

FACTORS ASSOCIATED WITH FOOD HYGIENE PRACTICES AMONG STREET FOOD VENDORS IN SELECTED FOOD VENDING LOCATIONS OF BAUCHI METROPOLIS, NIGERIA

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ABSTRACT

Background: The significance of street food vending in providing relatively nutritious food and means of livelihoods to many people is widely acknowledged in most developing countries. However, there is a growing concern over the safety of the foods. The nature of food hygiene practice among food vendors are attributed to many factors including vendors' characteristics and operational environment, knowledge and attitude among other. This study was conducted to determine the factors associated with food hygiene practice among street food vendors in selected food vending locations of Bauchi metropolis, Nigeria.

Materials and Methods: A cross-sectional study was performed on samples of 300 street food vendors operating in selected food vending locations of Bauchi metropolis, which were selected and interviewed face to face using a pretested structured questionnaire. Chi-square test was conducted to determine the food hygiene practice associated factors.

Result: Out of 300 street food vendors that participated in this study, 174 (58.0%) were females, averaged aged 31years, mainly characterized with low level of education 277 (92.3%), non-attendance of food hygiene training 244 (81.3%), and uncertified food businesses 246 (82.0%). Majority of the respondents have good levels of knowledge regarding food hygiene 273 (91.0%), attitudes towards food hygiene 279(93.0%) and food hygiene practice 271(90.3) The chi-square test revealed that food hygiene training ($\chi^2 = 4.897, p = 0.015$), knowledge regarding food hygiene ($\chi^2 = 13.541, p = 0.002$) and attitude towards food hygiene ($\chi^2 = 5.172, p = 0.040$) were associated with street food vendors' food hygiene practice.

Conclusions: Based on these findings, the study concluded that while street food vending in various food vending locations of Bauchi metropolis can be sustainable, food hygiene training, knowledge regarding food hygiene and attitude towards food hygiene should be prioritized and included as components of any intervention for ensuring good food practices among street food vendors.

Keywords: Food Hygiene, Practice, Street Foods, Vendors, Bauchi Metropolis, Nigeria

1.0 Introduction

In recent years, considerable attention has been given to the activities of street food vendors (SFVs), particularly in developing countries where their number increases every day. This growing attention has to do with the benefits derived from street food vending on one hand, and the profound concern over the safety of the street vended foods on the other. The current increase in the number of street food vendors may be attributed to the associated financial benefits, low capital requirement for running street food vending business, consumer satisfaction, lack of job opportunities as well as increase in rural-to-urban migration (Lues et al., 2006; Rane, 2011).

The mode and places of SFVs operations are relatively similar in most developing countries (Lues et al., 2006; Akinbode et al., 2011; Muyanja et al., 2011; Alimi, 2016). Street food vendors' business units are either stationery or mobile sited in public places including train stations, motor parks, major markets, construction sites, shopping complexes, work places, near streets, factories, schools and hospitals among others (Canini et al., 2013; Alimi, 2016; Cortose et al., 2016). However, due to lack of basic facilities such as portable water, cooling systems, waste disposal facilities and toilets, the hygienic condition at these locations is doubtful, making the consumers' health at risk (Canini et al., 2013; Alimi, 2016; Cortose et al., 2016).

Generally, the risk factors associated with street foods cut across all stages, including procurement and selection of raw materials, transportation, preparation, cooking, storing and serving (Rane, 2011; Alimi, 2016; Cortose et al., 2016). The role of food handlers in safeguarding public health at these critical stages is crucial, as more than 97% of street foods contamination incidences were attributed to their practices (Howes et al., 1996; Bas et al., 2006; Sumner et al., 2011; Lalit et al., 2015). Some studies also noted that, the rate of foodborne disease occurrence in developing countries increases with the prevailing patronage and expansion of food vending activities.

