Effect of Ebola on Meat Consumption Patterns of Rural Dwellers of Tonkolili District - Northern Sierra Leone West Africa

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Abstract: This study was conducted to determine the effect of incidence of Ebola on meat consumption patterns among rural dwellers of Tonkolili District. Data was collected from 1,600 respondents through well-structured and pre-tested questionnaire. This was randomly administered to selected respondents. Simple descriptive statistics involving mean, mode, percentages and Chi square was used and results presented in tables and charts. Result of the analysis showed that meat was not consumed on daily basis (0%) but was minimally consumed on weekly (1%) and monthly (4%) basis by respondents in Tonkolili District during the Ebola saga. It was found out that there was preference for beef (33.44%), mutton (3.75%), chicken (25.25%), pork, (2.5%), goat meat (10.81), bush meat (21.69%), and duck (2.56%), respectively. Factors such as disposable income, household size, and restriction of movement, ban on hunting, psychology and religion were vital in determining the consumption patterns of meat. A negative perception was seen for the consumption of pork, showing less preference for pork as opposed to beef and bush meat. Furthermore, majority of the respondents with 7-9(27%) and above 9 dependants (30%) were low income earners who earned meagre salaries above Le200000 and Le400000 respectively. Thus during the Ebola crisis, respondents had little access to meat protein which probably could have a negative effect on their immunity against the Ebola virus and other related pathogens

Keywords: Consumption patterns, Ebola virus, Meat, Preference

1. Introduction

Sierra Leoneans have passion for protein-related food. This was glaringly manifested before the Ebola nightmare when the standard of living was relatively high, although nutrition was a challenge, with 12.9% of malnourished under-5 children (Sierra Leone National Nutrition Survey report, 2014).Following the Ebola outbreak, the standard of living of most Sierra Leoneans declined sharply(FAO, 2015, United Nations Office for the Coordination of Humanitarian Affairs, 2015,). Quarantine and travel restrictions, infections, fear and economic downturn were likely factors to have had a significant impact on nutrition. Livestock products such as meat, which used to be an affordable commodity in almost every household before Ebola virus disease, became virtually unattainable luxury during the Ebola outbreak to many. The inhabitants of Tonkolili District were no exception to this unsavoury situation.

Globally, livestock product serves as dietary need for the populace. Generally the diet of most Sierra Leoneans is often protein poor both quantitatively as well as qualitatively (FAO 2000). Inadequate consumption of protein and energy as well as deficiency in key micro nutrients such as iodine, vitamin A and iron are key factors in the morbidity and mortality of children and adults (FAO, 2001).

It is estimated that 55% of the nearly 12 million deaths each year among the under five-year-old children in developing countries are associated with malnutrition or lack of consumption of adequate livestock products especially meat, egg, and milk (UNICEF. 1998, FAO, 2001).

Consumption of livestock products such as meat (beef, pork, mutton, venison, and chicken), eggs and milk is determined by many factors such as income level, household size, religion, age, cultural beliefs, and rise in prize, accessibility, and psychological effects (Stephen et al, 2014 FAO, 2015, Cosmos et al, 2013, Laura et al, 2016,). The high cost of commercial foods coupled with the expensive and scarce source of animal proteins, as well as the dwindling family income, has made utilization of high energy food such as carbohydrate of high viscosity gruel with low nutrient density a must. This is responsible for young children's inability to fulfil their energy\nutrient requirement, which eventually contributes to high rate of malnutrition among children. (IJarotimi, et al, 2016). The income level of most consumers is very low, therefore the consumption of meat is inadequate andpeople from low income group seldom feed meat, eggs, or fish to their infants, because of socioeconomic factors, taboos and ignorance .(Ijarotimi,et al, 2016).

Most consumers are of the wrong conception that farm animal products especially meat are delicacies particularly meant for adults other than children. It is therefore common to see the better parts of these products being reserved for adults. Children are in effect, deprived of the much needed protein for proper growth and development(Ijarotimi,et al, 2016).

