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Occupational Health Hazards and Injuries Among Fish Smokers in the Gambia Fishing Communities

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ABSTRACT

Fish smoking has now spread throughout the world and is now a highly common method of preserving fish. The Occupational Health Hazards and injuries among fish smokers in the Gambia fishing communities was investigated. Simple random sampling technique was used in the selection of 52 fish smokers from the two study communities. Focus group discussion and interviewer-administered questionnaires were used to collect data on the various hazards and injuries common among them. Data were analyzed using the Statistical Packagefor Social Sciences (SPSS 20.0). Descriptive statistics were used to summarize the data. An analytical statistic test was used to test for association using the chi-square at a 95% significant level. The majority of the fish smokers are married and within the age range of 31-48years.The physical hazards reported were minor cuts(51.2% and 88.9%); fish bites (72.1% and 77.8%); fish stings(75.9% and 66.7%); heat and cold(58.1% and 100.0%); minor head injury(72.1% and 88.9%). For biological hazards, 67.4% and 66.7% reported parasitic infections, 100.0%, and 100.0% reported smoke from the smokehouse as the main chemical hazard. Several, 72.1% and 88.9% reported internal injuries as their major ergonomic hazard. Common perceived injuries sustained during fish smoking among Tanji and Banjul fish smokers were cuts and lacerations (91.1% and 100%); bruises (82.2% and 77.8%); muscle strains and pains (86.7% and 88.9%); sting from fish spines (71.1% and 100%) and puncture wounds (57.8% and 88.9%). The mean CO of the outdoor fish smoking Environment in Tanji and Banjul were 381.0±154.4 and 436.0±266.8. The mean Indoor CO value in Tanji was 390±350.9. However, in Banjul the mean value was zero. Comparison of the mean outdoor CO values of fish smoking environment

in Tanji and Banjul revealed no significant difference (P=0.60). However, a comparison of mean indoor CO levels for the fish smoking environment in Tanji and Banjul was significantly different (P<0.001). Therefore, it is recommended that all fish smokers receive thorough training on the dangers and risks specific to their line of work and the need to practice safety.

Keywords: Occupational hazards, injuries, fish smokers, The Gambia

INTRODUCTION

Fish smoking is the oldest and most popular form of fish processing, in which the fish is dried using heat from a fire. Adeyeye et al (2015) revealed that it contributes significantly to household food and financial stability. According to Kolawole, et al (2010), through indigenous knowledge, for ages, mankind has used salting, frying, sun-drying, and smoking as methods of preventing fish spoilage all around the world.

Traditional fish processing methods such as salting, smoking, and sun-drying make fish available, affordable, and in high demand, guarantee protein, and food security, and hence promote good nutrition, health, and general well-being of people. Smoke-exposed foods are healthier, with lower levels of saturated fatty acids and higher omega-3/-6 ratios, which are beneficial for lowering coronary heart disease (CHD) in people who eat them (Akintola et al 2013). Also, Akintola et al (2013), Akintola (2015), indicated that smoking raises the contents of some amino acids in fish.

Smoking preserves fish by dehydrating the fish and introducing natural anti-microbial constituents such as phenols to the fish. It is better than other methods because it does not only dehydrate the fish but also removes some fats from the fish and hence reduces microbial growth. Once this is done, the life span of some fish products will be extended to a couple of weeks. In recent times smoking is used not only to preserve fish but also to improve the taste and the appearance of fish. (Akintola and Fakoya, 2017).

Long working durations and spending many years smoking fish can harm the health of women processors. Salvi et al (2014) revealed that smoke was a contributing factor to several respiratory conditions. It has been found that women fish smokers are more prone to developing COPD than non-fish smokers. (Umoh and Etete, 2014). Umoh and Okoko, (2014) also revealed that smoke can cause health conditions such as redness of the eyes, poor vision, rashes, and eczema.

