Research Article

Personal and food hygiene practices of subsistence food vendors operating in Kano metropolis, northwestern Nigeria

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Abstract

Background: Foodborne diseases are on the increase throughout the world due to poor attention given to personal and food hygiene measures by both lawmakers and people in charge of food preparation, especially in the developing countries.

Objective: To examine the knowledge and practices of food vendors operating in urban Kano on personal and food hygiene.

Materials and Methods: We used a descriptive cross-sectional design to study a random sample of 380 food vendors in Kano metropolis. Data were collected using pretested interviewer administered semi-structured questionnaire. Data were analyzed using Epi Info® software, version 3.5.1.

Results: The mean age of the food vendors was 27.78 ± 7.63 years. The majority (61.1%) of them were men (53.2%), married (61.8%), and had at least secondary education (51.1%). More than two-thirds (89.7%) had fair knowledge of personal hygiene, although there were deficiencies in some of the key hygiene areas, but 62.4% and 36.6% had good and fair knowledge of food hygiene, respectively. Most of the food vendors had good practices of personal hygiene (93.2%). Paradoxically, only 17.1% had good practice of food hygiene. Furthermore, more than half (54.2%) showed bad workplace hygiene practices.

Conclusion: Food vendors operating in Kano generally knew about personal and food hygiene, but this was not reflected in their hygienic practices. It is the statutory responsibility of the environmental health officers to safeguard and implement food hygiene laws in Nigeria. But despite the available structure and personnel at the local government area level, the laws are still inactive. The health authorities at the state and federal levels should empower the environmental health officers with the necessary policy and logistic support they require to fully implement the laws in Kano and Nigeria as a whole. The laws should also be reviewed to ensure more severe penalty for offenders.

KEY WORDS: Food hygiene practice, subsistence food vendors, Kano, northwestern Nigeria

Introduction

Food vendors are significant part of food sources in both developed and developing countries. They contribute significantly towards ensuring food safety, especially during processing, storage, preparation, or retailing of food, including drinks. Diseases spread through food, which is a common persistent problem that results in morbidity and occasionally mortality.[1] Foodborne diseases are on the increase throughout the world due to poor attention given to personal and food hygiene measures by both lawmakers and people in charge of food preparation, especially in developing countries.[1] A study by the joint Food and Agriculture Organization (FAO) and the World Health Organization expert committee on food safety reported that illness due to contaminated food is perhaps the most widespread health problem in the world and a major cause of reduced economic productivity.[2] Typhoid fever was also estimated to affect about 16.6 million individuals and account for 600,000 deaths worldwide each year.[3] It was also reported that approximately 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths are caused by foodborne

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diseases in the USA each year.[4] With the growing number of street food business driven by the miasma from poverty, food insecurity, and ignorance in the developing countries, what is seen or reported on foodborne illnesses is only the tip of the iceberg.

Investigations of outbreaks of foodborne diseases throughout the world show that, in nearly all instances, they are caused by failure to observe satisfactory standards in preparation, processing, cooking, storing, or retailing of food.[5] It is worthy of note that the problems of food safety differ considerably between industrialized and underdeveloped countries.[6] While vended foods in underdeveloped nations are traditionally prepared and retailed under minimal hygiene and cost, problems with food hygiene in the industrialized countries are more with processing and packaging. In either case, as the purchase and consumption of meals from restaurants and other public places increase, proper and adequate hand hygiene at food preparation facilities is of increasing importance.[7] Analysis of reports from Africa on food hygiene showed that knowledge and attitude of food handlers pose a great challenge to food hygiene in West Africa.[1] This study examined personal and food hygiene knowledge and practices of subsistence food vendors operating in urban Kano with the hope that the findings will be useful for policy makers and program managers for planning, implementation, and evaluation of public health interventions/strategies for the control of the recurrent foodborne illnesses in Kano.

