Original Research Article

Tackling Diet-related Non-Communicable Diseases in a Ghanaian population: An Assessment of Nutritional Knowledge and Cooking Practices of Fast-food Vendors in the Kumasi Metropolis of Ghana

Abstract:

Introduction: Fast-food vendors have been identified as stakeholders responsible for meal preparation and provision to majority of people and households. However, little is known about their general knowledge on nutrition and diet-related diseases. The study therefore assesses the nutritional knowledge and cooking practices of fast-food vendors in the Kumasi Metropolis of Ghana.

Methods and Material: A quantitative cross-sectional study was conducted in three suburbs (Bantama, Suame and Tafo) in Kumasi, Ghana 210 fast-food vendors were recruited for interviews based on chance per their location. A simple probability sampling technique was used to select study sites. Interviews were conducted with a semi-structured questionnaire. Descriptive statistics were used to analyse

continuous variables. Inferential statistics such as chi-square was used to compare the nutrition knowledge scores with the participants' demographic characteristics.

Results: Female respondents accounted for 66.2%. More than 80% of participants have attained pre-tertiary education, with the majority receiving nutrition education at the pre-tertiary level. The study found 49% of the participants had inadequate knowledge in nutrition, while only 6.2% had adequate nutrition knowledge. Participants' knowledge adequacy and inadequacy on diet-related NCDs, was 5.2% vs. 60%. A significant difference ($p=0.009$, $p\leq0.005$) was observed in nutrition knowledge adequacy among participants' gender and level of education respectively. Also, it was noted that all participants reused their oils several times for deep frying.

Conclusions: Majority of the fast-food vendors had inadequate knowledge in nutrition and diet-related diseases, and most of them tend to reuse frying oil many times, which can increase trans-fat levels. We suggest that the Metropolitan Assembly collaborates with relevant institutions to organize nutrition and health seminars and education for all fast-food vendors before certifying their operations.

Key-words: Nutrition knowledge, fast food, cooking practices, non-communicable diseases

Key Messages: There has been an obvious change in the lifestyle and food consumption patterns of many individuals and households in the past few years. There has been an increase in the patronage and consumption of fast-foods. Fast-foods are relatively cheaper sources of food and readily available however, many research outcomes have shown that fast foods are high in salt, sugar, monosodium glutamate and fats which when taken in excess can predispose an individual to non-communicable diseases such as hypertension, diabetes, cardiovascular diseases cancers etc. To ensure that fast foods are prepared in much healthier way, the acquisition of knowledge on nutrition and diet related-diseases by fast-food vendors has been shown to be key

Introduction:

There has been an obvious change in the lifestyle and food consumption patterns of many individuals and households in the past few years.[1] The commitment to food preparation at home has decreased due to the demands of modern life and work giving rise to the patronage and consumption of fast-foods.[2] By definition, fast foods are a wide range of ready-to-eat foods and beverages, which are sold on the street and in public places". [3] Fast-foods are relatively cheaper sources of food and readily available to a large number of people.[3] Despite the ease of access to these foods, many research outcomes have shown the negative effect of fast food on health status. [4,5,6]

Research has shown that fast foods contain health-injurious ingredients such as high salt, high sugar, trans-fats, and saturated fats.[7] To avert this situation and ensure that fast foods are prepared in much healthier ways, the acquisition of knowledge on nutrition and diet related-diseases by fast-food vendors has been shown to be key.[8] In promoting health, it is important to consider both the nutritional knowledge and attitude of consumers and fast-food providers.[8]

Reflecting on the rising food consumption patterns outside homes, eating-out establishments are playing an important role in meeting this need. [9,10] Fast foods are widely patronised for their taste, easy availability and reasonable price. [10] One very important role of fast-foods is their contribution towards maintaining the nutritional status of a large section of the population. However, they are largely refined and high in salt, sugar and fats. These ingredients, when in excess, lead to the development of obesity and its related Diet-Related Non-Communicable Diseases (DR- NCDs). [4,5,6]

These DR-NCDs, such as diabetes, cardiovascular diseases, cancers, and hypertension have become global disease burdens increasing morbidity and mortality. [11,12] In recent times, in Africa, several factors have been linked to the surge of NCDs. For instance, high intake of sodium, saturated fats, trans fats, fibre-poor diets, and low intake of fruits and vegetables have been associated with the onset of hypertension and diabetes, which have become pervasive within the population.[13] According to Addo *et al.,*[14] the prevalence of hypertension in rural and urban Ghana is 19.3% and 54.6%, respectively.