Food borne diseases commonly occur in developing countries including Nigeria owing to poor food hygiene practices, weak enforcement of food hygiene laws, inadequate supervision and monitoring as well as lack of food hygiene education among vendors (Omemu & Aderoju, 2008; Okojie & Isah, 2014). Hence, as street food vending grows and becoming a profitable occupation that competes with formal sector and providing meals to the wider population in many developing nations, SFVs' poor food hygiene practices arising from certain factors such as inadequate knowledge, low educational level, poor attitude, lack of training, lack of certification and poor sanitary condition of street food vendors locations are worthy of evaluation (Umoh & Odoaba, 1999; Toh & Birchenough, 2000; Codjia, 2000; Muinde & Kuri, 2005; Omemu & Aderoju, 2008).

Many studies conducted in various parts of the world to determine the factors associated with food hygiene practice among food handlers reported various results. For instance, a study conducted in Turkey (Bas et al., 2006) and Ethiopia (Nigusse & Kumie, 2012) indicated that knowledge of food handling is significantly associated with food handling practices, whereas, a study conducted in India (Mudey et al., 2010) and Bangladesh (Rabbi & Dey, 2013) revealed that food handling practices were associated with educational status of food

handlers. Furthermore, a study performed in 2009 covering two countries, Nigeria and Kenya revealed that type of premise, unclean equipment and work responsibility were the factors related with food handling practices among vendors (Muinde & Kuria, 2005). Gender was similarly found to be associated with food handling practices of vendors of street foods in Nairobi, Kenya (Muinde & Kuria, 2005). Added to socio demographic factors, literature found that many factors ranging from environmental, knowledge or awareness, attitudinal or behavioural factors were associated with food handling practices (Bas et al., 2006; Donkor et al., 2009). These studies and many others indicated variations of factors associated with food handling practices, particularly across different locations. In that regards however, a review of the existing literature revealed that only few food hygiene practice related studies in Nigeria captured the factors associated with food hygiene practice, particularly among street food vendors. Hence, it is based on the aforementioned scenario that this study was conceived. The current study determines factors associated with food hygiene practices among street food vendors in selected food vending locations of Bauchi Metropolis, Nigeria.

2.0 Materials and Methods

A cross-sectional study was conducted among 300 street food vendors from selected food vending locations of Bauchi metropolis, Nigeria. Bauchi is located in the north-eastern region of Nigeria (figure 1). The respondents were selected through multistage sampling with the help of survey assistants from the Department of Environmental Management Technology of Abubakar Tafawa Balewa University, Bauchi. Pretested structured questionnaire, designed by the researchers based on amended questions from previous studies (Omemu & Aderoju, 2008; Abdul-Mutalib et al., 2012; Tan et al., 2013) was administered using face-to-face interviews (in-person) between May to June, 2016 to collect the data for this study. The content and face validity of the questionnaire was tested thorough authentication from experts in the related field and contacts with street food vendors operating in Yelwan Makaranta, a satellite settlement of Bauchi metropolis respectively. Reliability of the questionnaire was tested among street food vendors operating in Toro, a 90km drive settlement away from the study area and found that the Cronbach's alpha for knowledge, attitude and practice questions were within the acceptable limit of >0.7 (Taylor, 2013).