Materials and Methods

Setting/Study Population

The study was carried out among subsistence food vendors operating within the eight metropolitan local government areas (LGAs) of Kano state: Kano municipal, Dala, Gwale, Fagge, Nassarawa, Tarauni, Kumbotso, and Ungogo.

Kano state is located in northwestern Nigeria and is one of the oldest and largest states in the country, and perhaps also the most traditional. Commerce and agricultural production have been the backbone of the Kano economy. Islam is the dominant religion, though there are significant groups of Christians. Urban drift from rural areas within Kano, from other states in Nigeria, and from West Africa has provided a steady stream of migrants adding to Kano's growing population. Kano is therefore a cosmopolitan melting pot of people. The city is characterized by overcrowding, poor sanitation, and inconsistent municipal water supply. The sale of food including drinks is common on the streets of Kano and provides a good source of nourishment for the common man. Kano state had a population of 9,383,682 according to the 2006 population census[8]; and the metropolitan LGAs contributed 2,828,861 (30.1%) of this figure. Majority of the residents were traders, civil servants, farmers, and students.

Study Design/Sampling

We used a descriptive cross-sectional design and a random sample of 380 eligible food vendors for the study, and only the subsistence level food vendors (food stalls "Mama Food" or street vendors and alike) qualified for the study. The sample size was determined using an appropriate formula for estimating minimum sample size for descriptive studies,[9] and a 33% prevalence for unhygienic food practices among food vendors operating in secondary schools in Ilorin, Nigeria.[10] The calculated minimum sample size was increased by 20% to compensate for incomplete responses and nonresponse. The multistage sampling technique was used for selection of the study subjects: at first stage, four LGAs were randomly selected from the eight metropolitan LGAs of Kano state. At the second stage, three wards were randomly selected from each of the selected LGAs by balloting. This gave a total of 12 wards. Thereafter, one settlement was selected from each of the wards using simple random sampling, arriving at a total of 12 settlements. With the assistance of the LGA officials, walk-through was conducted in the selected settlements to identify and list eligible food vendors; and proportionate to the size of the food vendors in the settlements, samples ranging between 21 and 37 were selected therein. The samples were selected systematically using sampling intervals obtained by dividing the number of the enlisted food vendors in the respective settlements with the required samples from the groups.

Instrument Description/Data Collection

Interviewers administered the pretested questionnaire that contained open- and closed-ended questions. The questions were designed to elicit sociodemographic characteristics, knowledge of personal and food hygiene, and food hygiene practices of the food vendors.

The questionnaire was pretested on 50 food vendors in a neighboring LGA other than the metropolitan LGAs. The questionnaires were administered by six trained Hausa-speaking research assistants, and the interviews were conducted in the local language (Hausa), spoken by the majority of the population in Kano. Informed consent was obtained from prospective respondents before questionnaire administration. The consent form was also in the local language (Hausa), and literate respondents indicated acceptance by signing the consent form whereas the nonliterate ones affixed their thumbprint. Permission and ethical clearance for the study were obtained from the Kano State Ministry of Local Government and Chieftaincy Affairs and the institutional review board of Aminu Kano Teaching Hospital, respectively. Data were collected in October and November, 2012.

Data Analysis

Data were analyzed using Epi Info® software, version 3.5.1 (CDC Atlanta, GA, USA). Quantitative variables were summarized using appropriate measures of location and variability, whereas categorical variables were presented as frequencies and percentages.

Respondents' knowledge and practice were scored and graded using a system adapted from a past study.[11] Each correct response to questions assessing knowledge and practice attracted one point, no point given for wrong answer. Respondents scoring $\geqslant$12 points of 16 for knowledge of personal hygiene were considered as having "good" knowledge, whereas those scoring 6–11 or $<$6 were considered as having "fair" or "poor" knowledge, respectively. In the same vein, respondents scoring $\geqslant$16 of 22 points for knowledge of food hygiene were considered as having "good" knowledge, whereas those scoring 8–15 and $<$8 were considered having "fair" and "poor" knowledge, respectively.