Fish smokers may work 24 hours a day depending on the availability of fish. The smoke produced by the combustion of biomass fuels is a major cause of asthma, chronic obstructive pulmonary disease (COPD), especially in children and the elderly, as well as lung cancer. (Kodgule, et al, 2012).

Agbebi (2018) in his study revealed that “The most common occupational hazards were redness and swelling of the eyes, chronic obstructive pulmonary diseases, stress-related health problems, the sting from fish spines, knife cuts, and snake bites while fetching firewood

(physical), parasitic and pathogenic infection (biological), hazards from disinfectants used (chemical), ergonomic hazards such as fractures and dislocations, long work hours, and high mental demand (psychological).

These fish smokers are exposed to carbon monoxide together with other poisonous gases during the smoking process. Carbon monoxide (CO) poisoning has been linked to both acute and long-term health impacts, and it may be responsible for up to half of all poisonings worldwide. Severe carbon monoxide (CO) poisoning reduces the amount of oxygen transported by the blood to tissues over time by forming carboxyhemoglobin. To compensate for the reduced oxygen content, the body responds by boosting cardiac output and pumping more blood. Decompensation occurs when the maximal cardiac output is achieved and the myoglobin in the heart muscle becomes poisoned, resulting in a catastrophic drop in cardiac output and loss of consciousness. This could harm the brain, heart, or other tissues; also, after rescue and re-oxygenation, a secondary cerebral reperfusion injury could develop. (Brian et al, 2011).

MATERIALS AND METHODS

Study Areas

This study was conducted in Tanji and Banjul town in The Gambia, along the Atlantic coast. Tanji Village (also known as Tanjeh or Tanje) is located on the Atlantic Ocean beach in the northern section of the Kombo South District, West Coast Region of The Gambia. The village is the most populated district in the Local Gambia Authority, with a population of 14,531 inhabitants based on the 2013 Census (GBoS, 2013 census). It is also known as the Tanji Fishing Village and lies at 30 kilometers from Banjul, the capital city, and 12 kilometers southwest of Kololi resort, on the Kombo Coastal Road. Tanji is dominated by three ethnic groups: Mandinka, Wolof, Jola, and Serer. The latter is mostly a fishing community, while the former is primarily a farming, crafts, and petty commerce community. The town center is around 1 kilometer from the main fishing area. There were 1,230 head fishermen across the country (2016 Frame Survey). There are over D2000 people engaged in various fishing activities in Tanji. Most of the fishermen are from other countries in West Africa from Senegalese, Malians, Guineans, Sierra Leoneans, and Ghanaians. Various categories of fresh fish traders exist including males and females.

Banjul, which is the capital city of the Gambia was originally called Bathurst and has a population of 31,301(GBoS, 2013 census). However, the population of the Greater Banjul Area, which includes the City of Banjul and the Kanifing Municipal Council, is estimated to be 413,397 people (according to the 2013 census, GBoS, 2013 census). Banjul is situated on St Mary's Island (Banjul Island), near the mouth of the Gambia River, where it meets the Atlantic Ocean. Bridges connect the island to the mainland to the west and the rest of the Greater Banjul Area. Ferries connect Banjul to the mainland on the other side of the river.

Study Design and Sampling Method

A community-based cross-sectional study was used. Data was collection using both qualitative and quantitative methods among fish smokers (both male and female) in the selected communities. Forty-three respondents were randomly selected from Tanji and 9 from Banjul communities.

Data Collection Method

A mixed-method (qualitative and quantitative) of data collection was adopted and two different types of instruments were used. They were:

Focus Group Discussions: Four (4) FGD sessions were conducted using focus group discussion guide These included two of each of male and female groups of youths and adults fish smokers. About 8-10 participants were selected for each of the FGD that was conducted in the community. Convenient places such as under shades and places without distractions were used for the conduct of the FGD. The FGD was conducted to get more insight into the research topic and also helped to accumulate clearer information on fish smoking and the health risks of this occupation. The findings from the FGD were recorded and used to improve the quality of the draft questionnaire before finally used for data collection.