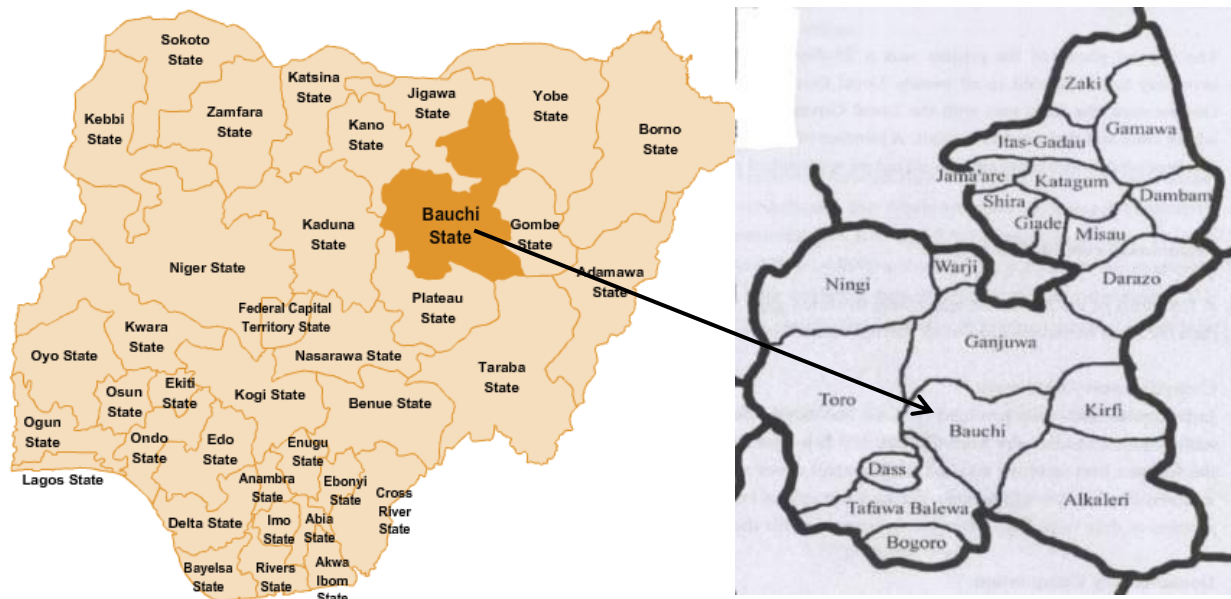


Figure 1: Map of Nigeria and Bauchi State showing Bauchi metropolis

The street food vendors' characteristics including gender, age, education, marital status, income, experience, training and certification were captured in the study. Age groups were categorized to "youth" (18 – 35 years old) and "adult" (36 years old and above). Educational levels were grouped into two "low educational level" (adult and non-formal education, primary school, secondary school) and "high educational level" (college or polytechnic, and university). Income categorized into " \leq ₦18, 000" (earning less than or equal to minimum wage) and " $>$ ₦18, 000" (earning greater than the minimum wage) of Nigerian formal sector.

Knowledge section consists of 25 statements with two options "true" or "false" for the SFVs to choose. Twenty-five statements were also made for attitude section and asked the SFVs to select from five point Likert scale options including "strongly agree", "agree", "neutral", "disagree" and strongly disagree. The practice section consists of 20 questions with two options "yes" or "no" for the SFVs to choose. The total scores at each section were obtained by summing the marks scored for each question and converted to percentages. The scores obtained for knowledge, attitude and practice were considered good if $\geq 50\%$ and poor if $< 50\%$.

The study used statistical package for social sciences (SPSS) version 21 throughout data analyses. Descriptive analyses including frequencies, percentages and mean were performed for street food vendors' characteristics, knowledge, attitude and practice. Chi-square test was conducted to determine the factors associated with food hygiene practice among SFVs.

3.0 Results and Discussion

3.1 Street food vendors' characteristics

Among the 300 surveyed street food vendors, most (58.0%) were females, youth (75.0%) and mean aged 31 years old. Majority of them have low educational level (92.3%), while only 7.7% attained high educational level. Single were more (52.0%) compared to married (48%). Most of the SFVs (68.7%) earn higher than the Nigerian formal sector minimum wage of ₦18,000, with average monthly income of ₦27,510. Many (40.0%) of them also have 1 - 5 years of vending experiences, followed 6 – 10 years (36.7%), then above 10 years (23.3%). Majority (81.3%) of the respondents have not attended food hygiene training and similarly have no certification (82.0%) to operate food vending outlets. Table 1 presents the street food vendors' characteristics.

Table 1: Street food vendors' characteristics (N=300)

Characteristics	Frequency (%)	mean±sd
Gender		
Male	126 (42.0)	
Female	174 (58.0)	
Age		31 ± 6.68
Youth	225 (75.0)	
Adult	75 (25.0)	
Education Level		
Low Educational Level	277 (92.3)	
High Educational Level	23 (7.7)	
Marital Status		
Married	144 (48.0)	
Single	156 (52.0)	
Monthly Income (₦)		27,510±11850.66
≤ 18,000	94 (31.3)	
> 18,000	206 (68.7)	
Years of Experience		7 ± 4.11
1 – 5 years	120 (40.0)	
6 – 10 years	110 (36.7)	
> 10 years	70 (23.3)	
Participated in Food Hygiene Training		
Yes	56 (18.7)	
No	244 (81.3)	
Business Certification Status		
Yes	54 (18.0)	
No	246 (82.0)	