The respondents that scored 5–8 of 8 points for personal hygiene practices were considered as to have "good" practice, whereas a score of $<$5 was considered "bad" practice. Similarly, a score of 8–14 of 14 points for food hygiene practices was considered "good" practice whereas $<$8 was considered "bad" practice. Furthermore, a score of 3–5 of 5 points for workplace practices was considered "good" practice whereas $<$3 was considered "bad" practice.

The χ^2-test was used to determine significant association between categorical variables. A *p*-value of $\leqslant$0.05 was considered to be significant.

Results

Sociodemographic Characteristics of the Food Vendors

The food vendors examined were between the ages 11 and 56 years. Their mean age was 27.78 $\pm$ 7.63 years. The majority (61.0%) of them were between 21 and 30 years, Muslims (74.5%), and currently married (61.8%). About half (53.2%) were men, 51.1% had at least secondary school education, and 84.5% operate their food business from a fixed location. The sociodemographic profile of the food vendors is summarized in Table 1.

Table 1: Sociodemographic profile of the food vendors

Characteristic	Frequency (%) *n* = 380
Age (years)	
11–20	48 (12.63)
21–30	232 (61.05)
31–40	69 (18.16)
41–50	27 (7.11)
51–60	4 (1.05)
Sex	
Male	178 (46.84)
Female	202 (53.16)
Ethnicity	
Hausa	131 (34.47)
Fulani	71 (18.68)
Yoruba	89 (23.42)
Igbo	40 (10.53)
Others	49 (12.89)
Religion	
Islam	283 (74.47)
Christianity	97 (25.53)
Marital status	
Married	127 (33.42)
Single	235 (61.84)
Divorced	11 (2.89)
Widowed	6 (1.58)
Separated	1 (0.26)
Educational status	
Primary	115 (30.26)
Secondary	157 (41.32)
Tertiary	37 (9.74)
Qur'anic education only	44 (11.58
No education	27 (7.11)
Nature of food business	
Restaurant	186 (48.95)
Food stall	84 (22.11)
Hawking	51 (15.53)
"Suya"/fish joint	51 (13.42)

Knowledge of Personal and Food Hygiene

The key parameters used for assessing the food vendors' knowledge of personal *hygiene* are summarized in Table 2. More than two-thirds (89.7%) generally had fair knowledge of personal hygiene, although there were deficiencies in some of the key hygiene areas. Specifically, less than a quarter of the respondents mentioned that regular plaiting of the hair in females and cutting of the hair were sanitary ways of looking after the hair. Similarly, less than a quarter of the respondents could readily mention that hands should be washed each time refuse is handled (15.3%), after blowing the nose (5.5%), after handling money (5.0%), or after touching the hair (1.0%). In addition, only 26.8% mentioned that hands should be washed each time before food preparation is commenced [Table 2]. Respondents' knowledge of personal hygiene was significantly associated with their educational status (χ^2 = 17.58, $p < 0.05$) and ethnicity (χ^2 = 11.23, $p < 0.05$). On binary logistic regression using a model consisting of the two variables, both respondents' educational status and ethnicity were found to have significantly influenced their knowledge of personal hygiene [Table 5].

When the respondents were assessed on knowledge of food hygiene, 237 (62.4%) had good knowledge, whereas 139 (36.6%) had fair knowledge. About a quarter (28.2%) knew that washing and blanching are sanitary methods of treating vegetables for consumption, that displaying food for sale in fly-proof net is sanitary (26.1%), and salting is an acceptable method of preserving fish or meat (5.0%), as shown in Table 3. The food vendors' knowledge of food hygiene was only influenced by their duration in food business (Fisher's exact $p < 0.05$). Those that were less than 10 years in food business were less likely to have had fair to good knowledge of food hygiene compared to their counterparts that spent more than 10 years in the business [OR (95% CI) = 0.03 (0.00–0.34)] [Table 5].