Questionnaire: A semi-structured questionnaire was developed based on the extensive literature review and findings from FGD in consultation with the supervisors. Research assistants were trained to collect the data from selected fish smokers within the community using the face-to-face interview. The questions were read out to the respondents and explanation provided whenever it is necessary. The interview was conducted in Mandinka, Serere, and Wolof being the major language spoken by most of the residents of the study site. The data collection was supervised by the researcher.

Before the commencement of the questionnaire administration, permission was first sought from the two fishing community leaders and then from the leaders of the fish smokers who helped to mobilize their members. Fish smokers start their work from10 am upwards and questionnaire administration was done at that time. It took about 10 minutes to administration each questionnaire and it was done at the respondents' sites of activity

Data Analysis

The open-ended questions were also given a code and later entered into the computer using SPSS software version 22 and Stata13.0. Data were analyzed using descriptive statistic and Chi-square test at $P<0.05$

RESULTS

Sociodemographic Features of the Respondents

The socio-demographic characteristics of the respondents are shown in Table 1. Majority of the fish smokers in Tanji were within the age range of 31-48 while those in Banjul were within 13-30 years age range. Several 58.1 %, in Tanji were males, and 55.6% in Banjul were females and several were married. Gambian, 69.8% and 55.6% is the major ethnicity among Tanji and Banjul. Several respondents in Tanji were Mandinka (65.1%) while 55.6% in Banjul were Wollof. Madarasa (an informal education) was the main educational qualification among 44.2% in Tanji. The monthly income was between D1000 to D10,000 Dalasis (Gambia Currency; USD20 to 200) among the respondents in Banjul. Also, majority 100% (Tanji) and 60.0% (Banjul) spent about 9 to 16 hours a day at work.

Table 1: Socio-demographic features of the fish smokers

Variables	Tanji (43) Freq	Percent	Banjul (9) Freq	Percent
Age				
13-30	8	18.6	6	66.7
31-48	25	58.1	3	33.3
>49	10	23.3	0	0.0
Sex				
Male	25	58.1	4	44.4
Female	18	41.9	5	55.6
Marital Status				
Single	5	11.6	4	44.4
Married	34	79.1	5	55.6
Divorce	0	0.0	0	0.0
Widow	4	9.3	0	0.0
Nationality				
Gambian	30	69.8	5	55.6
Senegalese	10	23.3	4	44.4
Gunean	1	2.3	0	0.0
Sierra Leonean	2	4.7	0	0.0
Ethnicity				
Mandinka	28	65.1	1	11.1
Fula	6	14	1	11.1
Wollof	2	4.7	5	55.6
Jola	6	14	1	11.1
Serere	7	16.3	1	11.1
Others	0	0.0	0	0.0
Educational Status				
Primary	14	32.6	1	11.1
Secondary	6	14.0	3	33.3
Tertiary	4	9.3	3	33.3
Madarasa	19	44.2	2	22.2
Income Level				
<D1000	24	55.8	0	0.0
D1000-10000	16	37.2	9	100.0
D11000-20000	3	7.0	0	0.0
>D20000	0	0.0	0	0.0
Duration of activity				
0-16	43	100.0	6	60.0
17-33	0	0.0	3	40.0
119+	0	0.0	0	0.0

Health Hazards Related to Fish Smoking: Data from FGD

Fish smokers from the two communities disclosed that the job exposes them to a lot of health hazards such as eye redness and watery discharge due to smoke, dehydration and unusual flaking of skin due to too much exposure to heat from the fire used in smoking. Some of the

participants stressed further that they usually experience general body pain, common cold that results sometimes from the smoke and difficulty in breathing and swallowing. Some of the typical statements are shown below;

