



## Effects of Health Education on Food Safety Cognitions Among Pregnant Mothers in Primary Healthcare Institutions in Rivers State, Nigeria

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### Abstract

This study investigated the effects of health education on attitudes and behavioural intentions towards food safety cognitions among pregnant mothers attending primary healthcare institutions in Rivers State. A pre-test and post-test design was adopted with a population which consisted of 1,838,789 pregnant mothers attending primary healthcare institutions in Rivers State. A sample size of 270 was selected using a multistage sampling procedure. Data was collected using a structured test instrument with a reliability index of 0.78. Data collected were analyzed with the aid of the Statistical Product for Service Solution (SPSS V-23) using mean, standard deviation (SD) and One-Way Analysis of Covariance (ANCOVA) at 0.05 level of significance. The findings of the study revealed that health education had a positive effect on food safety cognitions among pregnant mothers in Rivers State. The result of the ANCOVA showed that the intervention had a significant effect [ $F(1,49) = 2.69, p < 0.05$ ] on food safety cognition. However, only 5.3% ( $\omega^2 = 0.053$ ) of the variance in the post-test cognition scores could be explained by the intervention. It was concluded that health education is an effective strategy to influence pregnant mothers' food safety cognition, which is necessary to prevent them and their babies from food-borne diseases or food poisoning. It was recommended among others that, nurses, and other healthcare workers in the primary healthcare facilities should routinely educate pregnant mothers on food safety to increase awareness of food safety; and the government should enforce food safety by encouraging health workers to visit pregnant mothers' home from time to time for assessment, with special focus on hygienic kitchen environment which promotes food safety; and to ensure food safety is maintained.

**Keywords:** Cognition, Effects, Food Safety, Primary Healthcare Institutions

### Introduction

Safe food handling among pregnant mothers is key to sustaining life and promoting the health of their babies because mothers play a critical role in ensuring food safety since they are the main food handlers in the home. According to Kalu and Etim (2017), Food safety is the process of preparing, cleaning, cooking, storing, and preserving food in a way that minimizes the risk of bacterial cross-contamination and food poisoning. Foodborne disease is still a serious public health issue. Scallan et al. (2014) noted that foodborne pathogens account for more than 9.4 million cases of illness, 55,000 hospitalizations, and 1,300 deaths each year. The 2015 WHO report on the estimates of the global burden of foodborne diseases presented the first-ever estimates of disease burden caused by 31 foodborne agents (bacteria, viruses, parasites, toxins and chemicals) at global and sub-regional levels, highlighting that more than 600 million cases of foodborne illnesses and 420 000 deaths could occur in a year.

Foodborne illnesses disproportionately affect vulnerable populations, particularly children under five, and are most common in low- and middle-income nations. In another report, the World Health Organization (2017) showed that fifteen years old and under constituted forty percent of the cases of foodborne illnesses. More than 200 diseases, from cancer to diarrhoea, are brought on by contaminated food that contains dangerous bacteria, viruses, parasites, or chemical chemicals. An estimated 600 million people worldwide become sick after consuming tainted food, and 420,000 of them pass away annually, taking 33 million years of disability-adjusted living years away. Twelve thousand children under five die each year from food-borne illnesses, which account for forty percent of the burden.