Table 2: Knowledge of personal hygiene of food vendors in Kano

Key parameters used in assessing knowledge of personal hygiene	**Correct response (%) *n* = 380**
Knew that personal hygiene entails regular bathing and wearing clean clothes	361 (95.00)
Knew that sanitary ways of looking after the hair include	
Regular plaiting/cutting of hair	51 (13.42)
Washing hair regularly	329 (86.58)
Knew that the finger nails should be cut when necessary	238 (62.63)
Knew that regular washing of clothes prevent/reduce illnesses	311 (81.84)
Knew that hands should ideally be washed	
Before eating food	306 (80.53)
After eating food	266 (70.00)
After visiting toilet	309 (81.32)
After handling refuse	58 (15.26)
After blowing the nose	21 (5.53)
Before commencement of food preparation	102 (26.84)
After handling money	19 (5.00)
After touching the hair	4 (1.05)
Knew that the most sanitary way to clean the body after defecation is with soap and water	328 (86.32)
Knew that routine medical checkup for food vendors should be at 6-month interval	86 (22.63)
Grading of the food vendors' knowledge of personal hygiene	**Frequency (%)**
Good (12–16)	16 (4.21)
Fair (6–11)	341 (89.74)
Poor (0–5)	23 (6.05)
Total (16)	380 (100.00)

Table 3: Food vendors' knowledge of food hygiene

Key parameters used in assessing knowledge of food hygiene	**Correct response (%) *n* = 380**
Sanitary methods for treatment of vegetables before consumption include	
Washing and blanching	107 (28.16)
Washing with salt and water	192 (50.53)
Available methods of preserving fish/meat include	
Freezing	207 (54.47)
Salting	19 (5.00)
Drying	47 (12.37)
Knew that sanitary food preparation/vending site should be sited far from refuse or sewage dumping sites	348 (91.58)
Sanitary methods of displaying food for sale include	
A show glass	264 (69.47)
A fly-proof net	99 (26.05)
Foodborne illness may be due to	
Undercooked food	354 (93.16)
Eating food that stayed overnight unpreserved	351 (92.37)
Chemical additives applied during storage	269 (70.79)
Eating with unwashed hands after defecation	364 (95.79)
Practices that reduce episodes of foodborne illness include	
Washing raw food before cooking	365 (96.05)
Keeping good personal hygiene	372 (97.89)
Ensuring good environmental sanitation	365 (96.05)
Educating the public on foodborne illness and hygiene	293 (77.11)
Use of hand gloves, face mask, or caps during food preparation	286 (75.26)
Grading of the food vendors' knowledge of food hygiene	**Frequency (%)**
Good (16–22)	237 (62.37)
Fair (8–15)	139 (36.58)
Poor (0–7)	4 (1.05)
Total (22)	380 (100.00)

Personal and Food Hygiene Practices of the Food Vendors

We observed that most of the food vendors examined had good practice of personal hygiene (93.2%). Majority washed their hands before commencing food preparation (97.1%), after visiting the toilet (98.2%), and after handling refuses (96.8%); and in all situations, soap and water was used for the cleansing (80.8%). About half (50.5%) took bath and changed clothing daily, although less than half (46.3%) plait or cut their hair at least once per week. Interestingly, hand washing after handling money while in business was practiced by few (19.2%) as shown in Table 4. The respondents' practice of

Table 4: Personal and food hygiene practices of the food vendors (*n* = 380)