3.2 Street food vendors' knowledge regarding food hygiene

Table 2 presents the street food vendors' knowledge regarding food hygiene. From the table, majority 273 (91.0%) of the street food vendors had good knowledge regarding food hygiene with mean score (SD) of 17.18 (3.89). Only 27 (9.0%) of the SFVs were found having poor

knowledge. This outcome coincides with the previous findings around the world, where they also found that majority of food handlers were having good knowledge (Rahman et al., 2012; Abdul-Mutalib et al., 2012; Sharif et al., 2013; Thelwell-Reid, 2014; Afolaranmi et al., 2015; Webb & Morancie, 2015). The result on the other hand contradicts studies by Zain et al., (2002), Bas et al., (2006), Sharif and Al-Maliki, (2010) and Tessema et al., (2014) among others. Their studies showed poor level of knowledge among most of their surveyed food handlers.

Table 2: Street food vendors' knowledge regarding food hygiene

Items	Frequency (%)	mean±sd
Knowledge score		17.18±3.89
Knowledge level		
Good	273 (91.0)	
Poor	27 (9.0)	

3.3 Street food vendors' attitude towards food hygiene

The majority of the street food vendors 279 (93%) have good attitude towards food hygiene with mean attitude score (SD) of 101.55 (17.78). Only 21 (7%) among the surveyed SFVs had poor attitude towards food hygiene. Higher proportion of food handlers with good attitude were widely reported in the literature. For instance, a study among food handlers in Kuala Pilah, Malaysia revealed that food handlers had excellent attitude towards food hygiene with mean score (SD) of 82.8 (10.94) (Abdul-Mutalib et al., 2012). Similar outcome was reported by Tan et al., (2013) from their study conducted among food vendors at primary schools in Hulu Langat district of Selangor State, Malaysia. They found in their study that majority of the surveyed food handlers had good attitude with mean attitude score (SD) of 87.59 (8.45). Studies conducted in Turkey (Bas et al., 2006), China (Zhang et al., 2015) and Brazil (Soares et al., 2012) reported adequate food hygiene attitude among food handlers. However, poor attitude towards food hygiene were also reported from previous studies. Studies from Vietnam by Samapundo et al., (2016) and Ghana by Kunadu et al., (2016) showed that higher percentages of food handlers were characterized with poor attitude towards food hygiene. Table 3 presents the street food vendors' attitude towards food hygiene.

Table 3: Street food vendors' attitude towards food hygiene

Items	Frequency (%)	mean±sd
Attitude score		101.55 ± 17.78
Attitude level		
Good	279 (93.0)	
Poor	21 (7.0)	

3.4 Street food vendors food hygiene practice

Table 4 presents the street food vendors' food hygiene practice. From the table, out of 300 SFVs included in the study, 271 (90.3%) had good food hygiene practice with mean food hygiene practice score (SD) of 15.14 (2.95). This result is consistent with several findings in the literature (Odonkor et al., 2011; Tessema et al., 2014; Jianu & Gulet, 2014; Okojie & Isah, 2014; Lalit et al., 2015; Afolaranmi et al., 2015; Dun-Dery & Addo, 2016). These studies found that majority of their respondents had good food hygiene practice. The finding has on the other hand opposed findings by Muyanja et al., (2011) and Legesse et al., (2017) among others which reported that most of their respondents had poor food hygiene practices.

Table 4: Street food vendors' food hygiene practice

Items	Frequency (%)	mean±sd
Practice score		15.14±2.95
Practice level		
Good	271 (90.3)	
Poor	29 (9.7)	

3.5 Factors associated with food hygiene practice among street food vendors

Based on chi-square test in this study, the factors found to be associated with street food vendors' food hygiene practice were food hygiene training ($\chi^2 = 4.897$, $p = 0.015$), knowledge regarding food hygiene ($\chi^2 = 13.541$, $p = 0.002$) and attitude towards food hygiene ($\chi^2 = 5.172$, $p = 0.040$) (Table 5). The outcome revealed that there was no significant association between street food vendors' food hygiene practice and many of their characteristics including gender, age, education, marital status, monthly income, years of experience and business certification. These findings were not unique to the current study, as reported findings in the literature were mixed.