Similarly, the 2018 Global Nutrition Report revealed that over 400 million people worldwide were diagnosed with diabetes.[15]

Fast-food vendors have been identified as stakeholders within the food service value chain and are responsible for meal planning and preparation. They decide on what goes into the preparation and serving of these meals. It is common practice to resort to spices containing monosodium glutamate (MSG) to enhance food taste. These MSGs have been linked to the increasing prevalence of Nutrition-related NCDs like hypertension. Also, most fast foods have low fibre and are high in oil. The quantities of vegetables used or served are very minimal, and therefore the health-protecting benefits of fibre which are mainly obtained from these vegetables, may not be obtained by the people who patronise fast foods. According to Reichler and Dalton [16] the Institute of Medicine identified insufficient background and training in nutrition and recipe modification among caterers and chefs as key barriers regarding the preparation of healthy foods in eateries. Mortlock *et al.*,[17] noted that numerous authors are in general agreement that a good level of knowledge and the effective practice of such knowledge are essential in ensuring the safe production of food in catering operations.

The knowledge and cooking practices of fast-food providers relating to nutrition and health are important as consumers are increasingly becoming mindful of healthy eating and nutrition. Even though fast-food providers in the food industry play a vital role in making food accessible to the general public, little is known about their knowledge and practices regarding nutrition and nutrition-related diseases. This study, therefore, sought to assess the general nutrition knowledge and practices of fast-food providers in the Kumasi Metropolis of Ghana. The specific objectives were to ascertain the knowledge of fast-food providers on diet-related non-communicable diseases through interviews and to observe and identify the cooking practices of fast-food providers during meal preparation in the Kumasi Metropolitan area.

Subjects and Methods:

The study employed a cross-sectional design using the quantitative research approach, where variables were specific to the objectives and options were given for choices to generate quantitative data.

The study was conducted in three (3) suburbs of the Kumasi Metropolitan Area (KMA) in the Ashanti Region of Ghana, namely, Bantama, Suame and Tafo Sub Metro. The study population were fast food vendors within the Kumasi metropolis.

Sampling:

Kumasi Metropolitan Area has 10 sub-metros. The study used simple random sampling to select three (3) study sites through blind-folding and balloting of names written on pieces of folded paper. According to the KMA report cited online (http://kma.gov.gh), there were 446 certificated fast-food operators in the three selected sub-metro. The selection of the fast-food vendors to be interviewed was due to convenience and availability.

Sample size determination:

A minimum acceptable sample size of 210 fast food vendors was determined using the Yamane [18] formula, with a 100% response rate and an estimated population of 446 fast food vendors in Bantama, Suame, and Tafo, within the Kumasi Metropolis at 95% confidence interval and a margin of error of 5%.

Data collection:

An online semi-structured questionnaire, developed using google forms, was used to obtain data from the participants. The questionnaire was adapted from similar studies [19] on nutrition knowledge and was modified to suit the objectives of the study. The questionnaire was made up of four sections; socio-demographic details of the participants, nutrition knowledge, diet-related NCDs knowledge and cooking practices.

In assessing the dietary knowledge of respondents, a list of questions on food nutrients, basic functions of food nutrients, specific food nutrients and the functions and diet-related diseases were asked.

Ethical considerations:

Ethical clearance was received from the Committee on Human Research, Publication and Ethics of the College of Health Sciences, Kwame Nkrumah University of Science and Technology; with a **reference no. CHRPE/AP/730/22.**

Study participants were approached and the purpose of the research was explained. Those who agreed to be part of the study were given informed consent forms to sign and date. Subsequently, these participants were recruited voluntarily. Participants were informed about their right to withdraw from the study at any time, and this would not affect them in any way. Participants were assured of confidentiality and that their identity would not be disclosed. Again, any information given would be used exactly for the purposes of the study and not contrary. Also, the information would be accessible to only the research team and this information would be discarded appropriately after the study.

Analysis:

Statistical Package for Social Sciences version 25 (SPSS IBM Inc Chicago, USA) was used for data analysis. Absolute, relative frequencies and chi-square (Fischer's exact test) cross-tabulation were used to determine the nutritional knowledge and the cooking practices of the respondents. The outcomes are presented in tables and pie charts.

Results:

Socio-demographic characteristics of the participants

The sociodemographic information of the participants is presented in Table 1. A total of 210 participants took part in the study. There were 139 (66.2%) females and 71 (33.8%) males in this study. More than half (57.1%) of the participants were between the ages of 21-25 years, while 5% were more than 30 years old. Almost half (47.1%) of the participants were Northerners, with about a third (31.9%) being

Akans and about a fifth (21.0%) being either Gas or Ewes. More than 80% of the participants had attained pre-tertiary education as their highest level of education, with only about 12% being graduates of a tertiary institution. Regarding the participants' marital status, majority (71.4%) were single, a fourth (23.3%) of them were married, and about 5% were either divorced or separated.