Proteins especially those of animal origin, play an important role in the physiology of humans. They supply vitamin B12, iron and zinc and are the major nutrients for cell development, repairs and growth. (FAO, 2011). In Africa, meat is consumed by large proportion of the populace, and in many instances measures the social and financial strength of many homes. The situation in Sierra Leone is not quite different.Apart from the bush meat which is cheap but erratic in supply, other meat is only acquired by affluent people in society. Prior to the Ebola outbreak, inhabitants of Tonkolili District used to hunt animal pests for the primary purpose of protecting their farms, consumption and generation of income from the sales of meat. By then they realized higher productivity and extra income that enabled them to effectively manage their farming activities.

During the Ebola interregnum, the rearing and management of new breeds of Livestock drastically declined, and many livestock farmers shied away from the culture of adding and introducing new breeds of animals to their existing stocks owing to the fact that alarming Ebola outbreak originated from animals (Nasi et al, 2008).

Ebola impacted the lifestyle of people, and brought about a total change in their food consumption habits (Cosmos et al, 2013). These changes were products of the restrictions placed on the consumption of all types of bush animals, although meatwas not yet proven as the natural reservoir of Ebola virus or the manner in which the virus first appear to human. However, researchers have come up with a hypothesis that the first patient became infected through contact with an infected animal (Centre for Disease Control and Prevention, 2002, 2015).

The Ebola virus, for which the primary host is suspected to be fruit bats, has been linked to bush meat (Nasi et al, 2008). Between the first recorded outbreak in 1976 and the largest in 2014, the virus has transferred from animals to humans 30 times (Nasi et al, 2008). In 2014, the Ebola outbreak in West Africa originated in Gueckedou in South-Eastern Guinea and was linked to bush meat after it was learned that the first case came from a family that hunted two species of fruit bat, <u>Hypsignathusmonstrosus</u> and <u>Epomopsfranqueti</u> (Williams, 2012).The culture of hunting was reduced considerably and consequently, increase in population of these animal pests caused serious damage to agricultural crops and farmers in effect got poorer because they no longer realized income from the sales of bush meat.

This situation required more orientation and humanitarian assistance for the affected communities. The domesticated cattle, sheep, goats and pigs were not properly catered for in terms of management practices because most of the livestock owners were vulnerable to the virus, and many fell victims and demised. According to statistics on morbidity and mortality of Ebola situation in Sierra Leone, 13,126 cases were reported and 3,932 deaths were recorded in the whole country. In Tonkolili District, out of a population of 401,000, the number of cases recorded was 629, meaning that the cases/1000 population was 1.57(Wm. Johnston, 2015).Beyond the terrible toll on the lives and suffering, the epidemic had a measurable economic impact, such as higher fiscal deficits and lower real household incomes. Gross domestic Product (GDP) and investment declined. Prices of stable goods shoot-up, food supplies dwindled and jobs were lost as some countries closed borders (Reliefweb, 2015, WFP, 2015, WHO, 2015) to prevent the propagation of the virus.

The panic created during this period made livestock owners to abandon their ranches and pens, leaving their animals to fend feed for themselves, and subsequently most of the animals died of starvation, and diseases such as Pest de petit ruminants (more vulnerable to sheep and goat), Rinder pest etc. and some of the animals were stolen or fell victim to predators. This situation affected the whole country, particularly Tonkolili District with respect to accessibility to protein related food. In fact, it virtually almost led to livestock extinction. This had in no small way contributed to the weak immunity and hence vulnerability to Ebola virus and other related pathogens.

The objective of this study was to investigate the impact of Ebola outbreak on the meat consumption patterns of inhabitantsof Tonkolili District and its consequences on the health of the populace.

2. Methodology

Research Design

The research design for this study was a descriptive survey type, designed to look into the effect of Ebola on the meat consumption patterns of rural dwellers of Tonkolili District. The design was appropriate because it focused on observation and perception of the existing situation described and interpreted what was concerned with issues, conditions, practices, relationships, views, beliefs, attitudes, processes, and trends which made an impact on the nutritional status of rural dwellers with regard to Ebola virus surge. A Survey research design was also used because it is a procedure in quantitative approach which helps to administer questionnaire in order to identify trends in the attitudes, opinion, behaviour, or characteristics of the population. At the same time, this study employed qualitative technique to answer and understand the impact of the extension approaches (Creswell, 2014).