Food hygiene training was found to be associated with food hygiene practice in related studies conducted at Ghana, Bangkok, Italy and Ethiopia (Smith, 1994; Cuprasitrit et al., 2011; Monney et al., 2013; Legesse et al., 2017). All these studies revealed that food handlers who attended food hygiene training prior to their surveys display good food hygiene practices compared to their non-attended counterparts.

Previous studies found an association between knowledge and food handling practice (Bas et al., 2006; Nigusse & Kumie, 2012; Kibret & Abera, 2012; Tessema et al., 2014; Nigusse & Kumie, 2012). The study of Dunn-Derry & Addo, (2016) conducted in Ghana found that the street food vendors' awareness on food hygiene has significant relationship with their food hygiene practice. On the contrary, other studies such as Lues et al., (2006), Omemu & Aderoju, (2008) and Muyanja et al., (2011) revealed that majority of street food vendors have knowledge of food hygiene practices, but concluded that most of them do not put the knowledge into practice. It was also reported by Liu et al., (2014), that more than 66% of the vendors in Shijiazhuang, China that have basic food safety knowledge were still careless of food hygiene practices. A study by Soares et al., (2012) revealed non-association between

food hygiene knowledge, attitude and practice. Muyanja et al., (2011) revealed disassociation between food hygiene knowledge and practice.

Attitude towards food hygiene was also reported to be associated with food hygiene and food handling practices in the literature. For instance, Toh and Birchenough, (2000) reported a strong linear relationship between attitude of street food vendors and food safety practices. Similar finding was reported by Rahman et al., (2012) from their study among street food vendors in Northern Kucing city, Sarawak of Malaysia. They reported strong linear relationship between attitude and food hygiene practices.

Our study has also found that gender, age, education, marital status, monthly income, years of vending experience and certification were not associated with street food vendors' food hygiene practice. Contrary to our findings, some of these food handlers' characteristics were found to be significantly associated with food handling practice in the literature. For instance Tessema et al., (2014) found that marital status and monthly income were significantly associated with good food handling practices. Legesse et al., (2017), reported that increase in age was among the significant factors associated with food handlers practice. Studies conducted in Bangladesh, India and Nigeria found that food handlers' educational level is associated with good food hygiene practice (Zain & Naing, 2002; Mudey et al., 2010; Rabbi & Dey, 2013). Muinde and Kuria, (2005) in their study conducted in Nairobi, Kenya found that gender was associated with food handling practice.

Table 5: Factors associated with food hygiene practice among street food vendors

Variables	Food Hygiene Practice Level		n (%)	χ^2	p
	Good, n (%)	Poor, n (%)			
Gender				2.287	0.095
Male	110 (87.3)	16 (12.7)	126 (42)		
Female	161 (92.5)	13 (7.5)	174 (58)		
Age				1.031	0.219
Youth	201 (89.3)	24 (10.7)	225 (75)		
Adult	70 (93.3)	5 (6.7)	75 (25)		
Education				2.666	0.088
Low Education	248 (89.5)	29 (10.5)	277 (92.3)		
High Education	23 (100)	0 (0.0)	23 (7.7)		
Marital Status				2.546	0.081
Married	126 (87.5)	18 (12.5)	144 (48)		
Single	145 (92.9)	11 (7.1)	156 (52)		
Income				1.506	0.155
≤18, 000	82 (87.2)	12 (12.8)	94 (31.3)		
>18, 000	189 (91.7)	17 (8.3)	206 (68.7)		
Experience				2.069	0.355
1 – 5	112 (93.3)	8 (6.7)	120 (40)		
6 – 10	97 (88.2)	13 (11.8)	110 (36.7)		
>10	62 (88.6)	8 (11.4)	70 (23.3)		
Training				4.897	0.015*
Yes	55 (98.2)	1 (1.8)	56 (18.7)		
No	216 (88.5)	28 (11.5)	244 (81.3)		
Certification				0.013	0.574
Yes	49 (90.7)	5 (9.3)	54 (18)		
No	222 (90.2)	24 (9.8)	246 (82)		
Knowledge				13.541	0.002*

