

*Full Length Research Paper*

# **Occupational hazards, risk and injuries of fish processors in Tombo a coastal fish landing site, Sierra Leone, West Africa**

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**Fish and fish products bear potential hazards and risks of public health concern. A preliminary study of hazards, injuries and risks among fisherfolk in Tombo, Sierra Leone, West Africa was carried out on November 2018. Sixty subjects from among the organized fish processor groups were interviewed with semi-structured questionnaire. Results obtained from the study were analyzed with Microsoft Excel and presented in tables and charts. The results of the study indicated that females (56.7%) were more involved in fish processing than males (41.7%); and the active age of these processors fell in the age range of 35-45 years. Married people (71.7%), dominated singles, widowed and divorced put together. Dominant religion in the study area was Islam and Christianity. Smoking (hot and cold), frying, packing, icing, filleting, seasoning or the combination of two or more according to the subjects was the prevailing processing methods used by processors in Tombo. Inherent hazards, injuries and risks reported by the respondents included high blood pressure, cardiovascular disease, nervous tension, insomnia, skin disease, bronchitis or asthma, muscular problems or those of the joint, long-term neck and back pains, eye problem, typhoid, malaria, and hearing problem caused by environmental noise. To mitigate the hazard and risks associated with fish processing in Tombo, training on appropriate fish handling and processing techniques; the provision of appropriate handling and processing equipment by responsible stakeholders were considered according to the subjects rational options.**

**Key words:** Occupation, hazards, injuries, risks, fish processors, Tombo, Sierra Leone.

## **INTRODUCTION**

Fish is rich in macronutrients, minerals, vitamins, lipids and essential amino acids required for the development of the human body. According to Balami et al. (2019), fish

protein is fortified with immunoglobins, which helps the body fight against viral and bacterial infections; and helps to prevent protein calorie malnutrition.

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Din et al. (2004) noted that fish contributes about 40% of animal protein in the diet of human; and according to Kawarazuka (2010), fish has higher proportion of protein estimated at about 14- 20 g/100 g raw, edible part when compared to protein from plant source, which makes it a more efficient source of protein. The diverse health benefits of fish to man was outlined by Larsson et al. (2004). Eyo (2001) noted that fish is less tough, and easily digested, compared to beef, mutton, chicken and bush meat, which makes it acceptable to infant and adult.

Significant proportion of the fish consumed in Sierra Leone comes from the captured fisheries. These fisheries use a variety of methods to harvest fish, which include the use of hook and line by the artisanal fishers to the use of mechanized seines using big vessels like purse seiners, long liners, driftnets and other nets. The captured fisheries is broad and can be distinguished as industrial/commercial scale, small scale or artisanal, and recreational. Omotayo et al. (2006) reported that about 90% of the world's fishery catches come from oceans and seas, as opposed to inland waters.

Fish is highly perishable and easily prone to deterioration and quality reduction no sooner it is harvested from its natural environment. Consequently, for fish to meet its expected nutritional requirement, it needs to be properly handled and processed no sooner it is harvested to avoid deterioration (Okonta and Ekelemu, 2005). Physiological and microbial deterioration degrade the quality of fish, which if not altered by processing will result to significant post-harvest losses.

Fish processing is a chain that involve all the important handlings of fish and fish products. This chain starts from the time the fish are harvested and to the time when they are delivered to the consumer (Olaoye et al., 2015). Fish processing sector in Sierra Leone dominated by women, which was previously informal, is gradually growing into a more formal sector with associations of processors. However, unlike other African countries, fish processing in Sierra Leone are still rudimentary, limited to the use of traditional smoking methods. Although of late, institutions like FAO, Njala University through its Department of Aquaculture and Fisheries Management, and the Ministry of Fisheries and Marine Resources (MFMR) introduced improved smoking kilns with capacity to handle commercial volumes.

Fish handling and processing whose primary concern is the prevention of spoilage are fraught with a number of injuries, health hazards and fatalities. Physical, chemical, ergonomic and biological hazards are the categories of occupational risks and hazards to which fish processors are often exposed (Olaoye et al., 2015). Common physical hazards in the processing premises are slips, trips, falls, and exposure to loud noises; while for chemical hazards, common risks and hazards are acids accidents, solvents, vapours, fumes, and carbon monoxide. Ergonomic hazards are caused by physical factors affecting musculoskeletal system, while parasitic

infection, bacteria or viruses, injury from animals such as bites from shark or crocodile are responsible for biological hazards (Olaoye et al., 2015).