Description of Study Area:

The area selected for the study wasTonkolili District Northern Sierra Leone. The selection of this rural setting was madebecause the district suffered greatly from the Ebola surge. In view of this consideration, the region provides excellent field laboratory to study the extension approaches and their impacts of Ebola on meat consumption patterns.

Tonkolili District is in the Northern Region of Sierra Leone. It is about seventy five miles (160 kilometres) away from the capital city, Freetown. Tonkolili District borders Bombali District to the northwest, Kono District to the east, Kenema District and Bo District to the southeast, Port Loko and Koinadugu Districts to the northeast. Tonkolili is strategically located in the centre of Sierra Leone. The district is criss-crossed by many rivers including the Pampana River and Sierra Leone's longest river, the Rokel.Tonkolili District head quarter and largest city is Magburaka. The other major towns include Mabonto, Bumbuna, Makali, Masingbi, Yele, Bendugu, Mile 91, Yonibana and Matotoka.

It has a total area of 7,003km²(2,704sq ml) with a population of 530,776 people (Sierra Leone Population and Housing Census, 2015). The district is relatively flat and dominated

to the west and eastern part by secondary bush. To the northeast, it is densely forested and potentially rich for timber production and wildlife conservation. It is sparsely forested in the north, making the region suitable for mechanized crop cultivation and livestock production, especially cattle. The upland soils are relatively fertile and most parts sandy-loam and clay-loam in nature, making the land easy for cultivation. It is also undulating with vast swamps, most retaining water throughout the year (perennial swamps), suitable for all year-round paddy production and fish farming, while those retaining water only in the rains encourage vegetable farming in the dry seasons.

The region has a hot dry season from November to April followed by heavy rainfall from May to October. Average annual precipitation varies with up to 5,080 mm (200 inches) in the wettest parts along the coast. The prevailing winds are the South-West Monsoon during the wet season and the North-Eastern Harmattan which is a dust laden wind from the Sahara desert during the dry season. Average temperature in Southern region is from 21° C (73°F) to 31° C (88° F) all year round.

Economically, there is significant potential for an extractive economy, specifically the mining of iron ore, and gold and to a lesser extent diamonds. Today the biggest iron ore deposit in Africa and the third largest in the worldis found in the hills around Bumbuna, Mabonto and Bendugu. Agriculture also plays a significant role in the economy, the biggest bio energy company in Africa, Addax Petroleum, operates mostly in Mar in constituency 60. There is also a significant agricultural activity at the Magbass sugar complexrun by a Chinese construction engineering firm. Thousands of hectares of forest trees has been established by a foreign Company named MIRO in the Mile91 vicinity and a rubber factory is also about to be established. There are several hydroelectric power systems in the district, especially at Bumbuna. There is also agame reserve at Mamunta. However, economic development was hindered by the destruction of facilities during the 1991-2002 civil war

Target Population

The target population of this study consists of all individuals but a random selection of 1600 respondents was made.

Sample Size and Sampling Procedure

Stratified multiple random sampling procedure was adopted to select the nutrition expert agents and key informants constituting the sample for this study. The sampling aimed at selecting eligible persons with equal probability. Therefore, in the first instance, the townships of Magburaka, Matotoka, Mabonto, Masingbi were purposively selected because of the suspected high prevalence of malnutrition among adult and children in the district and the Ebola virus outbreak in Sierra Leone as a whole.

The second stage involved selecting 1600 inhabitants within the various Townships and villages of Tonkolili District in order to investigate their protein intake during the Ebola nightmare.

Development of Research Instrument

The instrument was developed based on the observation and interviews during the pilot-test, a review of literature of meat consumption patterns before the Ebola outbreak was obtained from NGOs' official records. A set of structured and semi-structured questionnaires were used to collect data. The instrument was designed to elicit data on the meat consumption patterns of rural dwellers of Tonkolili District.