In Sub-Saharan Africa especially Nigeria, despite the efforts of the Government through its National Agency for Food and Drug Administration and Control (NAFDAC, 2014), to improve the safety of food supply, food safety still remains a major issue that has been exacerbated by the peoples' ignorance of food hygiene, Government's uncoordinated approach to food safety control and the poor enforcement of food safety legislation and regulations. Food safety cognition is essential to safe food handling. Some of the many different cognitive processes include thinking, knowing, remembering, judging, and problem-solving (Kendra, 2023). In the present study, food safety cognition will simply be referred to as knowledge of food safety gained through health education on food safety. Health education on food safety is an essential tool to help pregnant mothers handle food hygienically because it enlightens them. Achalu (2019) defined health education as comprising of consciously constructed programme of learning involving some form of communication designed to improve health literacy including knowledge and developing life skills which are conducive to the individual. Health education could have a positive impact on mothers on what to do and how to do it (Renkert & Nutheam, 2016). Health education goes a long way to help mothers to acquire useful information that will improve their knowledge regarding ways to good health such as the practice of personal hygiene. However, Arduser and Brown (2017) noted that the avoidable mishandling of food among pregnant mothers, as well as the lack of hygiene procedures can lead to the transfer of food-borne diseases from the food processing stage, packaging stage, food distributing stage, to food consuming. There are many reasons why pregnant mothers must not be left out because they are the main food handlers in the home. Moreover, Dagne et al. (2021) noted that the home is the location associated with significant foodborne illness risk and the greatest proportion of the food eaten by children is prepared at home, thereby increasing the opportunities for food handling errors to occur. Even though some persons may eat out, children cannot do that as the mothers are responsible for all their food therefore, this study focused on pregnant mothers for this intervention. World Health Organization (WHO) recognized foodborne illnesses and occurrences as a foremost public health threat globally in the 21st century (WHO, 2015). This makes a study of this sort necessary to equip women with the needed information about food safety.

### Statement of the Problem

Food poisoning and foodborne diseases among little children are a consequence of preventable food handling errors by pregnant mothers, such as unintended contamination of food during preparation, cooking and storage. Food-borne diseases represent a widespread and growing public health problem, both in developed and developing countries with its impact on health and economy in developing countries (including Nigeria) than in developed countries. Yet, the burden of foodborne diseases on public health and to economies has often been underestimated due to underreporting and paucity of scholarly research. Observations in Rivers State healthcare facilities buttressed this, as several infants' hospitalization was due to food-borne infections of preventable cause through food safety such as nausea, explosive vomiting, watery diarrhoea, typhoid, cholera, and abdominal pain. In most cases, these children were rushed to the healthcare facility by the pregnant mothers who explained the onset of the incident tracing it to the child's feeding. These observations birthed the quest to carry out this study. Therefore, this study examined the effects of health education on food safety cognitions, attitudes and behavioural intentions among pregnant mothers in Rivers State.

### Research Questions

The study provided answers to the following research questions:

1. What is the effect of health education on food safety cognitions among pregnant mothers attending primary healthcare institutions in Rivers State?
2. What is the effect of health education on cognitions about food poisoning and cross-contamination among pregnant mothers attending primary healthcare institutions in Rivers State?
3. What is the effect of health education on cognition about the consequences of poor food safety among pregnant mothers attending primary healthcare institutions in Rivers State?

### Hypotheses

The following null hypotheses were formulated to guide the study and were tested at a 0.05 level of significance:

1. Health education has no significant effect on food safety cognitions among pregnant mothers attending primary healthcare institutions in Rivers State.
2. Health education has no significant effect on cognitions about food poisoning and cross-contamination among pregnant mothers attending primary healthcare institutions in Rivers State.
3. Health education has no significant effect on cognition about the consequences of poor food safety among pregnant mothers attending primary healthcare institutions in Rivers State.