- "I am drastically affected by smoke always which leads to eye redness and watery discharge". (Tanji fish smoker)
- "Too much of heat from the fire is another issue leading to dehydration and unusual flaking of skin "(Banjul fish smoker)
- "My problem is pain and redness of the eyes due to smoke". (Banjul fish smoker)
- "I used to have a Common cold that results sometimes from the smoke, Difficulty in breathing and swallowing". (Tanji fish smoker

Health Hazards Among the Fish Smokers in the Two Communities:

Among the fish smokers, the physical hazards reported were minor cuts (51.2% and 88.9%); fish bites (72.1% and 77.8%); fish stings (75.9% and 66.7%); heat and cold (58.1% and 100.0%); minor head injury (72.1% and 88.9%). For biological hazards, 67.4% and 66.7% reported parasitic infections, 100.0%, and 100.0% reported smoke from the smokehouse as the main chemical hazard. Several, 72.1% and 88.9% reported internal injuries as their major ergonomic hazard. In Banjul, the majority 88.4% reported prolonging work hours as their main psychological hazard. Table 2

Table 2: Reported hazards among the fish smokers in the two communities

Variables	Tanji (43) Freq	Percent	Banjul (9) Freq	Percent
Physical hazards				
Minor cuts	22	51.2	8	88.9
Bites	31	72.1	7	77.8
Stings	29	67.4	6	66.7
Rough sea/Wind	0	0.0	0	0.0
Heat and cold	25	58.1	9	100.0
Eye injury	9	21.0	6	66.7
Falls/accidents	10	23.3	2	22.2
Minor head injury	31	72.1	8	88.9
Noise from engine	0	0.0	0	0.0
Aggressive Customers	10	23.3		77.8
Biological hazards				
Parasites(leeches)	29	67.4	6	66.7
Pathogen	30	69.8	4	44.4
Chemical hazards				
Smoke from Engine/smoke house	43	100	9	100.0
Disinfectant	19	44.2	5	55.6
Ergonomic hazards				
Internal injuries	31	72.1	8	88.9
Broken bones or Dislocations	4	9.3	0	0.0
Back Strain	31	72.1	6	66.7
Psychological hazards				
Prolong work	38	88.4	0	0.0

Metal demand	35	81.4	0	0.0
Total	427		91	

Frequency of Exposure to Occupational Hazards Among the Fish Smokers

Table 3 shows the frequency of exposure to occupational hazards among the fish smokers. The majority 53.5% and 88.9% of fish smokers in Tanji and Banjul were exposed to minor head injury, minor cuts 39.5% and 77.8%; bites 53.5% and 44.45; stings 46.5% and 66.7% as physical hazards monthly. In Tanji 48.8% were exposed to heat and cold monthly while 44.4% experienced weekly exposures. Concerning biological hazards, 69.8% and 44.4% experienced infection by pathogens monthly. All the fish smokers 100.0% and 100.0% in Tanji and Banjul reported daily exposure to smoke from the smokehouse. In Tani, 34.9% were exposed to ergonomic hazards such as internal injuries monthly while 44.4% reported weekly exposure in Banjul. A comparison of the most common occupational hazard between fish smokers in Tanji and Banjul Community revealed that the following physical hazards such as minor cuts, stings, aggressive customers and eye injury were significant. Disinfectants were significant for chemical hazards. Also, internal injuries and back strain were significant ergonomic hazards while prolonged work hours awas the significant psychological hazards. Table 4