Validity of the Research Instrument

Face and content validity were established by a panel of experts in the discipline of nutrition to determine the extent to which the instrument measures what it is designed to measure. According to subjective assessment of a panel of experts in food and nutrition and other related fields of study, relevant specialists at Njala University were asked to assess the content and face validity of the instrument. Each of the experts on the panel was asked to examine the instrument for clarity, wording, length, format and overall appearance, and thiswould ensure that anything that would confuse respondents and research assistants were removed. The experts confirmed that the instrument contained items that would elicit the intended responses on the varied protein intake.

Reliability

The reliability of the instrument was determined by trial administration of questionnaires to 20 (1.66% of the sample) respondents in the study area. This was done by test-retest administration of questionnaire within a five-week interval and the needed modifications made. The result of this test was followed by the needed modifications of the data collection.

Data Collection

The use of primary and secondary data was employed for this study. Secondary data were obtained from literatures, project reports, official documents, publications and consultations, and library materials among others. Primary data were obtained through the use of structured and validated questionnaire to elicit information from target respondents. On-site data collection took place in April 2015. Prior to data collection, the first step after the development of research instrument was the recruitment and training of data collectors/enumerators. With the aim of enhancing the quality of data for the study, adequate and quality data collectors/enumerators were recruited. The selection and recruitment of data collectors considered sex, competency, academic and good command of local language of the study area. A total of thirty researchers (20data collectors and 10 facilitators for the focus group discussions) were recruited and given two days vigorous training focusing on practical field experience. During the data collection period, the researchers made every effort to coordinate, manage and take part in all activities with the aim of maintaining the quality of data.

Before commencement of actual field work - data collection, the investigators visited the selected sections in the chiefdom headquarters. The inhabitants selected as respondents in these sections were first contacted and suitable time was agreed on to meet all of them in their respective sections. Data was collected through administration of structured and

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semi-structured validated questionnaires consisting of both open and closed-ended questions to elicit information from target respondents. Before administering various tools, the aim and relevance of the study was explained to respondents, and they were assured that the information given by them would be kept strictly confidential. The instruction as how to respond to each tool was also explained to the respondents. They were asked to answer questions objectively and without discussing responses among themselves, so that the information reflects the reality of the situation on ground.

Also, focus group discussion was managed by two facilitators. The first facilitator introduced the purpose of the discussion and explained what was expected of the participants. He set the stage for the discussion and explained the procedures and rules; questions were asked, each participant was allowed to speak, and the facilitator moderated but did not participate in the discussion. The second facilitator led the discussion, controlled the flow and recorded the responses in the field notebook. Detailed accurate notes in the notebooks were noted as key information sources because they became the raw data that led to focus group findings.

Data Analysis

Data was analysed using the Statistical Package for Social Sciences (SPSS) software. The descriptive statistics used for Tables and graphs obtained were frequency distributions and percentages. In addition, opinion on the consumption of meat was compared by Chi-square(X^2) test of hypothesis and the data analysed by the equation given below.

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Hypothesis Test

 H_0 : Ebola crisis had no significant impact on the rate of meat consumption amongst rural dwellers.

 H_1 . Ebola saga had significant impact on the rate of meat consumption amongst rural dwellers

One-Way Analysis of Variance (ANOVA)

One Way Analysis of Variance was used to determine the statistical significant effect of

Independent variables (Number of defendants, religion, family income level and preference)

3. Result and Discussion

Research findings indicate that a number of factors (environmental, safety, religion, income, number of dependants and health) influence the consumption of meats in any economy including Sierra Leone. The findings of these researches are found in the works of researchers such as Metaly et al. (2010); Damisa and Hassan (2009); Renuka et al. (2009); Liu, and Deblitz (2007).

According to a survey in Sierra Leone by Welt hunger hilfe(2014) on the impacts of the Ebola Virus disease on the livelihood of rural communities, agriculture and food security, it was found out that the income level of people dropped considerably. The availability of food became limited and the cost increasedas market prospects deteriorated in the wake of the continuing spread of the Ebola virus disease.