According to Islam et al. (2014) fish processing is one of the most hazardous profession with high health risk. A number of hazards and injuries have been reported in fish processing industry which includes redness/swelling of the eye (which is the commonest), cuts, eye irritability, skin burns, falls, sunburns, mechanical and electrical accidents, bacterial and parasitic infections, noise induced hearing loss, allergic respiratory diseases and stress related health problems. Smoke inhaled during fish smoking process has been known to increase the risk of developing asthma and eye problems. Many countries globally have reported injuries in the processing industries. Australia, Canada, Korea, Estonia, Italy, Poland and the United States of America have all reported fatalities in fishing industries. Africa is not left out, for instance in Ghana, 1126 out of 1340 fisherfolk according to Kyei et al. (2016) reported that they were suffering from eye problems, namely ocular irritability, pain, and blurry vision.

International Labour Organization (1999) estimated that worldwide 24,000 fatal and 24 million nonfatal injuries happen every year in the fishing industry. According to FAO (2001), the national statistical data for occupational fatalities and injuries in the fishing industry for countries whose economy depend to a greater extent on the commercial fisheries sector is much higher than the national averages for other occupational fatalities and injuries regardless of the level of industrialization. This range from 21-100,000 depending on the country; this is higher than the International Labour Organization's (ILO) estimate of 24 000 fatalities worldwide, per year. Approximately 2.78 million deaths that occurs yearly globally are associated are work related hazards (Global Burden of Disease Study, 2015). Workers in developing countries suffer more from occupational risks and experience great losses (Global Strategy on Occupational Health for All, 1995). It is unfortunate to mention that in most fish processing industries worldwide, much emphasis is placed on fish quality aspects, especially slaughter techniques, organoleptic characteristics, improved equipment and increased production with little attention given to the quality of lives of the workers (Guertler et al., 2016). Health hazards, injuries and risks fish processors are exposed to are products of many factors which include but not limited to dangerous working conditions (Olaoye et al., 2015), age of workers (Velvizhi and Gopalakrishnan, 2017), and level of training as reported by Smith and Berecki-Gisolf (2014) citing Safe Work Australia. Documented information on risks and fatalities associated with fish processing in Tombo is rare and where available it is scanty. This present study, therefore, seeks to document information on the health hazards, risk and injuries associated with fish processing activities in Tombo, a

major fish-landing site in Sierra Leone, West Africa.

## MATERIALS AND METHODS

### Study area

Tombo where the study was carried out is a cosmopolitan coastal settlement in Sierra Leone, West Africa inhabited by different ethnic group. Sierra Leone is situated south of the Republic of Guinea and west of the Republic of Liberia and has an estimated population of 6.3 million as of 2014 (World Bank, 2016). The inhabitants of Tombo are predominantly Muslims belonging to the Temne, Sherbro, Limba, and Mende ethnic groups. The town is approximately 30 miles (49 km) east of Freetown, the capital of Sierra Leone. The main economic activity in the town is fishing with catches dominated by pelagic species, which include but not limited to *Ethmalosa fimbriata*, *Sardinella spp*, *Ilisha africana*, the Carangids, West African Spanish mackerel (*Scomberomorus tritor*), and bonefish (*Albula goreensis*) (Chaytor and Ndomahina, 2012); other economic activities of people in Tombo are coal mining and subsistence farming.

### Data collection and statistical analysis

Data for this preliminary study were collected in November 2018 from the field with an interviewer-administered questionnaire. Sixty subjects whose ages ranged from 18 to 45 years and above ( $\leq 55$  years) from the fish processors groups were selected through systematic random sampling. Prepared questionnaire was pretested in order to gather more information before finally administering them.

The subjects surveyed were those actively involved in diverse activities of fish processing as a means of livelihood and this was responsible for the low sample size used for this research. The questionnaire was administered in Temne language (the dominant tribe at the landing site) and "Krio" an abridged widely used form of English language to collect information on fish processors personal, occupational and work-related morbidity details such as risks, hazards and injuries. Occupational hazard is any existing or potential condition in the workplace, which, by itself or by interacting with other variables, can result in death, injury, property damage or other loss. Simply, hazard is a potential source of harm. Risk on the other hand is the likelihood of harm occurring. The responses provided in the structured questionnaire were coded to make it easier for the researchers and to minimize time spent with the ever-busy subjects. Subjects are however to elaborate on issues of importance under "any other".