Good	252 (92.3)	21 (7.7)	273(91)		
Poor	19 (70.4)	8 (29.6)	27 (9)		
Attitude				5.172	0.040*
Good	255 (91.4)	24 (8.6)	279 (93)		
Poor	16 (76.2)	5 (23.8)	21 (7)		

Note: (*) Significant $p < 0.05$, $\chi^2 =$ Chi-Square value

4.0 Conclusion and recommendation

The current study reveals that majority of the street food vendors in selected food vending locations of Bauchi metropolis have good food hygiene practice, while food hygiene training, knowledge regarding food hygiene and attitude towards food hygiene were the factors associated with their food hygiene practice. Based on these findings, our study suggests that far-reaching attention should be paid to particularly these associated factors. The stakeholders involved in handling affairs of street food vendors in Bauchi metropolis should document these factors with a view to inform potential intervention strategies. Food hygiene training, knowledge and attitude should be prioritized and included as components of any intervention programme. The higher proportion of street food vendors non-attendance to food hygiene training and lack of certification of their businesses revealed in this study should also be noted. Related authorities should device means of training street food vendors on basic food hygiene skills as well as certification of their businesses. Sound food hygiene training programmes among street food can enhance their practices, which eventually safeguards consumers' health.

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Declaration

Authors declare that they have no conflict of interest.

Authors' contribution

Author 1: Conceptualize the study, prepare research proposal, execute the survey, and produced the draft of manuscript.

Author 2: Contributed in guiding and editing the concept, methodological aspects, scheduling the research activities, cross-checking and validating research instrument, read and approve the manuscript.

Author 3: Contributed in methodological approach, cross-checking and certification of study instrument read and endorsed the manuscript.

Author 4: Contributed in editing and validation of the research instrument, guiding and arranging for pilot study, implementation of the survey, methodology, read and approve the manuscript.

References

- Abdul-Mutalib, N.-A., Abdul-Rashid, M.-F., Mustafa, S., Amin-Nordin, S., Hamat, R. A., & Osman, M. (2012). Knowledge, attitude and practices regarding food hygiene and sanitation of food handlers in Kuala Pilah, Malaysia. *Food Control*, 27(2), 289-293.
- Afolaranmi, T., Hassan, Z., Bello, D., & Misari, Z. (2015). Knowledge and practice of food safety and hygiene among food vendors in primary schools in Jos, Plateau State, North Central Nigeria. *J Med Res*, 4(2), 016-022.
- Akinbode, S., Dipeolu, A., & Okuneye, P. (2011). Willingness to pay for street food safety in Ogun state, Nigeria. *Journal of agricultural & food information*, 12(2), 154-166.
- Alimi, B., Oyeyinka, A., & Olohungebe, L. (2016). Socio-economic characteristics and willingness of consumers to pay for the safety of fura de nunu in Ilorin, Nigeria. *Quality Assurance and Safety of Crops & Foods*, 8(1), 81-86.
- Baş, M., Ersun, A. Ş., & Kıvanç, G. (2006). The evaluation of food hygiene knowledge, attitudes, and practices of food handlers' in food businesses in Turkey. *Food Control*, 17(4), 317-322.
- Canini, N. D., Bala, J. J. O., Maraginot, E. N., & Mediana, B. C. B. (2013). Evaluation of Street Food Vending in Ozamiz City. *Journal of Multidisciplinary Studies*, 1(1).
- Codjia, G. (2000). FAO technical support for improvement within the street food sector. *Pretoria: Government Printer*.
- Cortese, R. D. M., Veiros, M. B., Feldman, C., & Cavalli, S. B. (2016). Food safety and hygiene practices of vendors during the chain of street food production in Florianopolis, Brazil: A cross-sectional study. *Food Control*, 62, 178-186.
- Cuprasitrit, T., Srisorrachatr, S., & Malai, D. (2011). Food safety knowledge, attitude and practice of food handlers and microbiological and chemical food quality assessment of food for making merit for monks in Ratchathewi district, Bangkok. *Asia Journal of Public Health*, 2(1), 27-34.
- Donkor, E. S., Kayang, B. B., Quaye, J., & Akyeh, M. L. (2009). Application of the WHO keys of safer food to improve food handling practices of food vendors in a poor resource community in Ghana. *International journal of environmental research and public health*, 6(11), 2833-2842.
- Dun-Dery, E. J., & Addo, H. O. (2016). Food Hygiene Awareness, Processing and Practice among Street Food Vendors in Ghana. *Food and Public Health*, 6(3), 65-74.