Table 3: Frequency of exposure to occupational hazards among the fish smokers

Hazards	Fish smokers Tani(N=43)			Fish smokers Banjul(N=9)		
	Daily (%)	Weekly (%)	Monthly (%)	Daily (%)	Weekly (%)	Monthly (%)
Physical hazards						
Minor cuts	3(7.0)	2(4.7)	17(39.5)	1(11.1)	0(0.0)	7(77.8)
Bites	5(11.6)	3(7.0)	23(53.5)	0(0.0)	3(33.3)	4(44.4)
Stings	6(14.0)	3(7.0)	20(46.5)	0(0.0)	0(0.0)	6(66.7)
Heat and cold	1(2.3)	3(7.0)	21(48.8)	2(22.2)	4(44.4)	3(33.3)
Eye injury	0(0.0)	0(0.0)	9(20.9)	0(0.0)	4(44.4)	2(22.2)
Accidents	0(0.0)	2(4.7)	8(18.6)	2(22.2)	0(0.0)	0(0.0)
Minor head injury	2(4.7)	6(14.0)	23(53.5)	0(0.0)	0(0.0)	8(88.9)
Aggressive Customers	0(0.0)	5(11.6)	5(11.6)	0(0.0)	0(0.0)	7(77.8)
Biological hazards						
Parasites	9(20.9)	3(7.0)	17(39.5)	1(11.1)	0(0.0)	5(55.6)
Pathogen	0(0.0)	0(0.0)	30(69.8)	0(0.0)	0(0.0)	4(44.4)
Chemical hazards						
Smoke from smoke house	43(100.0)	0(0.0)	0(0.0)	9(100.0)	0(0.0)	0(0.0)
Disinfectant	9(20.9)	10(23.3)	0(0.0)	1(11.1)	2(22.2)	2(22.2)
Ergonomic hazards						
Internal injuries	3(7.0)	13(30.2)	15(34.9)	2(22.2)	4(44.4)	2(22.2)
Broken bones or Dislocations	1(2.3)	0(0.0)	3(7.0)	0(0.0)	0(0.0)	0(0.0)
Back Strain	12(27.9)	12(27.9)	7(16.3)	1(11.1)	4(44.4)	1(11.1)
Psychological hazards						
Prolong work	20(46.5)	18(41.9)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Metal demand	12(27.9)	3(7.0)	20(46.5)	0(0.0)	0(0.0)	0(0.0)
Total	126	83	218	19	21	51

Table 4: Comparison of the most common occupational hazard between fish smokers in Tanji and Banjul Community

Common occupational hazard	Tanji (%)	Banjul (%)	Total (%)	Chi-square test	p-value
Physical					
Minor cuts	71.2	11.5	43(82.7)	12.915	0.005*
Bites	82.7	17.3	52(100)	0.000	-
Stings	55.8	15.3	37(71.1)	21.342	0.000*
Rough sea/Wind	82.7	17.3	52(100)	0.000	-
Heat and cold	80.7	17.3	51(98.0)	5.565	0.062
Eye injury	27.3	18.2	5 (45.5)	15.958	0.001*
Falls/accidents	82.7	17.3	52(100)	0.0000	-
Minor head injury	50.1	1.9	27(52.0)	7.585	0.055
Noise from engine	82.7	17.3	52(100)	0.000	-
Aggressive Customers	57.7	13.4	37(71.1)	22.130	0.000*
Biological hazards					
Parasites(leeches)	36.5	0.0	19(36.5)	6.266	0.099
Pathogen	5.8	0.0	3(5.8)	0.666	0.414
Chemical hazards					
Smoke from Engine/smoke House	82.7	17.3	52(100)	0.000	-
Disinfectant	3.8	9.6	7 (13.4)	26.536	0.000*
Ergonomic hazards					
Internal injuries	44.3	0.0	23(44.3)	8.632	0.035*
Broken bones or Dislocations	5.7	0.0	3(5.7)	0.666	0.881
Back Strain	71.1	9.6	42(80.7)	5.326	0.149
Psychological hazards					
Prolong work	59.6	5.8	34(65.4)	15.667	0.001*
Mental demand	9.6	3.8	7(13.4)	6.041	0.110

*=significant, P<0.05

Commonest Injuries Related to Fish Smoking: Data from FGD

Fish smokers in the two communities disclosed that there are a lot of injuries related to their job. The commonest injuries mentioned were burns from the fire. Also cuts from knives, pricks from the fish spine and eye injury were mentioned. Some of the statements were as follows:

- "I used to sustain burns injury from the fire used to smoke fish. (Tanji fish smoker)
- "When preparing fish for smoking, I used to sustain cuts injury from the knife as well as from the teeth of fish" Tanji fish smoker)
- "I used to have pricks from the hooks of fish when preparing fish for smoking" (Banjul fish smoker)
- "My eyes have become red in color as a result of the smoke. Even my chest has become affected "(Banjul fish smoker)

Perceived Injuries Sustained During Fish Smoking:

Common perceived injuries sustained during fish smoking among Tanji and Banjul fish smokers were cuts and lacerations (91.1% and 100%); bruises (82.2% and 77.8%); muscle strains and pains (86.7% and 88.9%); sting from fish spines (71.1% and 100%) and puncture wounds

(57.8% and 88.9%). Fig 1 Similarly, the comparison of the most common injuries between fish smokers in Tanji and Banjul Community revealed that foreign objects in the eyes was significant. Table 5

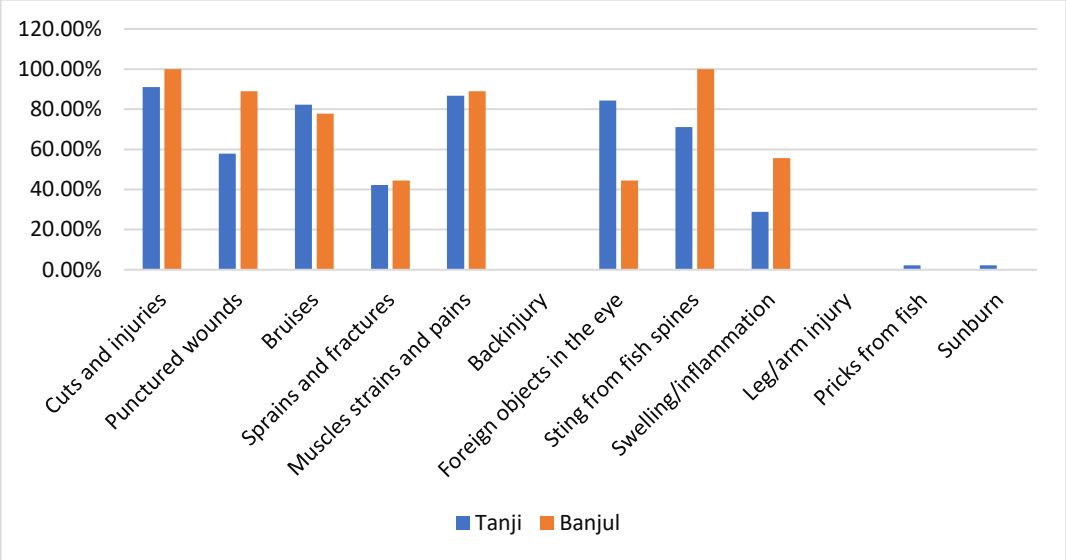

Figure 1: Common injuries sustained during fish smoking

Table 5: Comparison of the most common injuries between fish smokers in Tanji and Banjul Community

Common injuries	Tanji (%)	Banjul (%)	Total (%)	Chi-square test	p-value
Cuts and lacerations	75.0	17.3	48(92.3)	0.907	0.341
Puncture wounds	50.0	15.4	34(65.4)	2.657	0.103
Bruises	69.2	13.5	43(82.7)	0.184	0.668
Sprains and fractures	32.7	7.7	21(40.4)	0.075	0.785
Muscles strains and pains	71.2	15.4	45(86.5)	0.052	0.820
Back injury	82.7	17.3	52(100)	0.000	-
Foreign objects in the eye	21.1	15.8	7(36.8)	6.468	0.011
A sting from fish spines	61.5	17.3	41(78.8)	2.920	0.087
Swelling/inflammation	21.2	9.6	16(30.8)	3.139	0.076
Leg/arm injury	82.7	17.3	52(100)	0.000	-
Pricks from fish	82.7	17.3	52(100)	0.000	-
Burns	71.1	15.4	45(86.5)	3.756	0.289
Sunburn	1.9	0.0	1(1.9)	0.213	0.644