Results obtained was further validated with the observation of the activities of subjects and the environment where they work. Secondary information was obtained from journal articles, dissertations and thesis, seminar papers, census reports, conference/workshop papers and reports. Approval to carry out the study was granted by the Sierra Leone Ministry of Fisheries and Marine Resources (MFMR), who through its Director issued us a letter instructing the resident fisheries officer at Tombo to grant us access to the fisher-folks. The fisheries officer was the go-between the processors and us. He explained to the subjects the purpose of our study and the confidentiality involved. A compromise was reached with the subjects on the appropriate time to visit them. Subjects were reached very early in the morning at the landing site especially at the time when fishermen return to shore with their overnight catches, and others were met at their processing units at noon when the fish processors have set their fish in the smoking kilns. To further address ethical issues, the consent of the selected subjects were sought before taking their photographs. Information

collected on the socio-economic characteristics and occupational health hazards and risks of the fish processors at Tombo were summarized in Microsoft Excel and were analyzed for frequency counts and simple percentages which were presented in tables, bar and pie charts.

## RESULTS

### Socio-economic characteristic of interviewed subjects

The socio-economic information of fish processors studied in Tombo is presented in Figures 1 to 5 and Table 1. The ages of majority of the processors ranged between 36 – 45 years, which accounted for 56.7% of the interviewed subjects. This age class was closely followed by processors in the ages 26- 35 (31.7%). Ages below 25 years were in the least, accounting for only 5% of the interviewed subjects (Figure 1). In the study area, female subjects (58.3%) predominate their male counterparts, a pointer to the fact that there are more female fish processors than male (Figure 2). Results on the marital status of the subjects revealed that 72% were married, 18% single while 7% and 3% were widowed and divorced, respectively (Figure 3). Subjects with primary education ranked highest (53.3%) while the proportion of subjects without any form of education were also significant, accounting for 31.7% of the interviewed subjects; only an insignificant few had tertiary education at 3.3% (Figure 4). It was however surprising to note that Tombo dominated by Muslims only had 1.7% subjects claiming to have Quranic education (Figure 5).

Information regarding the number of occupants in a household according to the subjects ranged from 2 to 15 and more. Subjects with 2 to 5 occupant size (45%) dominated, while those with household size of more than 15 were in the least (5%). Evaluation of fish processing experience indicated that 66.7% of the subjects had fishing experience of 1- 5 years, while 33.3% had experience of 6- 10 years (Table 1).

### Processing methods used by subjects in Tombo

Fish freezing, smoking, frying, salting are the common methods of processing in the tropics and are useful for stabilizing fish supply. Modern processing techniques have encouraged the consumption of many species of fish that have become popular throughout the world. The result of this study as presented in Figure 6 revealed the order of processing method preference by the subjects in the study area. The order of processing method adopted by subject is smoking (58.3%), followed by filleting (10%), packing (6.7%), frying (1.7%) and icing (1.7%), respectively. Smoking is highly preferred by subjects as a means of processing fish because it is cost effective and the fuel for smoking is easily affordable in the study area.

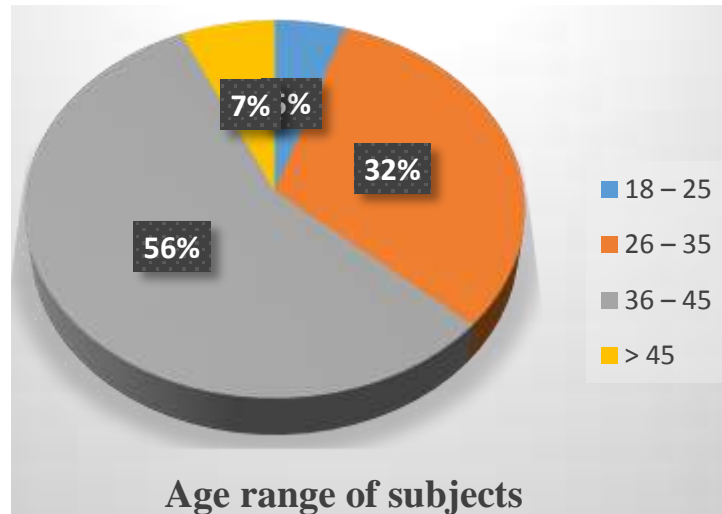


Figure 1. Age of the fisherfolk as stratified by gender (n = 60 fisherfolk).