Table 1: socio-demographic characteristics of participants

	Frequency N =210	Percent (%)
Age		
15-20	21	10.0
21-25	120	57.1
26-30	57	27.1
31+	12	5.7
Sex		
Female	139	66.2
Male	71	33.8
Ethnicity		
Akan	67	31.9
Ewe	17	8.1
Ga	27	12.9
Northerner	99	47.1
Level of Education		
MSLC /JHS	50	23.8
SHS	75	35.7
NVTI	60	28.6
Tertiary	25	11.9
Marital Status		
Divorce	2	1.0
Separated	9	4.3
Married	49	23.3
Single	150	71.4

Source: field data, (2022)

Participants' sources of Nutrition knowledge

Figure 1 presents the sources of nutrition knowledge of the participants. Thirty-seven percent of the participants (37%) received general nutrition knowledge either from family and friends or (14%) from the mass media. Seven percent (7%) sourced nutrition knowledge from dieticians. Six percent (6%) of the participants reported receiving nutrition knowledge solely from other health personnel. About a third (29.0%) of them received nutrition knowledge from more than one source.

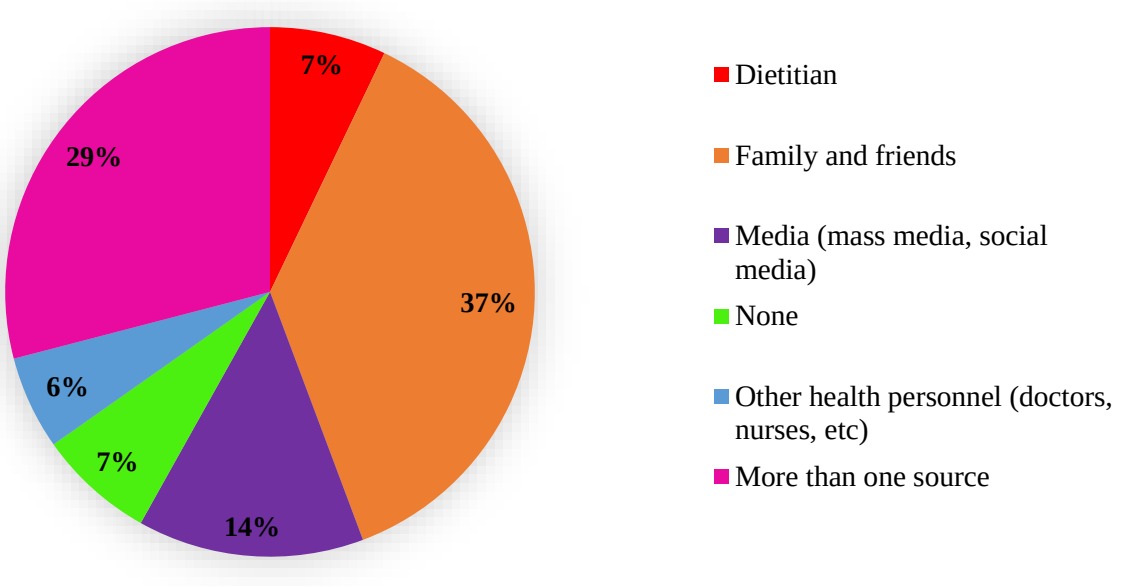

Fig 1: Participants' General Sources of nutrition knowledge
Source: field data, (2022)

Participants' general nutrition knowledge

Among the 210 fast food vendors, over 90% of them agreed that cereals, yam, plantain, bread and spaghetti are good sources of carbohydrates. Majority of the respondents (64.8%) did not agree or were not sure whether adequate fibre intake helps with satiety. More than half (51.9%) of the participants erroneously agreed with the statement that fruits and vegetables were not good sources of vitamins, while 11.4% were not sure as they neither agreed nor disagreed with the statement. There was a split when the respondents were asked whether children needed more protein than adults; a little below 50% of the participants agreed to the question, while a similar number (43.8%) also disagreed. However, more than 90% of the participants rightfully agreed to the sources of protein. Most (66.7%) of the respondents in this study disagreed that a lack of iron intake could lead to anaemia, as shown in Table 2.