In this study, majority (84.4%) of the respondents did not have access to meat, rather, only a small percentage had access to meat (Table 2). This is simply due to factors such as ban on bush meat hunting, low income, high household dependants, and religious beliefs. Both at home and abroad, it was widely believed that bush animals such as Monkeys, Chimpanzee, Bats and other related animal species were primary carriers of the Ebola virus (Nasi et al, 2008,Centre for Disease Control and Prevention, 2002). Low income became eminent as a result of restriction on movement, which handicapped trade and many financial transactions. In this regard 40% and 32% of the respondents earned meagre income between Le200000 and Le400000 respectively which was aboutUS\$27 and US\$54 (Figure 3), and hence the inability of majority of the respondents to purchase safe domesticated meat such as venison, pork, mutton, beef and chicken etc. Farming activity was adversely affected as most respondents could not carry out their normal agricultural practices from which they obtained income to sustain their livelihood. This made majority of the respondents (85%) unable to buy meat and only 1% and 14% were able to buy a pound of meat on a weekly and monthly basis (Figure 4). Preference for meat was more skewed for beef (33.44%) and chicken (25.25%) and this was followed by bush meat (21.69%). Although there was high preference for beef, accessibilitywas gravely challenged by low income.Further, bush meat that was cheaper was banned for consumption due to speculation that it could be the primary carrier of the Ebola virus. Religious beliefs and social taboos also affected the level of meat consumption, as Muslims have nothing to do with pork even though it could be the cheapest meat. A Chi Square test was employed to investigate the meat consumption patterns and it was ascertained from the result that during the Ebola outbreak, majority (84.4%) of the respondents did not have access to meat therefore Chi square(X^2) calculated was obtained as 12.091(Table3) which is less than Chi Square Tabulated(X^2) [14.067]. Therefore, the null hypothesis (Ho) was rejected and the alternative (H₁) was accepted. This study further examined the impact of three sources of information - social campaign, group information and personal knowledge on Ebola as well as their relationship with consumption of bush meat. For H1, t statistics 0.001<0.05 (standard alpha) hence the null hypothesis was rejected while the alternative was accepted (that the Ebola outbreak had impact on meat consumption in Tonkolili District). Thus, there is a strong statistical relationship between social campaign on Ebola and consumption of bush meat in Tonkolili District. The social campaign led to reduction of bush meat consumption due to the Ebola outbreak. .This finding quite agrees with the research of Paitoon (2006) where all the findings suggested that the result of the avian influenza was significant in terms of both quantity reduction of chicken consumption and the structural change of the elasticity of consumption. In terms of awareness, the finding also agrees with the findings of Adolf et al., (2009) where it was noted that social campaign was worthwhile and justifiable. This finding also agrees with the social ecological theory, which states that ecological

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theory can be implemented to encourage people to take greater responsibility for health related decisions which can yield health improvement interventions. The implication is that once information flows from health officials, and government, whether it is substantialor not, consumers are likely to believe without furtherverification, and are sure to allow the information to impact on their purchase decision(Cosmos et al, 2013). Thus, the agencies in charge of information dissemination should always be quick to spread the right information.

Research studies have shown that deficiency of high quality protein such as meat can result in depletion of immune cells, inability of the body to make antibodies and other related immune problems (WHO, 2010). In this study access to high quality protein such as meat was very minimal (Figure 4). In this regard this could be a major factor for the high vulnerability of the Ebola Virus amongst the populace of Tonkolili District and probably the country as a whole.

Meat	Beef	Pork	Mutton	Chicken	Goat	Bush	Duck	TOTAL
Preference					meat	meat	meat	
Magburaka	60	10	10	50	20	40	10	200
Matotoka	67	3	10	48	21	45	6	200
Makali	80	7	5	50	15	40	3	200
Massigbi	73	2	6	61	20	35	3	200
Yele	80	6	10	32	20	50	2	200
Mabonto	56	3	6	62	19	48	6	200
Bendugu	59	8	7	35	34	50	7	200
Mile91	60	1	\\6, I	66	24	39	4	200
TOTAL	535	40	60	404	173 (347	41	1600
%	33.44	2.5	3.75	25.25	10.81	21.69	2.56	100

Table 1 depicted that majority (80.38%) of the respondents had high preferences for beef, chicken and bush meat. There was low preference(19.62) for pork, mutton, and duck meat respectively

				Ta	ble 2					
		Majo	r Towns	in each ch	iefdon	in Tonkol	lili District			
Response	Magb/ka	Matoto	Makali	Massigbi	Yele	Mabonto	Gbendugu	Mile91	Total	%
YES	20	30	40	30	40	25	35	30	250	15.6
NO	180	170	160	170	160	175	165	170	1350	84.4
TOTAL	200	200	200	200	200	200	200	200	1600	100

Table 2 shows the response of respondents to meat consumption during the Ebola Saga in Tonkolili District.