Personal hygiene practices	Frequency (%)	Grading
Situations when hands are washed		
Before commencement of food preparation	369 (97.11)	Good practice (5–8) = 354 (93.16%)
After cooking food	339 (89.21)	Bad practice (0–4) = 26 (6.84%)
After handling money	73 (19.21)	Total score (8) = 380 (100.00%)
After visiting the toilet	373 (98.16)	
After handling refuse	368 (96.84)	
Always use soap and water for washing hands	307 (80.79)	
Took bath at least once daily	192 (50.52)	
Wash/change clothing daily	192 (50.52)	
Plait/cut hair at least once weekly	176 (46.31)	
Food hygiene practices		
Wash/rinse utensils at least once daily	343 (90.26)	Good practice (8–14) = 65 (17.11%)
Substances used in cleaning utensils		Bad practice (0–7) = 315 (82.89%)
Tissue paper	4 (1.05)	Total score (14) = 380 (100.00%)
Water only	14 (3.68)	
Soap and water	95 (26)	
Containers/items used in serving food		
Serving spoon	283 (74.47)	
Bare hands	89 (23.42)	
Nylon bags	81 (21.32)	
Sheets of paper	111 (29.21)	
Reusable plates/ dishes	302 (79.47)	
Hygienic practices while serving food		
Wearing sanitary caps	126 (33.16)	
Wearing aprons	225 (59.21)	
Using hand gloves/picking with nylon bags	52 (13.68)	
Wearing face mask	6 (1.58)	
Ways of handling food remnants that stayed overnight		
Refrigerated/reheated and sold	69 (18.16)	
Eaten up by workers	136 (35.79)	
Thrown away	153 (40.26)	
Avoid work while coughing/sore throat	149 (50.85)	
Avoid work while having diarrhea	164 (55.97)	
Avoid work while having skin infection	101 (34.47)	
Workplace practices		
Clean work environment at least once daily	145 (38.16)	Good practice (3–5) = 174 (45.79%)
Ways of managing solid wastes from trade		Bad practice (0–2) = 206 (54.21%)
Burning	102 (26.84)	Total score (5) = 380 (100.00%)
Open dumping	132 (34.74)	
Collection by paid waste managers	172 (45.26)	
Ways of managing liquid wastes from trade		
Discharged into drainage system	188 (49.47)	
Thrown on land or in stagnant water	146 (38.42)	

Table 5: Factors significantly associated with knowledge and practices of the food vendors

				Bivariate		Multivariate	
	Good/fair (*n* = 357)	**Poor (*n* = 23)**	**Total**	**Test (*p*-value)**	**Odds ratio (95% CI)**	**Test (*p*-value)**	**Odds ratio (95% CI)**
Knowledge of personal hygiene							
Educational status							
At least secondary	192 (53.8)	2 (8.7)	194	χ^2 = 17.58 (0.0001)	12.22 (2.71–76.57)	*Z* = 2.91 (0.004)	9.02 (2.05–39.69)
No secondary	165 (46.2)	21 (91.3)	186				
Ethnicity							
Hausa/Fulani	182 (51.0)	20 (87.0)	202	χ^2 = 11.23 (0.0001)	0.16 (0.04–0.57)	*Z* = 2.22 (0.026)	0.24 (0.07–0.84)
Others	175 (49.0)	3 (13.0)	178				
Knowledge of food hygiene	**Good/fair (*n* = 376)**	**Poor (*n* = 4)**					
Duration in food business (years)							
⩽10	365 (97.1)	2 (50.0)	367	Fisher's (0.006)	0.03 (0.00–0.34)	—	—
>10	11 (2.9)	2 (50.0)	13				
Food hygiene practices	**Good (*n* = 65)**	**Bad (*n* = 315)**					
Educational status							
At least secondary	25 (38.5)	169 (53.7)	194	χ^2 = 4.97 (0.026)	0.55 (0.30–0.96)	*Z* = 1.67 (0.09)	—
No secondary	40 (61.5)	146 (46.3)	186				
Ethnicity							
Hausa/Fulani	47 (72.3)	155 (49.2)	202	χ^2 = 11.55 (0.001)	2.7 (1.45–5.06)	*Z* = 0.85 (0.39)	—
Others	18 (27.7)	160 (50.8)	178				
Nature of food business							
Fixed site	39 (60.0)	231 (73.3)	270	χ^2 = 4.66 (0.031)	0.55 (0.30–0.99)	*Z* = 1.59 (0.11)	—
Ambulant	26 (40.0)	84 (26.7)	110				
Workplace hygiene practices	**Good (*n* = 174)**	**Bad (*n* = 206)**					
Educational status							
At least secondary	78 (44.8)	116 (56.3)	194	χ^2 = 4.98 (0.026)	1.59 (1.04–2.43)	*Z* = 2.05 (0.04)	1.53 (1.02–2.31)
No secondary	96 (55.2)	90 (43.7)	186				
Knowledge of food hygiene							
Good/fair	170 (97.7)	206 (100.0)	376	Fisher's (0.043)	0.00 (0.00–1.28)	*Z* = 0.00 (0.99)	—
Poor	4 (2.3)	—	4				