Table 2: General nutrition knowledge of fast-food vendors

Nutrition Knowledge	Strongly disagree n (%)	Disagree n (%)	Neither agree nor disagree n (%)	Agree n (%)	Strongly agree n (%)
5. Cereals, yam, plantain, bread, and spaghetti are good sources of carbohydrates.	5(2.4)	0(0.0)	9(4.3)	64(30.5)	132(62.9)
6. Carbohydrate provides the body with energy	5(2.4)	2(1.0)	8(3.8)	66(31.4)	129(61.4)
7. Oats, legumes, and green leafy vegetables and fruits are good sources of fibre.	51(24.3)	38(18.1)	17(8.1)	40(19.0)	64(30.5)
8.Adequate intake of fibre helps increase satiety	52(24.8)	54(25.7)	30(14.3)	25(11.9)	49(23.3)
9. Meat, fish, egg and beans are good sources of protein	5(2.4)	7(3.3)	6(2.9)	57(27.1)	135(64.3)
10. Protein helps promote growth	5(2.4)	8(3.8)	15(7.1)	49(23.3)	133(63.3)
11. Children need more protein than adults.	44(21.0)	56(26.7)	18(8.6)	34(16.2)	58(27.6)
12. Fruits and vegetables are not good sources of vitamins.	48(22.9)	29(13.8)	24(11.4)	36(17.1)	73(34.8)
13. Vitamins protect the body against diseases	5(2.4)	33(15.7)	15(7.1)	66(31.4)	91(43.3)
14. Kontomire, alefu, spinach, kidney and egg are good sources of iron	36(17.1)	46(21.9)	24(11.4)	49(23.3)	55(26.2)
15. Lack of iron causes anaemia	47(22.4)	93(44.3)	18(8.6)	21(10.0)	31(14.7)

Source: field data, (2022)

Nutrition knowledge adequacy of the participants

Table 3 illustrates the adequacy levels of the nutrition knowledge of the participants. Overall, about half (49.0%) of the participants had inadequate knowledge on nutrition, with just 13 (6.2%) participants having adequate nutrition knowledge. A significant difference in knowledge adequacy was found between gender, with more males (26.7%) having moderate knowledge than the females (18.1%) ($p< 0.05$). Slightly more females (4.3%) than males (1.9%) had adequate nutrition knowledge. Again, there was a significant difference($p<0.05$) in the knowledge adequacy among the participants' level of education. Half (50.5%) of the participants aged 21-25 had adequate nutrition knowledge There was also a significant difference observed among the different general sources of nutrition knowledge as

well as among the different educational units where nutrition education was received by the participants ($p<0.05$).

Table 3: Adequacy level of participants' nutrition knowledge

	Nutrition knowledge classification				
	Inadequate n (%)	**Moderate n (%)**	**Adequate n (%)**	**Total n (%)**	**p- value**
Gender					
Female	92(43.8)	38(18.1)	9(4.3)	139(66.2)	
Male	11(5.4)	56(26.7)	4(1.9)	71(33.8)	**0.009***
Total	103(49.0)	94(44.8)	13(6.2)	210(100)	
Age					
15-20	10(4.8)	10(4.8)	1(0.5)	21(10.0)	
21-25	78 37.1)	34(16.2)	8(3.8)	120(57.1)	0.086
26-30	12(5.7)	43(20.5)	2(1.0)	57(27.1)	
35+	3(1.4)	7(3.3)	2(1.0)	12(5.7)	
Total	103(49.0)	94(44.8)	13(6.2)	210(100)	
Level of education					
MSLC /JHS	27(12.8)	23(11.0)	0(0.0)	50(23.8)	
NVTI	32(15.2)	27(12.8)	1(0.5)	60(28.6)	
SHS	39(18.6)	33(15.7)	3(1.4)	75(35.7)	**0.000***
Tertiary	5(2.4)	11(5.2)	9(4.3)	25(11.9)	
Total	103(49.0)	94(44.8)	13(6.2)	210(100.0)	
Do you have any knowledge in nutrition?					
No	9(4.3)	4(1.9)	3(1.4)		16 (7.6)
Yes	95(45.2)	90(42.9)	9(4.3)	194(92.4)	0.070
Total	103(49.0)	94(44.8)	13(6.2)	210(100.0)	
If yes what is the source the knowledge?					
Dietitian	1(0.5)	12(5.7)	2(1.0)	15(7.1)	
Family and friends	28(13.3)	45(21.4)	4(1.9)	77(36.7)	
Media (mass media, social media)	18(8.6)	9(4.3)	2(1.0)	29(13.8)	0.195
Not applicable	10(4.8)	6(2.9)	0(0.0)	16(7.6)	
Other health personnel (doctors, nurses, etc)	7(3.3)	5(2.4)	0(0.0)	12(5.7)	
More than one source	39(18.6)	17(8.1)	5(2.3)	61(29.0)	
Total	103(49.0)	94(44.8)	13(6.2)	210(100.0)	
At what educational level did you receive nutrition education?					
N/A	18(8.6)	9(4.3)	0(0.0)	27(12.9)	
JHS	10(4.8)	25(11.9)	0(0.0)	35(16.7)	
SHS	34(16.2)	28(13.3)	2(1.0)	64(30.5)	**0.014***
NVTI	30(14.3)	20(9.5)	1(0.5)	51(24.3)	
Polytechnic	11(5.2)	10(4.8)	3(1.4)	24(11.4)	
University	0(0.0)	2(1.0)	7(3.3)	9(4.3)	
Total	103(49.0)	94(44.8)	13(6.2)	210(100.0)	