a=Pearson Chi-Square, *=significant, P<0.05

Carbon II Oxide (CO) Values of the Smoking Environment

Table 4 shows the various ambient CO values obtained in Tanji and Banjul. The mean CO of the outdoor fish smoking Environment in Tani and Banjul were 381.0±154.4 and 436.0±266.8. The mean Indoor CO value in Tanji was 390±350.9. However, in Banjul, the mean value was zero.

Comparison of the mean outdoor CO values of fish smoking environment in Tanji and Banjul revealed no significant difference (P=0.60) Table 5 However, a comparison of mean indoor CO levels for the fish smoking environment in Tanji and Banjul was significantly different (P<0.001). Table 6.

Table 4: CO levels obtained in the Tanji and Banjul Environment (ppm)

Variables	Tanji Mean CO	Banjul Mean CO
Fish smoking environment		
Outdoor CO	381.0±158.4	436.0±266.8
Indoor CO	390.6±350.9	00

Table 5: Comparing outdoor CO levels of fish smoking environments (FSE) in Tanj and Banjul

Variable	Mean	Standard error	95% Confidence intervals		P-value
Tanji	381	55.99	248.61	513.39	0.60
Banjul	436.04	64.71	266.83	298.84	
Difference	-55.04	102.50	-267.08	157.01	

P-value not statistically significant, indicating no difference between Tanji and Banjul

Table 6: Comparing indoor CO levels of fish smoking environments (FSE) in Tanji and Banjul

Variable	Mean	Standard error	95% Confidence intervals		P-value
Tanji	390.62	71.63	242.45	538.79	<0.001
Banjul	0	0	0	0	
Difference	390.62	71.63	246.44	534.80	

P-value is statistically significant. Please note that Banjul has no CO measurement

DISCUSSION

Fish smoking is an activity with lots of hazards that need to be tackled because of the implication it has on health. Studies have shown that fish smokers are exposed to harmful smoke which damages smokers' eye-sights and also causes lung problems (El-Kurebe A. 2016). This study reveals that the physical hazards reported among fish smokers were minor cuts (51.2% and 88.9%); fish bites (72.1% and 77.8%); fish stings (75.9% and 66.7%); heat and cold (58.1% and 100.0%); minor head injury (72.1% and 88.9%). For biological hazards, 67.4% and 66.7% reported parasitic infections, 100.0%, and 100.0% reported smoke from the smokehouse as the main chemical hazard. Several, 72.1% and 88.9% reported internal injuries as their major ergonomic hazard. In Banjul, the majority 88.4% reported prolonging work hours as their main psychological hazard. Agbebi (2018) in his study on Analysis of Occupational Hazard of Fish Smoking Among Fisher-Folks in Coastal Areas of Ondo State, Nigeria revealed that major occupational hazards recorded in the study areas were; redness and swelling of the eyes which the commonest, chronic obstructive respiratory diseases, stress-related health problems sting from fish spines, knife cuts, snakebites while fetching firewood (physical), parasitic and pathogenic infection (biological), hazards from disinfectant used (chemical), broken bones and dislocation, back strain (ergonomic), prolong work hour and high

mental demand (psychosocial). Mshelia et al. (2019) also reported that fish processors work for long hours which makes them be at a greater risk of depression.

The majority 53.5% and 88.9% of fish smokers in Tanji and Banjul were exposed to minor head injury, minor cuts 39.5% and 77.8%; bites 53.5% and 44.45; stings 46.5% and 66.7% as physical hazards monthly. In Tanji 48.8% were exposed to heat and cold monthly while 44.4% experienced weekly exposures. Concerning biological hazards, 69.8% and 44.4% experienced infection by pathogens monthly. All the fish smokers 100.0% and 100.0% in Tanji and Banjul reported daily exposure to smoke from the smokehouse. In Tanji, 34.9% were exposed to ergonomic hazards such as internal injuries monthly while 44.4% reported weekly exposure in Banjul.