personal hygiene was not influenced by their gender (χ^2 = 1.68, p = 0.19), ethnicity (χ^2 = 0.55, p = 0.46), age (χ^2 = 1.72, p = 0.19), or educational status (χ^2 = 0.85, p = 0.35).

Paradoxically, only 65 (17.1%) of the food vendors had good practice of food hygiene. Hygienic practices during food processing or retailing include use of face mask during food processing or retailing (1.6%), use of hand gloves or picking of food items with nylon bag while retailing (13.7%), use of sanitary caps (33.2%), and use of apron (59.2%). The respondents handled cooked food remnants that stayed overnight by refrigerating, reheating the following day and sold (18.2%), or the food remnant was eaten up by the workers before close of business. In 153 (40.3%), food remnants that stayed overnight were thrown away. The respondents' food hygiene practices were significantly associated with their educational status (χ^2 = 4.97, $p < 0.05$), ethnicity (χ^2 = 11.55, $p < 0.05$), and type of food business (χ^2 = 4.66, $p < 0.05$). When subjected to binary logistic regression using all the associated factors in a model, none of the factors predicted the food vendors' practice of food hygiene as depicted in Table 5.

Regarding the workplace practices of the food vendors, more than half (54.2%) was adjudged to have bad practice. Specifically, only 145 (34.74%) cleaned their work environment at least once a day, majority dispose of solid wastes from the trade through paid wastes managers, and liquid wastes were discharged into drainages (gutters) in majority of the cases (49.47%). The workplace practices of the respondents were also found to be associated with the food vendors' educational status (χ^2 = 4.98, $p < 0.05$) and their knowledge of food hygiene (Fisher's exact $p < 0.05$). After standardization using multivariate analysis, only educational status

emerged as an independent factor that influenced the workplace hygiene practices of the food vendors ($z = 2.05$, $p < 0.05$). Those that had at least secondary school level of education were more likely to have had favorable workplace hygiene practices than their counterparts with no secondary education [OR (95% CI) = 1.53 (1.02–2.31)] [Table 5].

Discussion

Although majority of the food vendors examined had fair knowledge of personal hygiene, they were lacking in some key hygiene areas such as hand washing. A similar scenario was obtained in South Africa where good knowledge of personal hygiene and hand-washing practice were shown.[7] Personal hygiene and hand washing especially is a veritable means of reducing food contamination. This is corroborated by the fact that humans are recognized sources of disease-producing microorganisms from the normal flora that occur in the hair, nose, mouth, throat, bowels, and skin.[7] Contamination of the hand that comes into contact with contaminated body surface predisposes food that comes into contact with it to agents of gastroenteritis, including cholera, enteric fevers, and other forms of foodborne illnesses. Observing personal hygiene for food handlers is therefore crucial to reduce the risk of food contamination.[12]

Majority of the food vendors scored “fair to good” when asked about food safety concepts, circumstances that may lead to foodborne illnesses, and the practices that may reduce episodes of foodborne illnesses. This pattern was similarly reported by Murat et al.[13] from Turkey, Azanza et al.[14] from Philippines, and Zain and Naing[15] from Kota Bharu district of Malaysia when they examined food vendors on these areas. However, Okojie et al.[5] from the southern part of Nigeria contrarily reported poor knowledge of food hygiene among food handlers operating on the university campus.