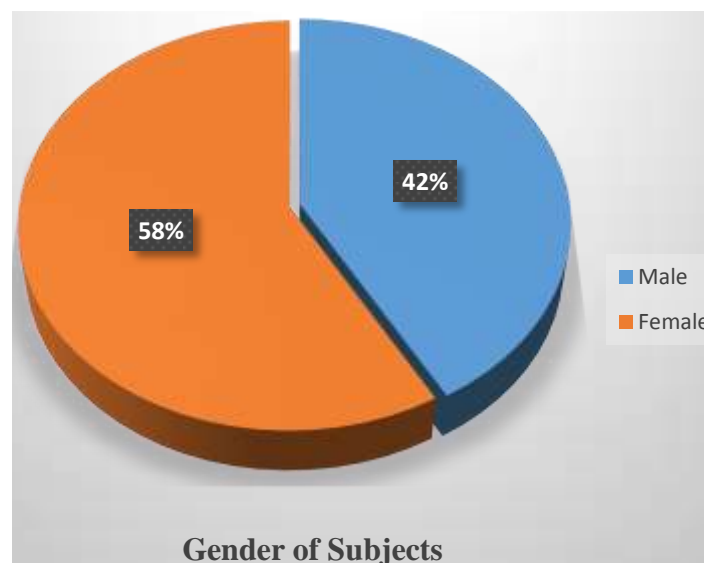


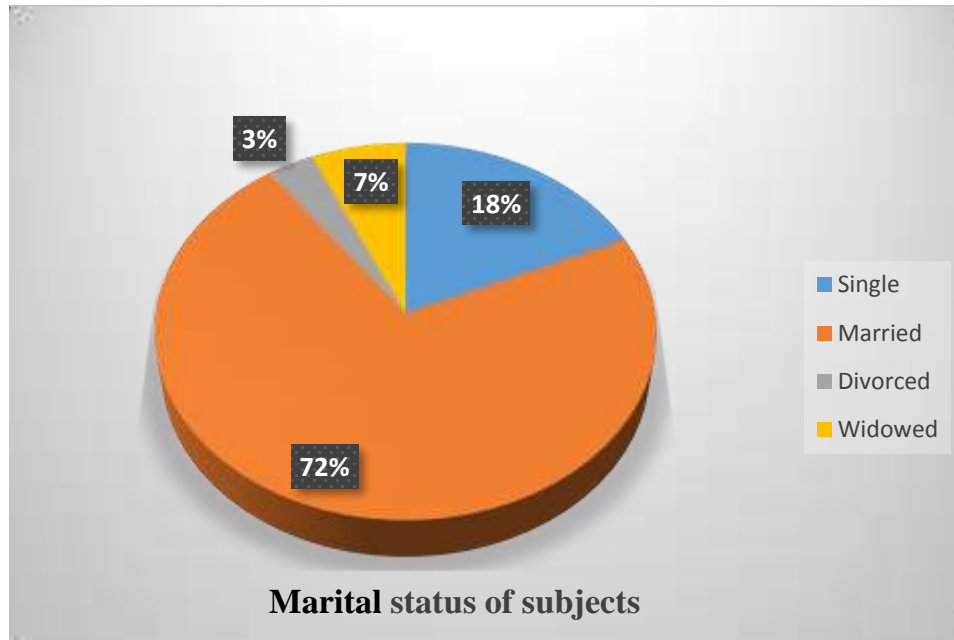
Figure 2. Gender of subjects.

### Hazards incurred by fish processors in Tombo

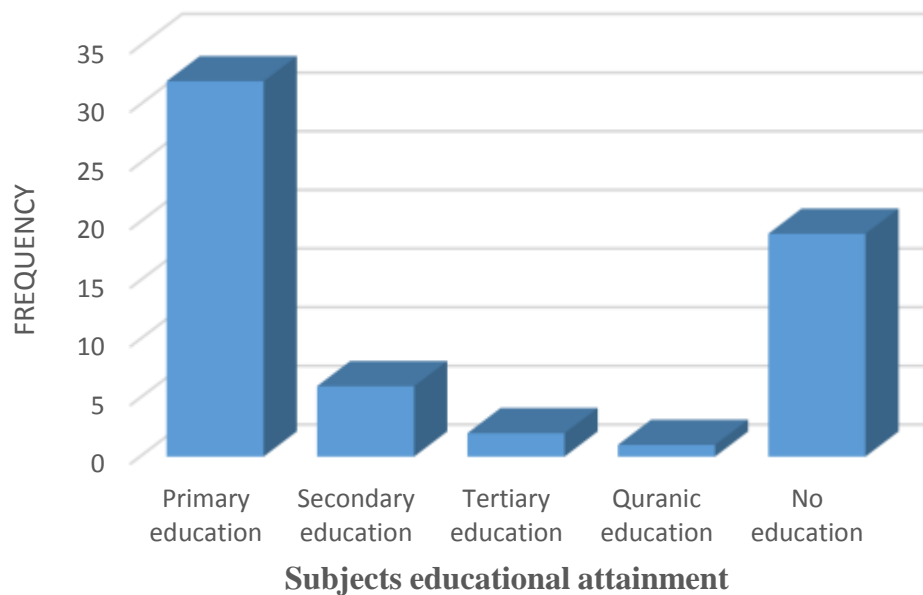
Fish processors in Tombo are exposed to varying degree of health hazards. The result obtained for this study further revealed that the most common hazards experienced by the processors were insomnia or restless night, which is common to the entire interviewed subject (100%). Nervousness (95%), headaches (100), body pain and aches (98.3%), blocked nose, running nose and sneezing fits (100%), respiratory problem (100%), eye problem (Plate 1), typhoid and malaria (100%) were also common, while dry skin and skin rashes accounted for 70% of processors' health outcomes in the study area.

