoS One*. 12(11),
- Cupertino, A, Ginani, V, Cupertino, A.P and Botelho, R.B (2022). School Feeding Programs: What Happens Globally? *Int. J. Environ. Res. Public Health* 19 (2265).
- Drake, L, Fernandes, M, Aurino, E, Kiamba, J, Giyose, B, Burbano, C, et al (2017). *School feeding programs in middle childhood and adolescence*. Child and Adolescent Health and Development 3rd edition: The International Bank for Reconstruction and Development/The World Bank.



- Holly, M.A., Lucas, A.C., Charlton, A.B. and McMahon, A.A (2018). Models of nutrition-focused continuing education programs for nurses: a systematic review of the evidence. *Australian Journal of Primary Health*, 24, 101–108
- Jaffee, S, Henson, S, Unnevehr, L, Grace, D and Cassou, E (2018). *The Safe Food Imperative: Accelerating Progress in Low- and Middle-Income Countries. Agriculture and Rural Development*. The World Bank: Washington, DC, USA.
- Kabasakal, E., Özpulat, F and Bakır E (2021). Analysis of the Nutrition, Self-Care Skills, and Health Professional Support in Schools of Children with Autism Spectrum Disorder. *Florence Nightingale J Nurs*. 29(2), 239-249.
- Lásztity, R (2009). Food Quality and Standards – Vol. I. *Encyclopedia of Life Support Systems (EOLSS)*
- Lema, K, Abuhay, N, Kindie, W, Dagne, H, Guadu, T (2020). Food Hygiene Practice and Its Determinants Among Food Handlers at University of Gondar, Northwest Ethiopia, *Int J Gen Med*, 13, 1129-1137.
- Leslie T.A., Bitrus H.S., Abaribe C.E., Okwuikpo M.I., Maitanmi J.O. (2021). Patterns of Food Safety and Hygiene Practices Among Food Vendors in Government Primary School, Ikenne Local Government, Ogun State. *African Journal of Health, Nursing and Midwifery* 4(4), 1-13.
- Nkosi, N.V and Tabit, F.T (2021). The food safety knowledge of street food vendors and the sanitary conditions of their street food vending environment in the Zululand District, South Africa. *Heliyon*. 7(7).
- Nordhagen, S, Lee, J, Onuigbo-Chatta, N, Okoruwa, A, Monterrosa, E, Lambertini, E, Pelto, G.H (2022). What Is Safe and How Much Does It Matter? Food Vendors' and Consumers' Views on Food Safety in Urban Nigeria. *Foods* 211 (225).
- Okojie, P.W and Isah, E.C (2014). Sanitary Conditions of Food Vending Sites and Food Handling Practices of Street Food Vendors in Benin City, Nigeria: Implication for Food Hygiene and Safety." *Journal of Environmental and Public Health*
- Oldroyd, R.A, Morris, M.A and Birkin, M (2020). Food safety vulnerability: Neighbourhood determinants of non-compliant establishments in England and Wales. *Health Place*. 63:102325.
- Onyeaka, H., Ekwebelem, O.C., Eze, U.A., Onwuka, Q.I., Aleke, J., Nwaiwu, O and Chionuma, J.O (2021). Improving Food Safety Culture in Nigeria: A Review of Practical Issues. *Foods*. 10(8), 1878.
- Petrescu, D.C, Vermeir, I and Petrescu-Mag, R.M (2020). Consumer Understanding of Food Quality, Healthiness, and Environmental Impact: A Cross-National Perspective. *Int. J. Environ. Res. Public Health* 17 (169)
- Prescott, M.P, Herritt, C, Bunning, M and Cunningham-Sabo, L (2019). Resources, Barriers, and Tradeoffs: A Mixed Methods Analysis of School Pre-Consumer Food Waste. *J Acad Nutr Diet*. 119 (8), 1270-1283.
- Savov, A.V and Kouzmanov, G.B (2009). Food Quality and Safety Standards at a Glance, *Biotechnology & Biotechnological Equipment*, 23 (4), 1462-1468.



- Susanna, D, Kusuma, A, Mairani T and Fitria, L (2020).The implementation of the five keys to safer food in campus cafeterias and the effects on *Escherichia coli* contamination. *Ital J Food Safety* 9(3),
- Wang, D & Fawzi, W.W (2020). Impacts of school feeding on educational and health outcomes of school-age children and adolescents in low- and middle-income countries: protocol for a systematic review and meta-analysis. *Syst Rev* 9 (55).
- World Food Programme (2013).*State of school feeding worldwide*. Rome, Italy: WFP.
- Young, I, Waddell, L.A, Wilhelm, B.J, Greig, J.A (2020). Systematic review and meta regression of single group, pre-post studies evaluating food safety education and training interventions for food handlers. *Food Res Int.*, 128(1), 108-121.
- Zanin, L.M, da Cunha, D.T, de Rosso, V.V, Capriles, V.D, Stedefeldt, E (2017). Knowledge, attitudes and practices of food handlers in food safety: An integrative review. *Food Res Int*, 100 (1), 53-62.

Cite this article:

Author(s), SODIMU Jeminat Omotade, OKAFOR, Ngozi Anthonia (RN, RM, RPHN, PhD, Assoc. Prof.), Prof. AJAO, Ezekiel O. (RN, RNT, RRNN, PhD, FWACN), (2023). “ Strengthening Food Safety Using Nurse-Led Training Among Handlers And Pupils In Schools”, Name of the Journal: International Journal of Medicine, Nursing & Health Sciences, (IJMNHS.COM), P, 21 – 34. DOI: [www.doi.org/10.5281/zenodo.7757279](https://doi.org/10.5281/zenodo.7757279) , Issue: 1, Vol.: 4, Article: 3, Month: February, Year: 2023. Retrieved from <https://www.ijmnhs.com/all-issues/>

Published By



AND

ThoughtWares Consulting & Multi Services International (TWCMSI)