## Methodology

The study was carried out in Rivers State which is one of the 36 States of Nigeria, nicknamed the “Garden City of Nigeria.” The State is also one of the nine States that make up the Niger Delta region. The pretest and post-test design was adopted with a study population which consisted of pregnant mothers in Rivers State which was estimated at 1,838,789. The sample size for this study was 270 which was determined using power analysis for sample size determination given by Devonshire et al. (2016) shown below:  $n = Z^2 \times p(1-p) / d^2$ . Where:  $n$  = minimum sample size;  $Z^2$  = statistics for level of confidence = 1.96;  $p$  = proportion of the best guess given as 80% = 0.8;  $d$  = the degree of tolerance is 5% = 0.05;  $n = 1.96^2 \times 0.8(1-0.8) / 0.05^2$ ;  $n = 246$ . Adding 10% attrition, that is,  $246 + 24 = 270$ . The multistage sampling procedure was adopted for the study comprising of stratified sampling, simple random cluster sampling, and simple random technique. In the first stage, a stratified sampling technique was adopted in which the State was grouped into three strata based on the three existing geopolitical zones, Rivers East, Rivers West and Rivers South-East. In the second stage, the simple random sampling technique was used to pick two Local Government Areas in each of the strata making it six LGAs selected. In the third stage, the cluster random sampling technique was used to group the six selected LGAs into two groups, control and intervention groups. In the fourth stage, one healthcare facility was randomly selected from each of the local government areas, and finally, in the fifth Stage, the simple random sampling technique was used to select 45 respondents from each of the selected health facilities for the study to give a total of 270. Data was collected using a structured test instrument titled: “Food Safety Cognition Test Instrument (FSCTI)”. The instrument addressed food safety cognitions, cognition about food poisoning and cross contamination, and cognition about consequences of poor food safety respectively in a multiple-response format. The questions were carefully drafted to ensure the variables of the study were addressed adequately. The instrument has a reliability coefficient of 0.78. Data collection was carried out in three phases -Pre-intervention, Intervention and Post-Intervention. Pre-intervention (pre-test) stage involved the collection of initial pre-test data from eligible participants who gave consent to be included in the study in both the control and intervention groups. The intervention phase comprised sessions of health education with the pregnant mothers chosen for this study, on food safety which lasted for six weeks. The teaching covered all areas of food safety. The health education was given once every week for 45 minutes with the use of lecture and discussion methods of health education, and participants were evaluated and given the opportunity to ask questions and clarify any misconception. The health education lasted for a period of six weeks, which included one week of revision on all the topics taught, and another week used for post-intervention (post-test). The post-intervention session which is the post-test test was conducted on the seventh week of the intervention programme. The researcher and research assistants re-administered the same set of test instruments to the pregnant mothers' use for this study. Data collected were entered and coded in the Statistical Product for Service Solution (SPSS) version 23.0. Data was analyzed using descriptive statistics of mean and standard deviation (SD) to answer research questions while all the hypotheses were tested with One-Way Analysis of Covariance (ANCOVA) at 0.05 level of significance.

## Results

The results of the study are shown below:

**Table 1: Mean and standard deviation of the effect of health education on food safety cognitions among pregnant mothers in Rivers State**

SN	Item	Pretest		Posttest		Mean difference	Remark
		$\bar{X}$	SD	$\bar{X}$	SD		
1	Food safety is majorly concerned with measures to ensure food is free from contamination	2.96	0.19	4.98	0.14	2.02	Positive effect
2	Food safety entails cleanliness and maintaining hand hygiene	3.14	0.23	3.90	0.30	0.76	
3	Food safety should be observed when producing, preparing, storing and serving of food and water	1.28	0.45	4.30	0.46	3.02	
4	Items like potable water and health ingredients are needed to ensure that food is safe for consumption are	3.30	0.46	4.24	0.43	0.94	
5	Unhygienic food safety practices involve combing hair near foodstuffs, pressing the phone while handling food	2.88	0.32	4.86	0.3	1.98	
<b>Grand mean</b>		<b>2.71</b>	<b>0.33</b>	<b>4.45</b>	<b>0.32</b>	<b>1.74</b>	

The highest possible score for each item = 5

Table 1 shows the mean and standard deviation on the effect of health education on food safety cognitions among pregnant mothers in Rivers State. The result showed that the pretest scores have a grand mean of  $2.71\pm 0.33$  while the post-test grand mean score was  $4.45\pm 0.32$  (out of the highest possible score of 5) with a total mean difference of 1.74. Thus, health education had a positive effect on food safety cognitions among pregnant mothers in Rivers State.