### Injuries of fish processors in Tombo

Representative descriptions of commonly observed work injuries and potential high-risk exposure to fish processing are outlined in Figures 7 and 8. Cuts and Burns (53.3%) were identified as the major multiple injuries suffered by the subjects. This is because these processors during fish processing, use sharp edged tools (knife). Unprotected skin exposure, due to the lack of personal protective gear such as gloves, presents another source of risks in Tombo. Subjects suffered from cold (30%), heat (15%), and smoke (10%), changes in temperature (28.3%), respectively. Other maladies



**Figure 3.** Marital status of the subjects.



**Figure 4.** Educational attainment of the subjects.

experienced and reported by the subjects during the course of the study were swollen fingers caused by whitlow (Plate 2) and swollen legs (Plate 3) probably caused by prolonged standing or by infection.

#### **Subjects' health surveillance programme**

Significant percentage (96.7%) of the subjects

interviewed agreed to have health services provision (community health centre, first aid facility and health insurance) in place in the community. Awareness of the dangers involved in fish processing is universal among the subjects and they agreed to undergo periodic medical checkup (Table 2). The knowledge of first aid treatment was however low, as only 33.3% of the interviewed subjects were aware of first aid treatment, while 66.7% claimed not to have knowledge of first aid treatment. This

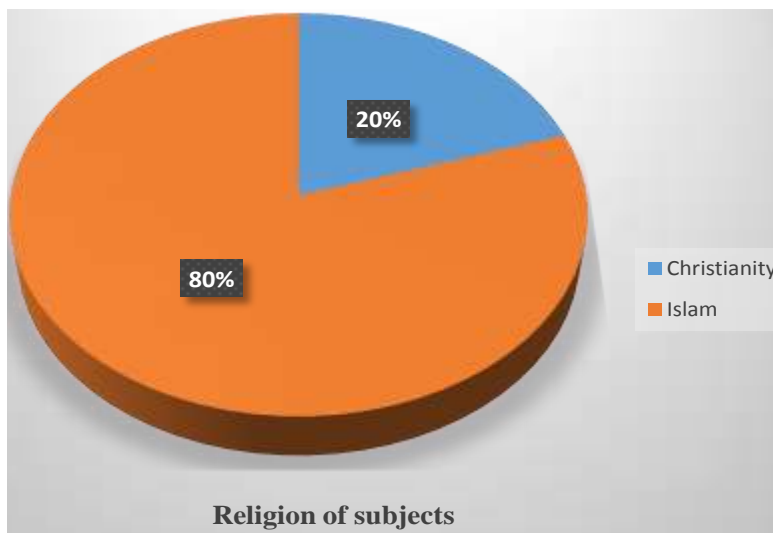


Figure 5. Religion of the subjects.

Table 1. Other demographic characteristics of the subjects in Tombo.

Characteristics	Frequency	Valid (%) (N = 60)
<b>Tribe of subjects</b>		
Temne	39	65
Mende	9	15
Shebro	5	8.3
Others (Fulla, Mandigo and Limba)	7	11.7
<b>Number of occupants per subject house</b>		
2-5	27	45
6-10	19	31.7
11-15	11	18.3
> 15	3	5
<b>Years of experience in fish processing</b>		
1 - 5	40	66.7
6 - 10	20	33.3
<b>Secondary occupation of subject</b>		
Local contractor	13	21.7
Motor cycle rider	12	20
Commercial bus conductor	12	20
Trading	23	38.3

low first aid knowledge was perceived as a serious risk capable of undermining the sustainability of the fish processing unit.