Data was presented in Chi-square with $p \leq 0.05$
Source, field data, (2022)

Participants' knowledge on nutrition-related non-communicable diseases

Majority (56.2%) of the participants rightfully disagreed to the assertion that fat from animal and animal products is good for the human body. Again, about half (56.2%) of the participants agreed that saturated fats from food is linked to the development of cardiovascular diseases. More than half (60%) of the participants did not agree that fast foods are a source of high fats and oils while 83.9% indicated there was no link or they were not sure of the link between salt and salty foods intake and hypertension. A little over 60% of the respondents were also unaware that canned foods are high in salt. About 71.4% of the participants disagreed that monosodium glutamate was not healthy for the body, with slightly more than half (58.6%) of the participants neither agreeing or not sure about fibre intake preventing diabetes and cardiovascular diseases (Table 4).

Table 4: Knowledge of respondents on non-communicable diseases

Statements	Strongly disagree n (%)	Disagree n (%)	Neither agree nor disagree n (%)	Agree n (%)	Strongly agree n (%)
*About 50% of NCDs are diet-related	78(37.1)	72(34.3)	24(11.4)	20(9.5)	20(9.2)
*Monosodium-glutamate is not healthy for the body	74(35.2)	76(36.2)	21(10.0)	16(7.6)	23(11.0)
*Hypertension is attributed to high intake of salt	65(31.0)	77(36.7)	34(16.2)	26(12.4)	8(3.8)
*Canned foods contain a lot of sodium (salt).	55(26.2)	70(33.3)	11(5.2)	33(15.7)	41(19.5)
*Ketchup are very high in sugar	64(30.5)	43(20.5)	21(10.0)	44(21.0)	38(18.1)
*Fats from animal and animal products is good for the body.	64(30.5)	54(25.7)	23(11.0)	40(19.0)	29(13.8)
*Fats from plant and plant products is good for the body.	86(41.0)	29(13.8)	21(10.0)	45(21.4)	29(13.8)
*Foods high in saturated fats and oil are related to cardiovascular diseases.	36(17.1)	24(11.4)	32(15.2)	81(38.6)	37(17.6)
*Fast foods is a source of high fats and oils.	63(30.0)	56(26.7)	7(3.3)	52(24.8)	32(15.2)
*To prevent HPT and CVDs, the WHO recommends salt intake of less than 6 grams per person per day.	55(26.2)	53(25.2)	30(14.3)	40(19.0)	32(15.2)
*Fibre intake can prevent diabetes and cardiovascular diseases	53(25.2)	39(18.6)	31(14.8)	48(22.9)	39(18.6)

*Data was presented in frequency and percentage terms.
Source, field data, (2022)

Diet-related non-communicable disease knowledge adequacy of the participants

Table 5 shows the adequacy levels of participants' knowledge regarding Nutrition-related NCDs. Overall, 11 participants, representing 5.2%, exhibited adequate knowledge about diet-related non-communicable diseases. Also, 139 (66.2%) participants had inadequate knowledge about diet-related NCDs. However, there were no significant differences between the sociodemographic characteristics of the participants and their NCDs knowledge adequacy levels. None of the participants with educational level of MSLC /JHS and NVTI had adequate knowledge about diet-related non-communicable diseases. Also, out of the 9 people who received knowledge about diet-related NCDs at the university, majority (5 participants) had adequate knowledge levels.