We also observed that the majority of the respondents paradoxically had good practice of hand washing. This concurs well with a report of findings from Ghana[16] but contrasts the finding of the study by Okojie et al.[5] from southern part of Nigeria that reported a very low frequency of hand washing among food handlers. Interestingly, despite the remarkable knowledge of the respondent on food hygiene, they showed bad practices especially at food preparation and/or retailing practices, and workplace practices. Although soap and water was used by most of the food vendors in cleaning their utensils as obtained in other parts of Nigeria,[10] Ghana,[6] and Sudan,[17] the use of protective devices such as face mask, hand gloves, sanitary caps, and aprons during food processing or retailing was abysmally low as reported by Musa and Akande[10] from Ilorin, Nigeria. Similar studies from the USA[18] and Italy[19] also reported low use of hand gloves among food vendors in regular food processing or retailing except where sticky food items are processed, or when food vendors sustain injuries in their hands. We also observed that about two-thirds of our respondents throw away leftover food; and few refrigerate, reheat, and sell them off the next day. With the recurrent power outage in Nigeria, maintenance of optimum temperatures for storage of food becomes more challenging. It is well acknowledged that adequate temperature in cooking and storage of foods is important to minimize the growth of bacteria; and food that cannot be maintained within the safety temperature zone may act as incubator for pathogenic bacteria whether the food is raw, partially cooked, or fully done.[20,21] It is worthy of note that while it is strongly discouraged to consume foods that are poorly preserved to avoid contamination, wastages in form of discarding excess foods is also uncalled for. In these times of abject poverty and food insecurity in Africa, hygienically prepared excess foods from vendors may perhaps be useful in schools and other social institutions for the less privileged if delivered the same day while it is still fresh. Muinde and Kuria[12] recommended that street food vendors should prepare enough food for the day, so that they can sell all the food because most of them do not have good storage facilities.[12]

Bad hygiene practices in the workplace were common to more than half of the respondents. A significant proportion of the food vendors do not clean their work environment at least once a day, and food is prepared close to waste disposal sites for ease of discarding wastes from the trade. Furthermore, majority of food vendors manage wastes from their trade poorly. Proximity to waste disposal sites may be a source of contamination of food either through flies or contaminated air. The FAO notes that foods should be prepared in a place set aside exclusively for that purpose, whereas the place of preparation should be kept clean at all times and should be far from any source of contamination (rubbish, waste water, dust, and animals).[22]

The disparity in hygiene knowledge and practices of our respondents is a clear indication for a disregard or lack of enforcement of public health laws in our study area, and perhaps other parts of Nigeria albeit the fact that regulatory structure exists and processes are clearly documented. This scenario exists probably because the prescribed punishment on breach of sanitation laws is either not severe or the fines on offenders are very insignificant to deter food vendors from committing offences. The moribund state of these laws may perhaps explain the recurrent epidemics of cholera and other forms of gastroenteritis in the northern part of Nigeria, especially in Kano. However, we observed that both personal and food hygiene knowledge and practices of respondents were significantly associated with their educational status. This buttresses the fact that health education will be useful in improving the knowledge, as well as the attitude and practice of food hygiene among food vendors.

Conclusion

Food vendors operating in Kano generally knew about personal and food hygiene, but this was not reflected in their hygienic practices. It is the statutory responsibility of the

environmental health officers to safeguard and implement food hygiene laws in Nigeria. But despite the available structure and personnel at the LGA level, the laws are still inactive.

Recommendations

In view of the findings of this study, we recommend that the Federal and State Ministries of Health in Nigeria should empower the environmental health officers with the necessary policy and logistic support they require to fully implement food hygiene laws in Kano and Nigeria as a whole. The laws should also be reviewed to ensure more severe penalty for offenders. The environmental health officers should also ensure that all food vendors are licensed to practice, and they are monitored at all times. In addition, a regular continuing education throughout the chain of food production, processing, preparation, and retailing should be organized for all food handlers.

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