## DISCUSSION

### Socio-economic characteristic of interviewed subjects

The result of this study furnished information on the age

class of the subjects involved in fish processing in Tombo, Sierra Leone. It was obvious, based on the reported ages that middle-aged subjects 36-45 years participated more in fish processing activities than the youths and the old. Ngaruiya et al. (2019) reported the age bracket of 22 to 45 years in their study on occupational health risks and hazards among the fisherfolk in Kampi Samaki, Lake Baringo, Kenya. This result is not quite different from what was obtained in this study. Chando (2002), Cliffe and Akinrotimi (2015) and

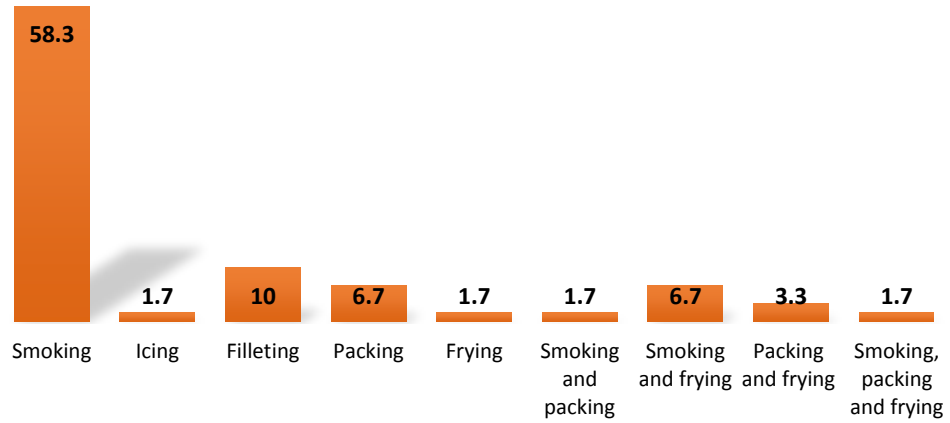


Figure 6. Methods of fish processing by subjects in Tombo.



Plate 1. A subject with infected watery eyes.

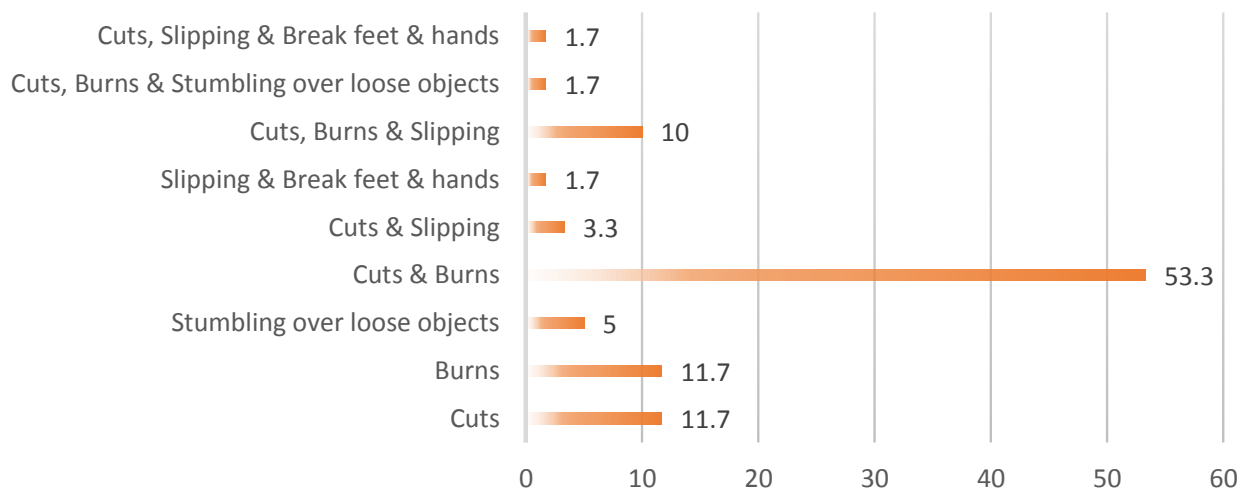
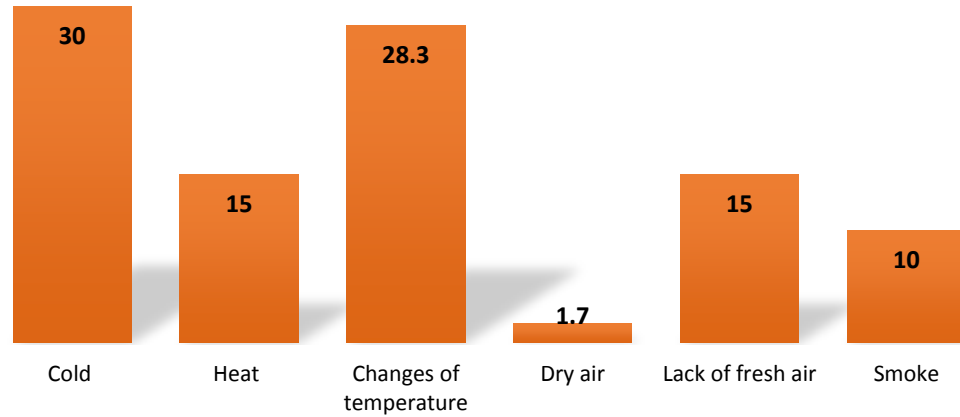


Figure 7. Injuries affecting fish processors.