- Howes, M., McEwen, S., Griffiths, M. & Harris, L. (1996). Food Handlers Certification by Home Study: Measuring Changes in Knowledge and Behavior. *Dairy, Food and Environmental Sanitation*, 16: 737–744.
- Jianu, C., & Goleț, I. (2014). Knowledge of food safety and hygiene and personal hygiene practices among meat handlers operating in western Romania. *Food Control*, 42, 214-219.
- Kibret, M., & Abera, B. (2012). The sanitary conditions of food service establishments and food safety knowledge and practices of food handlers in Bahir Dar town. *Ethiopian journal of health sciences*, 22(1), 27-35.
- Kunadu, A. P.-H., Ofosu, D. B., Aboagye, E., & Tano-Debrah, K. (2016). Food safety knowledge, attitudes and self-reported practices of food handlers in institutional foodservice in Accra, Ghana. *Food Control*, 69, 324-330.
- Lalit, I., Brkti, G., & Dejen, Y. (2015). Magnitude of hygienic practices and its associated factors of food handlers working in selected food and drinking establishments in Mekelle town, northern Ethiopia. *International Food Research Journal*, 22(6).
- Legesse, D., Tilahun, M., Agedew, E., & Haftu, D. (2017). Food Handling Practices and Associated Factors among Food Handlers in Arba Minch Town Public Food Establishments in Gamo Gofa Zone, Southern Ethiopia. *Epidemiology (Sunnyvale)*, 7(302), 2161-1165.1000302.
- Liu, Z., Zhang, G., & Zhang, X. (2014). Urban street foods in Shijiazhuang city, China: Current status, safety practices and risk mitigating strategies. *Food Control*, 41, 212-218.
- Lues, J. F., Rasephei, M. R., Venter, P., & Theron, M. M. (2006). Assessing food safety and associated food handling practices in street food vending. *International Journal of Environmental Health Research*, 16(5), 319-328.
- Monney, I., Agyei, D., Ewoenam, B. S., Priscilla, C., & Nyaw, S. (2014). Food hygiene and safety practices among street food vendors: an assessment of compliance, institutional and legislative framework in Ghana. *Food and Public Health*, 4(6), 306-315.
- Mudey, A. B., Kesharwani, N., Mudey, G. A., Goyal, R. C., Dawale, A. K., & Wagh, V. V. (2010). Health status and personal hygiene among food handlers working at food establishment around a rural teaching hospital in Wardha District of Maharashtra, India. *Global Journal of Health Science*, 2(2), 198.
- Muinde, O., & Kuria, E. (2005). Hygienic and sanitary practices of vendors of street foods in Nairobi, Kenya.
- Muyanja, C., Nayiga, L., Brenda, N., & Nasinyama, G. (2011). Practices, knowledge and risk factors of street food vendors in Uganda. *Food Control*, 22(10), 1551-1558.
- Nigusse, D., & Kumie, A. (2012). Food hygiene practices and prevalence of intestinal parasites among food handlers working in Mekelle university student's cafeteria, Mekelle. *GARJSS*, 1(4), 65-71.