Table 5: Adequacy level of participants' NCD knowledge

	Inadequate n (%)	Moderate n (%)	Adequate n (%)	Total n (%)	p- value
Gender					
Female	91(43.3)	41(19.5)	7(3.3)	139(66.3)	0.285
Male	48(22.9)	19(9.0)	4 (1.9)	71(33.8)	
Total	**139(66.2)**	**60(28.6)**	**11 (5.2)**	**210(100.0)**	
Age					
15-20	17(8.1)	4(1.9)	0(0.0)	21(10.0)	
21-25	83(39.5)	32(15.2)	5(2.4)	120(57.1)	0.053
26-30	33(15.7)	19(9.0)	5(2.4)	57(27.1)	
35+	6(2.9)	5(2.4)	1(0.5)	12(5.7)	
Total	**139(66.2)**	**60(28.6)**	**11(5.2)**	**210(100.0)**	
Level of education					
MSLC /JHS	45(21.4)	14(6.7)	0(0.0)	59(28.1)	
NVTI	31(14.7)	4(1.9)	1(0.5)	36(17.1)	
SHS	54(25.7)	19(9.0)	4(1.9)	77(36.7)	0.702
Tertiary	9(4.2)	23(11.0)	6(2.9)	38(18.1)	
Total	**139 (66.2)**	**60 (28.6)**	**115.2)**	**210 (100.0)**	
What is the source the knowledge?					
Dietitian	11(5.2)	0(0.0)	4(1.9)	15(7.1)	
Family and friends	57(27.1)	20(9.5)	1(0.5)	78(37.1)	
Media (mass media, social media)	26(12.4)	1(0.5)	2(1.0)	29(13.8)	0.689
None	10(4.8)	5(2.4)	0(0.0)	15(7.1)	
Other health personnel (doctors, nurses, etc)	10(4.8)	1(0.5)	1(0.5)	12(5.7)	
More than one source	25(12.0)	33(15.7)	3(1.4)	61(29.0)	
Total	**139(66.2)**	**60(28.6)**	**11(5.2)**	**210(100.0)**	
At what educational level did you receive nutrition education?					
None	14(6.7)	12(4.3)	1(0.5)	27(12.9)	
JHS	25(12.0)	10(4.8)	0(0.0)	35(16.7)	
SHS	44(21.0)	17(8.1)	3(1.4)	64(30.5)	0.448
NVTI	31(14.8)	16(7.6)	4(1.9)	51(24.3)	
Polytechnic	22(10.5)	2(1.0)	0(0.0)	24(11.4)	
University	1(0.5)	3(1.4)	5(2.4)	9(4.3)	
Total	**139(66.2)**	**60(28.6)**	**11(5.2)**	**210 (100.0)**	

Data was presented in Chi-square with $p \leq 0.05$
Source, field data, (2022)

Cooking practices of fast-food vendors

Participants were asked about their cooking practices, and their responses are presented in Table 6. More than half (68.1%) of the participants reported always or mostly adding stock cubes during meal preparations, while 26 (12.4%) use stock cubes sometimes. Additionally, 72.8% of the participants

reported always using canned tomatoes than fresh ones in the preparation of stews and soups. Only about 5.7% and 15.2% of the participants reported always or most times serving adequate cut vegetables with meals. Again, about 90% of respondents reported of always using the same oil many times for deep frying, with 55.2% of the respondents reporting of not often deskinning the chicken before cooking.

Table 6: Cooking practices of fast-food vendors

Cooking practices	Always n (%)	Most times n (%)	Sometimes n (%)	Not often n (%)	Never n (%)
*I add stock cubes (e.g., royco, maggie,) in meal preparations.	98(46.7)	45(21.4)	26(12.4)	21(10.0)	20(9.5)
*I use polished/ refined rice when cooking rice dishes.	84(40.0)	39(18.6)	9(4.3)	49(23.3)	29(13.8)
*I use more canned tomatoes than fresh tomatoes when I am preparing stews and soups.	74(35.2)	79(37.6)	15(7.1)	23(11.0)	19(9.0)
*I use butter/lard/margarine in food preparation or garnishing.	80(38.1)	62(29.5)	15(7.1)	36(17.1)	17(8.1)
*I serve adequate cut vegetables (cabbage, lettuce, carrot and cucumber, etc) with meals.	12(5.7)	32(15.2)	52(24.8)	8440.0)	30(14.3)
*I use ketchup and salad cream to serve the food	76(36.2)	52(24.8)	23(11.0)	41(19.5)	18(8.6)
*I use saturated fat/oil for cooking.	11(5.2)	20(9.5)	28(13.3)	98(46.7)	53(25.2)
*I reuse the same oil many times for deep frying.	115(54.8)	74(35.2)	6(2.9)	6(2.9)	9(4.3)
*I deskin the chicken before cooking.	7(3.3)	9(4.3)	6(2.9)	116(55.2)	72(34.3)

*Data was presented in frequency and percentage terms.