Table 3								
Category	01	E 1	01-E1	(O1-E1) ²	(O1-E1) ² /E1			
Magburaka-yes	20	30.63	-10.63	112.99	3.69			
Magburaka-No	180	169.38	10.62	112.78	0.67			
Matotoka-Y es	30	30.63	-0.63	0.39	0.013			
Matotoka-No	170	169.38	0.62	0.38	0.0022			
Makali-Yes	40	30.63	9.37	87.79	2.87			
Makali-No	160	169.38	-9.38	87.98	-0.52			
Massigbi-Yes	30	30.63	-0.63	0.39	0.012			
Massigbi-No	170	169.38	0.62	0.38	0.0022			
Yele-Yes	40	30.63	9.37	87.79	2.87			
Yele-No	160	169.38	-9.38	87.98	0.52			
Mabonto-Yes	25	30.63	-5.63	31.69	1.03			
Mabonto-No	175	169.38	5.62	31.58	0.19			
Bendugu-Yes	35	30.63	4.37	19.09	0.62			
Bendugu-No	165	169.38	-4.38	19.18	0.11			
Mile91-Yes	30	30.63	-0.63	0.39	0.01			
Mile91-No	170	169.38	0.62	0.38	0.002			
TOTAL	1600	1600	0.00	650.51	12.0914			

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Table 3 gives the Contingency Table of the meat consumption patterns in Tonkolili District Calculated= 12.0914P=0.9 (R-1)(C-1)= 2-1x8-1= 7

Tabulated= 14.067. Since the p value is above 0.05 we accept the hypothesis which states that the Ebola affect meat consumption in Tonkolili district. The p value is p=0.9 which is 90% chances of Ebola saga affecting meat consumption pattern. Any deviation from the expected is due to chance only.

Since the x^{2} = 12.0914 is less than tabulated value = 14.067 we therefore reject the null hypothesis which states that Ebola does not affect meat consumption in Tonkolili District and accept the alternative hypothesis that Ebola saga affect meat consumption pattern in Tonkolili District.



Figure 1: Shows the map of Sierra Leone Showing Tonkolili District, the Study Area.



Figure 2 revealed that majority of the respondents had high dependants to feed and those with 7-9 and above 9 dependants were 27% and 30% respectively.



Figure 3 is a revelation of the monthly net earnings of respondents. It shows that 40% and 32% of the respondents earned meagre income between Le200,000 and Le400,000, while a very small percentage(1%) earned above Le 1,000,000.



Figure 4 shows the percentage frequency of meat consumption and it revealed that majority (85%) of the respondents did not have access to meatduring *the* Ebola saga. Only small percentage had access to meat once on a weekly (1%) and monthly (14%) basis.

4. Conclusions

Based upon the findings, it was concluded that:

- 1) The Ebola Saga restricted movement which adversely affected trade and agricultural activities, hence respondents became poorer.
- Meat was not consumed on daily basis, rather was minimally accessed on weekly and monthly basis by few respondents.
- 3) 3 Most respondents had many dependants with low income; consequently safe domesticated meat cannot be easily purchased.
- 4) The relatively cheap bush meat was stigmatized by being a primary carrier of the Ebola virus, therefore was not consumed.
- 5) Thus during the Ebola saga respondents had little access to meat protein which probably could have a negative effect on their immunity against the Ebola virus and other related pathogens

5. Recommendations

- 1) More orientation about the benefits of consuming meat and humanitarian assistance is needed for the affected communities.
- Local livestock initiatives should be enhanced through efficient extension services, control of animal diseases, provision of superior animal parent stocks, availability of loans and providing feed for livestock at reasonable prices.

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