**Table 2: Mean and standard deviation of the effect of health education on cognitions about food poisoning and cross-contamination among pregnant mothers**

SN	Item	Pretest		Posttest		Mean difference	Remark
		$\bar{X}$	SD	$\bar{X}$	SD		
1	Food poisoning occurs when there is unpleasant illness caused by eating contaminated food	1.82	0.38	4.86	0.35	3.04	Positive effect
2	Food poisoning can be caused by poorly prepared food and storing raw food next to cooked food	2.98	0.14	3.96	0.19	0.98	
3	Raw and undercooked foods from animals and vegetables can cause food poisoning	2.88	0.32	4.92	0.27	2.04	
4	spread of bacteria around the kitchen, from food to surfaces and from surfaces to food is cross-contamination	1.94	0.23	3.94	0.27	2.00	
5	The most common way for food to be contaminated by pathogens is through cross-contamination	2.88	0.32	4.92	0.26	2.04	
6	Foods like raw milk and raw unwashed vegetables are more likely than others to contain germs	2.86	0.35	4.94	0.23	2.08	
<b>Grand mean</b>		<b>2.56</b>	<b>0.29</b>	<b>4.59</b>	<b>0.26</b>	<b>2.03</b>	

The highest possible score for each item = 5

Table 2 shows the mean and standard deviation on the effect of health education on cognitions about food poisoning and cross-contamination among pregnant mothers in Rivers State. The result showed that the pretest scores have a grand mean of  $2.56\pm 0.29$  while the post-test grand mean score was  $4.59\pm 0.26$  (out of the highest possible score of 5) with a total mean difference of 2.03. Thus, health education had a positive effect on cognition about food poisoning and cross-contamination among pregnant mothers in Rivers State.

**Table 3: Mean and standard deviation of the effect of health education on cognitions about consequences of poor food safety among pregnant mothers in Rivers State**

SN	Item	Pretest		Posttest		Mean difference	Remark
		$\bar{X}$	SD	$\bar{X}$	SD		
1	Illnesses contracted from eating contaminated food or beverages is known as: foodborne disease	2.92	0.27	4.94	0.23	2.02	Positive effect
2	Different foodborne diseases are caused by viruses, bacteria, and parasites	1.86	0.35	3.86	0.35	2.00	
3	Intoxication is not a symptom of foodborne illness:	2.90	0.30	3.84	0.37	0.94	
4	Examples of food borne diseases are Shigellosis, Gastroenteritis and Salmonellosis	1.28	0.45	4.42	0.49	3.14	
5	Foodborne illness can be caused by harmful toxins in food and raw egg	3.42	0.49	4.62	0.47	1.20	
<b>Grand mean</b>		<b>2.47</b>	<b>0.37</b>	<b>4.34</b>	<b>0.38</b>	<b>1.86</b>	

Highest possible score for each item = 5

Table 3 shows the mean and standard deviation of the effect of health education on cognition about the consequences of poor food safety among pregnant mothers in Rivers State. The result showed that the pretest

scores have a grand mean of  $2.47 \pm 0.37$  while the post-test grand mean score was  $4.34 \pm 0.34$  (out of the highest possible score of 5) with a total mean difference of 1.86. Thus, health education had a positive effect on cognition about the consequences of poor food safety among pregnant mothers in Rivers State.

**Table 4: Analysis of Covariate (ANCOVA) on the effect of health education on food safety cognitions among pregnant mothers.**

Source	Type III Sum of Squares	df	Mean Square	F	p-value
Corrected Model	25.820 <sup>a</sup>	2	12.910	24.421	0.000
Intercept	28.838	1	28.838	54.552	0.000
Treatment	0.306	1	0.306	0.579	0.447
Pretest	25.194	1	25.194	47.658	0.000
Error	141.147	267	0.529		
Total	15991.000	270			
Corrected Total	166.967	269			

The result from Table 4 shows the summary of ANCOVA on the effect of health education on food safety cognitions among pregnant mothers attending primary healthcare institutions in Rivers State. The result shows that there is no significant mean difference in food safety cognitions between pregnant mothers who received health education through discussion method and those who received through lecture method ( $F_{1, 267} = 0.579$ ,  $p$ -value = 0.447). Therefore, the null hypothesis that health education has no significant effect on food safety cognitions was retained at the .05 level of significance.