Participants' report on other uses of oil overused for deep frying

Figure 2 indicates what the participants do with the same oil they use for several deep frying. After severally using the same oil for deep frying, almost all the participants (80%) reported that they prepared "shito" or stew with the overused oil.

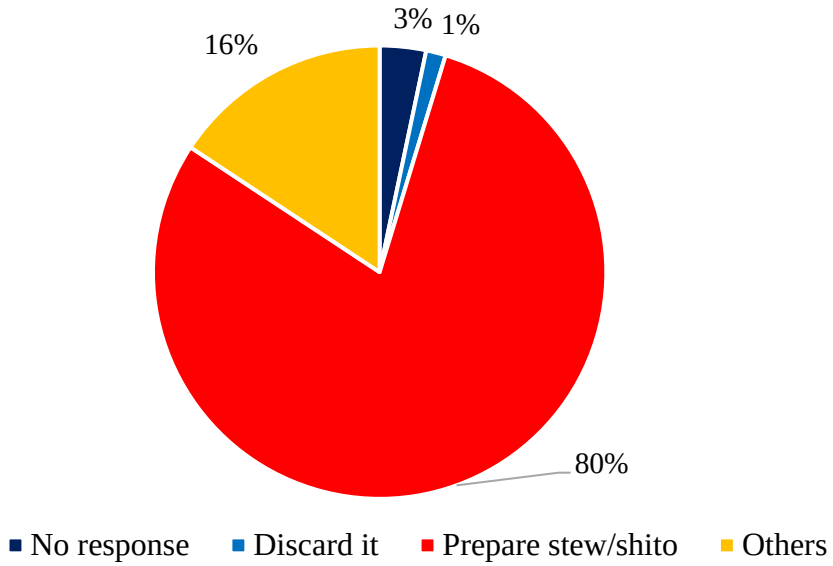

Figure 2: How participants use the overused oil after deep frying.
Source: field data, (2022)

Discussion:

The current study assessed the nutrition knowledge and the cooking practices of fast-food vendors within the Kumasi Metropolis of Ghana. There were 139 (66.2%) females and 71 (33.8%) males in this study, and this is consistent with many studies that had more females in food preparation and vending services, demonstrating that the local food service industry is traditionally dominated by females. [20,21,22] However, some authors reported more males than females in their studies. [2,3,23]. In this study, the assessment of knowledge on nutrients showed that majority of the participants were aware of the good sources of carbohydrates and proteins, and this is similar to the study by Lessa *et al.*,[24]

Even though there has been an established relationship between insufficient iron intake and the development of anaemia [25,26,27], most of the respondents in this study were unaware of the link between iron deficiency and anaemia, as majority (66.7%) disagreed that a lack of iron intake could lead to anaemia. Nutrition knowledge is key to preparing healthy and nutritious meals for consumption. In this study, majority of the participants had inadequate knowledge on nutrition. Even though there is a paucity of literature in the area of general nutrition knowledge of food vendors and handlers, most of the studies on nutrition knowledge of food vendors and handlers (focus on their food safety knowledge) reported

mixed results. While some studies concurred with the results from this study, [21,24] others reported majority of their participants having adequate nutrition knowledge. [1,2,3,28] There was a significant difference in knowledge adequacy between genders, with more males (26.7%) having moderate knowledge than females (18.1%). A greater number of females (43.8%) than males (5.4%) had inadequate knowledge. Slightly more females (4.3%) than males (1.9%) had adequate nutrition knowledge. Again, there was a significant difference in the knowledge adequacy among the participants' level of education, and a half (50.5%) of the participants aged 21-25 had adequate nutrition knowledge. There was also a significant difference observed among the different general sources of nutrition knowledge as well as among the different educational units where nutrition education was received by the participants. Interestingly, for the participants who did not receive nutrition education from any educational institution, none of them had inadequate knowledge in nutrition, while very few of those who received nutrition education in the senior high school (0.5%), polytechnic (0.5%), and university (1%) had inadequate nutrition knowledge.

In this current study, majority of the participants rightfully disagreed with the assertion that fat from animal and animal products is good for the human body. Additionally, about half (56.2%) of the participants agreed that saturated fats from food are linked to the development of cardiovascular diseases; and this link has been established by several studies. [29,30,31]

Interestingly, though fast foods have been known to be a source of high dietary fats and oils and, therefore, could lead to increased caloric intake, [3,7,32] more than half (60%) of the participants disagreed. The participants displayed a relatively low knowledge about salt intake and the link to hypertension, as 83.9% indicated there was no link or they were not sure of the link between salt and salty foods intake and hypertension. A little over 60% of the respondents were also unaware that canned foods are high in salt. They also demonstrated their lack of knowledge about the effects of monosodium glutamate (MSG) on health, as more than half (71.4%) of them disagreed that monosodium glutamate was not healthy for the body. However, many studies have shown that frequent consumption of MSG is associated with hypertension and being overweight, [33,34,35] and this contradicts the responses given by

the respondents. Although several studies have shown the importance of fibre in preventing diabetes and cardiovascular diseases, [36,37,38,39] slightly more than half (58.6%) of the participants either did not agree or were not sure about that.