**Figure 8.** Categories of hazards affecting fish processors in Tombo.



**Plate 2.** Swollen hand resulting from whitlow.

Dambatta et al. (2016) have reported that young adults and middle-aged people are usually more energetic, experienced and with better understanding of the trade. Oyediran et al. (2017) in a study on the effects of occupational health in Nigeria reported that the majority of the fisherfolks were in their active ages, and noted that younger fisherfolks are more prone to occupational hazards and risks than older ones. The finding of this study is further corroborated by the result of Olapade and Sesay (2019) in a study of women involvement in fishery activities of two coastal communities in Sierra Leone. The

finding of this study also align with the work of Obande et al. (2004) on the role of women in artisanal fisheries along the lower River Benue. Olowosegun et al. (2004) noted that women in the reported age class are active and are able to endure the rigours associated with fish processing. The odds of hazards awareness according to Tadesse et al. (2016) is six times higher with employees with longer years of job experience.

In this study, the preponderance of women over men was recorded in fish processing activities in Tombo. This result is not different from the results of Cliffe and





**Plate 3.** Subject swollen legs.

**Table 2.** Health surveillance status of respondents in Tombo.

characteristics	Frequency	Valid (%) N = 60
<b>Health service on site</b>		
Yes	50	83.3
No	10	16.7
<b>Awareness of fish processing danger</b>		
Yes	60	100
<b>Frequency of medical check up</b>		
Once	51	85
Twice	1	1.7
Thrice	1	1.7
Every week	2	3.3
None	5	8.3
<b>Knowledge in first aid treatment</b>		
Yes	20	33.3
No	40	66.7

Akinrotimi (2015) who reported a 54% involvement of married women in fisheries activities of some coastal communities of Rivers State, Nigeria. Olapade and Sesay (2019) also reported high presence of married women in fisheries activities in Sierra Leone fishing coastal

communities. The question to ask is if marital status of subjects has any bearing with occupational risks. This was not determined, but certainly married subjects would risk their lives for the survival of their families. Manyungwa-Pasani et al. (2017) who reported that

women dominate the post-harvest fishing activities in Malawi fish value chain better explain the dominance of women as observed in our study. Women according to Ibim and Amiye (2014) contribute significantly in post-harvest fish production. Mochi (2003) and Anyanwu et al. (2007) opined, that without women's participation, it will be impossible to achieve sustainable rural development and food security. The involvement of women in fisheries activities is not in doubt, especially in the two domains of processing and marketing as opined by Thorpe et al. (2011). The dominance of married women observed in this study can be explained from the premise that married women are homemakers who generate income and who by so doing ensure food security for their families (Nwabeze et al., 2013).

The result of this study revealed the Temne ethnic extraction as the dominant tribe in Tombo, and this ubiquitous presence of the Temne people could be explained by the proximity of Tombo to major Temne towns and cities. Tombo located in the western rural district of Sierra Leone bordered closely major Temne districts of Port Loko and Tonkolili. It is a common knowledge that the Temne people of Sierra Leone are itinerant traders and fishers, the latter, capable of luring them to settle close to the Atlantic oceans and other major rivers.

Muslims predominate the population of Tombo; the Temne, Madingos and Soso are traditionally Muslims with only few embracing other religions. Olapade and Conteh (2014) in their study on benefit related relationships among artisanal fisher folks of Tombo fish landing community reported the preponderance of Muslims over Christians. Religion does not appear to play any role in occupational hazards and risks of the subjects, and neither does it influence involvement of subjects in fish processing trade. Religion however is believed to influence the number of occupants in a household. Bloated household size in Tombo was associated with Muslim dominance since they have the proclivity to marrying more than one wife (Polygamous lifestyle). In this study, the highest number of occupants in a household was 2- 5 (45%) which is different from the size of 5- 10 occupants reported by Olapade and Conteh (2014). The result of our study is also different from the findings of Agbebi (2018) who in the study on the analysis of occupational hazards of fish smoking among fisher-folk in coastal areas of Ondo State, Nigeria reported that majority of fish processors in Ondo State had large household size of between 6- 10 people. The disparity could be attributable to gap in the period of study and possible migration of fish processors, and or the sample size used for this study.