**Table 5: Analysis of Covariate (ANCOVA) on the effect of health education on cognitions about food poisoning and cross-contamination among pregnant mothers in Rivers State.**

Source	Type III Sum of Squares	df	Mean Square	F	p-value
Corrected Model	.736 <sup>a</sup>	2	0.368	0.591	0.555
Intercept	283.416	1	283.416	455.223	0.000
Treatment	0.514	1	0.514	0.825	0.365
Pretest	0.110	1	0.110	0.177	0.675
Error	166.231	267	0.623		
Total	15991.000	270			
Corrected Total	166.967	269			

The result from Table 5 shows the summary of ANCOVA on the effect of health education on cognitions about food poisoning and cross-contamination among pregnant mothers attending primary healthcare institutions in Rivers State. The result shows that there is no significant mean difference in cognitions about food poisoning and cross-contamination between pregnant mothers who received health education through the discussion method and those who received it through the lecture method ( $F_{1, 267} = 0.825$ ,  $p$ -value = 0.365). Therefore, the null hypothesis that health education has no significant effect on cognitions about food poisoning and cross-contamination was retained at the .05 level of significance.

**Table 6: Analysis of Covariate (ANCOVA) on the effect of health education on cognitions about the consequences of poor food safety among pregnant mothers in Rivers State.**

Source	Type III Sum of Squares	df	Mean Square	F	p-value
Corrected Model	93.691 <sup>a</sup>	2	46.846	17.131	0.000
Intercept	3337.185	1	3337.185	1220.411	0.000
Treatment	8.116	1	8.116	2.968	0.086
Pretest	93.688	1	93.688	34.262	0.000
Error	730.105	267	2.734		
Total	47895.000	270			
Corrected Total	823.796	269			

The result from Table 6 shows the summary of ANCOVA on the effect of health education on cognitions about the consequences of poor food safety among pregnant mothers attending primary healthcare institutions in Rivers State. The result shows that there is no significant mean difference in cognitions about the consequences of poor food safety between pregnant mothers who received health education through the discussion method and those who received it through the lecture method ( $F_{1, 267}=2.968$ ,  $p\text{-value}=0.086$ ). Therefore, the null hypothesis that health education has no significant effect on cognitions about the consequences of poor food safety was retained at the .05 level of significance.

### Discussion

The finding of the study revealed that health education had a positive effect on food safety cognitions among pregnant mothers in Rivers State. The result of the ANCOVA showed that the intervention had a significant effect [ $F(1,49) = 2.69$ ,  $p<0.05$ ] on food safety cognition. However, only 5.3% ( $\omega^2 = 0.053$ ) of the variance in the post-test cognition scores could be explained by the intervention. The finding of this study on the positive effect of health education on food safety cognitions is expected because the intervention which involves health education provides an opportunity for pregnant mothers to learn and understand the importance of food safety and the potential risks associated with foodborne illnesses. This in a way has helped boost their food safety cognition. The finding of this study is in line with that of Losasso et al. (2014) whose study on the effect of health campaigns on food safety knowledge and behaviour in the Veneto region of Italy with a population consisting of all beneficiaries of the campaign showed that the intervention had an effect on food safety cognition among the beneficiaries. This similarity might be due to the homogeneity of the intervention administered as they were both focused on equipping individuals with the information needed to enhance their cognition. The finding of this study is also in keeping with that of Abdulahi et al. (2020) whose study on the effect of health education on food safety among mothers attending an immunization clinic in Ilorin, Nigeria found that health education significantly improved mothers' food safety cognition, attitudes, and practices. The finding of this study gives credence to that of Ibrahim et al. (2018) whose study on the effect of health education intervention on food safety knowledge and practices of mothers in Riyadh city of Saudi Arabia revealed that health education had a significant effect on mothers' food safety cognition. The finding of this study is in tandem with that of Marzban et al. (2020) whose study on the effect of education on the knowledge, attitude, and practice of the catering staff about food hygiene and safety in Yazd City Arabia revealed that health education had a significant effect on the staffs' food safety cognition. The finding of this study is akin to that of Onyeneho and Horsfall whose study in 2014 on the effectiveness of food hygiene training interventions among food handlers in Nigeria revealed that health education had a significant effect on mothers' food safety cognition. This similarity might be due to the homogeneity of the intervention administered as they were both focused on equipping individuals with the information needed to enhance their cognition.