- Odonkor, S. T., Adom, T., Boatın, R., Bansa, D., & Odonkor, C. J. (2011). Evaluation of hygiene practices among street food vendors in Accra metropolis, Ghana. *Elixir Online Journal*, 41, 5807-5811.
- Okojie, P., & Isah, E. (2014). Sanitary conditions of food vending sites and food handling practices of street food vendors in Benin City, Nigeria: implication for food hygiene and safety. *Journal of environmental and public health*, 2014.
- Omemu, A., & Aderoju, S. (2008). Food safety knowledge and practices of street food vendors in the city of Abeokuta, Nigeria. *Food control*, 19(4), 396-402.
- Rabbi, S. E., & Dey, N. C. (2013). Exploring the gap between hand washing knowledge and practices in Bangladesh: a cross-sectional comparative study. *BMC public Health*, 13(1), 89.
- Rahman, M. M., Arif, M. T., Bakar, K., & bt Talib, Z. (2016). Food safety knowledge, attitude and hygiene practices among the street food vendors in Northern Kuching city, Sarawak. *Borneo Science*, 31.
- Rane, S. (2011). Street vended food in developing world: hazard analyses. *Indian journal of microbiology*, 51(1), 100-106.
- Samapundo, S., Thanh, T. C., Xhaferi, R., & Devlieghere, F. (2016). Food safety knowledge, attitudes and practices of street food vendors and consumers in Ho Chi Minh city, Vietnam. *Food Control*, 70, 79-89.
- Sharif, L., & Al-Malki, T. (2010). Knowledge, attitude and practice of Taif University students on food poisoning. *Food Control*, 21(1), 55-60.
- Sharif, L., Obaidat, M. M., & Al-Dalalah, M. R. (2013). Food hygiene knowledge, attitudes and practices of the food handlers in the military hospitals. *Food and Nutrition Sciences*, 4(03), 245.
- Smith, R. (1994). Food hygiene training: the chance to create a coherent policy. *British Food Journal*, 96(7), 41-45.
- Soares, L. S., Almeida, R. C., Cerqueira, E. S., Carvalho, J. S., & Nunes, I. L. (2012). Knowledge, attitudes and practices in food safety and the presence of coagulase-positive staphylococci on hands of food handlers in the schools of Camaçari, Brazil. *Food Control*, 27(1), 206-213.
- Sumner, S., Brown, L. G., Frick, R., Stone, C., Carpenter, L. R., Bushnell, L., . . . Tobin-D'Angelo, M. (2011). Factors associated with food workers working while experiencing vomiting or diarrhea. *Journal of food protection*, 74(2), 215-220.
- Tan, S. L., Bakar, F. A., Karim, M. S. A., Lee, H. Y., & Mahyudin, N. A. (2013). Hand hygiene knowledge, attitudes and practices among food handlers at primary schools in Hulu Langat district, Selangor (Malaysia). *Food Control*, 34(2), 428-435.
- Taylor, J. (2013). Confusing stats terms explained: Internal consistency. *Stats Make Me Cry [blog]*, 8.
- Tessema, A. G., Gelaye, K. A., & Chercos, D. H. (2014). Factors affecting food handling Practices among food handlers of Dangila town food and drink establishments, North West Ethiopia. *BMC public Health*, 14(1), 571.

- Thelwell-Reid, M. (2014). *Food Safety Knowledge and Self-Reported Practices of Food Handlers in Jamaica* (Doctoral dissertation, Walden University).
- Toh, P. S., & Birchenough, A. (2000). Food safety knowledge and attitudes: culture and environment impact on hawkers in Malaysia.: Knowledge and attitudes are key attributes of concern in hawker foodhandling practices and outbreaks of food poisoning and their prevention. *Food Control*, 11(6), 447-452.
- Umoh, V., & Odoaba, M. (1999). Safety and quality evaluation of street foods sold in Zaria, Nigeria. *Food Control*, 10(1), 9-14.
- Webb, M., & Morancie, A. (2015). Food safety knowledge of foodservice workers at a university campus by education level, experience, and food safety training. *Food Control*, 50, 259-264.
- Zain, M. M., & Naing, N. N. (2002). Sociodemographic characteristics of food handlers and their knowledge, attitude and practice towards food sanitation: a preliminary report.
- Zhang, H., Lu, L., Liang, J., & Huang, Q. (2015). Knowledge, attitude and practices of food safety amongst food handlers in the coastal resort of Guangdong, China. *Food Control*, 47, 457-461.