Fish smokers are exposed to a lot of injuries. From the study, the common perceived injuries sustained during fish smoking were cuts and lacerations (95.5% and 93.5%): puncture wounds (72.7% and 76.7%); sprains and fractures (70.8% and 80.5%); muscles strain and pains (79.2% and 85.7%); foreign objects in the eyes (63.6% and 58.4%) and sting from fish spines (85.7% and 94.8%). Bull et al (2001) in their study revealed that the most common injuries were abrasions, broken bones, wounds, and sprains. Olaoye et al (2015), reported that cuts, burns, eye redness, and pricks from fish spines were common among the fisherfolks. Ngaruiya, et al (2019) reported cuts among the fisherfolk. Novalbos et al (2008), also reported that several fisherfolks had sustained cuts while working. Other findings showed that cuts were among fisherfolk (Myers 2010; Olaoye et al, 2015; Ngajilo; Jeebhay 2019, & Agbebi 2018). According to Jerie (2016), Okojie, and Isah2014), untreated cuts predispose fish handlers to infectionsCarbon II oxide (CO) Levels.

Exposure to carbon monoxide (CO) has been associated with acute, long-term health effects and may be responsible for as many as half of all poisonings globally). Inhalation into the respiratory tract induces a hypersensitivity response leading to inflammation of the respiratory lining which gives rise to acute respiratory symptoms such as cough, cold, and chest pains.

Pollutants with the strongest evidence for public health concern are fine particulate matter and gases (mainly carbon monoxide, ozone, nitrogen oxides, sulfur dioxide, and volatile organic compounds) (WHO, 2014).

Long-term exposure to solid fuel smoke is associated with chronic obstructive pulmonary disease (COPD), increased risk of acute respiratory infections/pneumonia, lung cancer, tuberculosis (TB), and cataracts (Kurmi, et al, 2010).

The study revealed that the mean indoor and outdoor was higher than the WHO recommended limit of 9ppm for indoors and 25ppm for outdoors. Also, the results of the study show that the indoor CO is higher than the outdoor CO. This is similar to the findings by Fazlzadeh et al (2015) in their study on Concentrations of carbon monoxide in indoor and outdoor air of Ghalyun cafes in the Ardabil City of Iran which revealed that CO concentrations are remarkably higher in the indoor air of cafes (24.8±17.2 ppm) than the outdoor atmosphere (2.7±1.3 ppm). The high CO levels might have also contributed to some of the symptoms shown by the fish smokers. A study

by Reed (2011), revealed that symptoms of carbon monoxide exposure can include everything from headaches, dizziness, and drowsiness to nausea, vomiting, or tightness across the chest. Severe carbon monoxide poising can cause neurological damage, coma, and death. Fish smokers are at higher risk of exposure to CO because they use wood during smoking. Also, they spend a long time near the smoke daily. Flintwood–Brace, Alice (2016) in her study on biomass smoke exposure in traditional smokehouses and respiratory symptoms among fish smokers at Aboadze/Abuesi in the western region of Ghana shows that the number of years spent as a fish smoker increased with increasing risk of respiratory symptoms

CONCLUSION

Risks and hazards could have an impact on humans and all human activities. Fish processors including fish smokers are exposed to lots of hazards and injuries during processing which may contribute significantly to the occurrence of work-related diseases and significant income loss mainly due to the time lost to sicknesses. Therefore, it is recommended that all fish smokers receive thorough training on the dangers and risks specific to their line of work. They should also be taught to practice safety.

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List of Abbreviations: GBOS: Gambia Bureau of Statistics
FGD: Focus group discussion

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