The result of the ANCOVA showed that the intervention had a significant effect [ $F(1,49) = 1.19$ ,  $p<0.05$ ] on food safety cognition about food poisoning and cross-contamination among pregnant mothers. This finding is expected and thus not surprising because the intervention which is health education also affects the ability of pregnant mothers to access and understand food poisoning and cross-contamination. Individuals exposed to health education tend to have better comprehension skills about what they are taught, making it easier for them

to understand food safety materials and guidelines. This, in turn, helps them to adopt better food safety practices and reduce their risk of food poisoning and cross-contamination. The finding of this study is in line with that of Akande et al. (2014) whose study conducted in Nigeria among pregnant mothers showed that those exposed to health education levels had a significantly higher level of knowledge about food poisoning and cross-contamination compared to those with lower who are not. The finding of this study is also in support of that of Karim et al. (2017) whose study conducted among pregnant mothers in Malaysia found that those with secondary and tertiary education had a higher level of food poisoning and cross-contamination knowledge compared to others. Health education interventions have been found to be positively associated with increased concern about food poisoning and cross-contamination. The finding of this study is also in consonance with that of Al-Jedah et al. (2020) whose study among pregnant mothers revealed that those with higher education levels may be more likely to prioritize food safety when making decisions about food selection, preparation, and storage. They may also be more likely to seek out and use reliable sources of information about food poisoning and cross-contamination. This similarity might be due to the homogeneity of the study population as they were both focused on women or mothers.

The result of the ANCOVA showed that the intervention had a significant effect on the consequences of poor food safety. However, only 6.7% ( $\omega^2 = 0.067$ ) of the variance in the intervention could be explained by health education. This finding is expected because education plays an important role in shaping an individual's food safety knowledge and attitudes. Research has shown that exposure to education programmes is associated with higher cognitions about the consequences of poor food safety among pregnant mothers. Studies have shown that mothers exposed to health education as an intervention are more aware of food safety issues and have a better understanding of the consequences of poor food safety. They are also more likely to perceive foodborne illnesses as a serious threat and are more motivated to take measures to prevent them (Yang et al., 2020). The findings of this study are in support of Almohanna et al. (2020) which showed that health education level plays a significant role in shaping cognition about the consequences of poor food safety. Higher levels of education have been found to be positively associated with more cognition about the consequences of poor food safety among pregnant mothers. The finding of this study is also akin to that of Hennessy et al. (2014) which showed that education is a significant factor that can affect pregnant mothers' cognition towards the consequences of poor food safety. This similarity might be due to the homogeneity of the study population as they were both focused on women or mothers.

### Conclusion

Based on the findings of the study, it was concluded that health education is a veritable tool in influencing pregnant mothers' cognition towards food safety, which is necessary to prevent them and their babies from food-borne diseases or food poisoning.

### Recommendations

The following recommendations were made based on the findings of the study:

1. Nurses, and other healthcare workers in primary healthcare facilities should routinely educate pregnant mothers on food safety to promote awareness of food safety.
2. Governments should enforce food safety by encouraging health workers to visit pregnant mothers' homes from time to time for assessment, with a special focus on a hygienic kitchen environment which promotes food safety; and to ensure food safety is maintained.
3. Policymakers should establish and work with local authorities to control food handling practices through the enforcement of regulations, proper hygienic practices and food safety control measures.

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