The use of stock cubes in meal preparation has been implicated in the rise in hypertension and related diseases. [35,40] In this study, more than half (68.1%) of the participants reported always or mostly adding stock cubes during meal preparations, while 26 (12.4%) used stock cubes sometimes. This was to enhance the taste of the foods to draw more customers since most customers are more interested in the taste of the food than other characteristics, as asserted by empirical literature.[23,24,34,41] Stock cubes, due to their high levels of sodium, usually monosodium glutamate (MSG), are not recommended for regular consumption, as MSG has similar effects of increased blood pressure as salt does.[35] In addition, 72.8% of participants reported always using canned tomatoes than fresh ones in the preparation of stews and soups. If as high as 68.1% and 72% of fast-food vendors are constantly using MSG and canned tomatoes, respectively, in food preparation, then consumers are being exposed to a high risk of NCDs, and this might have accounted for the surge in NCDs in Ghana in recent years.

In preventing and managing nutrition-related NCDs such as hypertension and diabetes, the WHO has recommended the daily consumption of at least five (5) portions of fruits and vegetables.[12] In this study, about half of the participants reported that they do not usually serve adequate cut vegetables (cabbage, lettuce, carrot and cucumber, etc) with meals. This may be due to the high cost of fruits and vegetables and other health and food safety concerns. Fruits and vegetables are the major sources of protective nutrients and play a vital role in reducing the risk of many NCDs hence their role in daily diet cannot be glossed over. If fast food vendors who have invaded the food market do not provide adequate vegetables to consumers, then consumers are at risk of NCDs and other immunocompromised diseases.

When asked whether they reuse the same oil several times for deep frying, almost all (90%) of the participants always used the oils several times, while just about 4% never reuse the oil. It has been reported that when oils are reused often, they transform into trans-fat, which has been associated with the development of CVDs. [42,43,44] Several studies, however, point to the fact that most food vendors

reuse oils several times for deep frying, as also observed from this study, and this could be injurious to health. [44,45] Additionally, almost all the participants reported that they prepared "shito" or stew with the overused oil (Figure 2). This further aggravates the concerns about the intake of trans-fat since these overused oils are likely to have isomerised into trans-fat. Trans-fat has been noted to not only increase the levels of the low-density lipoprotein cholesterol (bad cholesterol) in the body, but also reduce that of the high-density lipoprotein cholesterol (good cholesterol). These are linked to a higher risk of developing stroke, heart disease and type 2 diabetes. [46]

This study also assessed how chicken is prepared by fast-food vendors. Chicken is a very important part of fast food in Ghana, as many patrons of these foods opt for chicken. Chicken is a good source of protein; however, the skin contains a lot of fat which is unhealthy. [47,48] In this study, 188 (89.5%) participants did not usually deskin the chicken before using it for meal preparation.

Conclusion:

A majority of the fast-food vendors had inadequate knowledge in nutrition. A significant difference was found between the nutrition knowledge adequacy levels relative to gender and the education level of the respondents.

Again, a greater majority of the participants had inadequate knowledge in diet-related non-communicable diseases (Nutrition-related NCDs), with just a few of them demonstrating adequate knowledge levels. However, there was no significant differences between the Nutrition-related NCDs knowledge adequacy levels of the participants and their socio-demographic characteristics.

Regarding their cooking practices, almost all the participants used the same oil several times for deep frying. Just a few discarded this over-used oil, while majority prepared "shito" or stew with it. The fast-food providers used high saturated fats as well as high sodium products in meal preparations for consumers and, in effect, exposed consumers to the risk of the developing Nutrition-related NCDs.

Recommendations

The need for regular nutrition education of fast-food vendors to limit the unhealthy methods in meal preparation and resort to the use of natural spices in place of artificial spices such as stock cubes is due. The Ministry of Education should include nutrition and health as a course in catering institutions. This will help train and equip food vendors on how to prepare foods in a healthy manner.

Limitation

A limitation to the study is that the purposive sampling technique employed due to the unorganised nature of the food vendors could be subject to researcher bias.

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