The level of education recorded in this study is low as only 3.3 and 10% reported to have tertiary and secondary education respectively, while 53.3 and 31.7% had primary education and no education respectively. The low level of education reported in this study is similar to what

Ngaruiya et al.(2019) reported for fisherfolk at Kampi Samaki, Kenya. Kyei et al. (2016), reported similar low education situation for fisherfolk in Ghana where majority had attained primary and secondary education, with only 2% attaining tertiary level of education. The situation is not quite different from what Davis (2012) in a study on perceptions of occupational risk reported for fisherfolk in the United States of America (USA). It became apparent that small-scale fisheries does not require high level of educational attainment owing to the low level of technology and skills involved. Notwithstanding, education plays significant role in the awareness and understanding of occupational risks and hazards among the fisherfolk. The more the education, the better the awareness and the lower the risk of occupational hazards and this statement agrees with Percin et al. (2011) who opined that high levels of education were also associated with less occupational risks as compared with low levels of education. Attainment of certain level of education by fisherfolk especially women is also an important asset as it helps them to manage their business and home effectively (Olapade and Sesay, 2019). Fishing experience according to Dambatta et al. (2016) is the number of year fisher folks spent in fishing business. Extended experience has the advantage of increasing fishers' performance and cannot be divorced from occupational risks and injuries. According to Saha et al, (2006) on-job experience of fishers may contribute in protecting them from injuries and fatalities. Saha et al. (2006) statement was buttressed by Breslin et al. (2007) who reported that younger workers had 1.2 to 2 times higher rate of occupational risk as compared with older ones. Younger workers who are more prone to hazards, risks and injuries often underestimate the safety and health associated with their roles DGIPESAUP (2011). It is not *ultra vires* to state that the low on-job experience duration of subjects in Tombo may expose them to high hazards and risks related to processing activities.

### Processing methods used by subjects in Tombo

Fish smoking using both traditional and improved smoking kiln is the main method of fish processing in Tombo. According to the subjects interviewed, smoking is highly preferred because they believe it is cost effective and because the fuel used for smoking is easily affordable. Olaoye et al. (2015) in a study on the occupational hazards and injuries associated with fish processing in Nigeria reported that smoking is the oldest, conventional and most common method of fish processing in the tropics. In Manipur, India, according to Ningthoujam and Singh (2012), smoking is the simplest and cheapest technique that is used by Manipuri women. It is a traditional fish handling methods inherited from their forebears (Ningthoujam and Singh, 2012). Fish smoking is however attended by plethora of hazards and

injuries.

### **Hazards incurred by fish processors in Tombo**

Fish processing workers according to Zakia et al. (2012) are susceptible to many physical hazards in the course of their work. Fish processors in Tombo are exposed to varying degree of health hazards. The fishing industry due to a number of hazards involved has been reported by different authors as one of the most dangerous occupation in the world (Rodrigues and Kiran, 2013; ElSaadawy et al., 2014). Fisherfolk as reported in different studies experience occupational hazards and risks (Udolisa et al., 2013; Youn et al., 2014; Olaoye et al., 2015; Kolawole and Bolobilwe, 2019). The health problems among fish processing workers have been attributed mainly to safety risks (mechanical and electrical accidents); excessive noise levels and low temperatures; bacterial and parasitic infections; and poor ergonomic practices and workplace organization (Conway and Husberg, 1999). Olaoye et al. (2015), also reported that common hazards in fish processing industry ranges from redness/swelling of the eye (which is the commonest) to mechanical and electrical accidents, bacterial and parasitic infections, noise induced hearing loss, allergic respiratory diseases and stress related health problems.

#### **Common health hazards**

observed among fish processors in Tombo include insomnia or restless night which is common to all the interviewed subjects, nervousness, headaches, body pain and aches, blocked nose, running nose and sneezing fits, respiratory problem, eye problem, typhoid and malaria, while dry skin and skin rashes are part of processors' health outcomes in the study area.

### **Injuries affecting fish processors**

In the present study, it was found out that cut and burns (53.3%) and cold (30%) were the predominant hazards faced by fish processors in Tombo. Saha et al. (2006) reported that frequent contact with ice water makes fish processors prone to different disease conditions, which include frequent respiratory irritation like sneezing and coughing during, work, headache and blanching of hand. Since processors collect fish from the fishermen early in the morning, this can predispose them to extreme cold. Cut and burns experienced by most fisherfolk according to Olaoye et al. (2015) result from the direct exposure to naked flames while processing fish especially when smoking fish. Many authors have reported cuts among fisherfolk (Erondu and Anyanwu, 2005; Nag and Nag, 2007; Myers, 2010; Olaoye et al., 2015; Ngajilo and Jeebhay, 2019). There are other maladies associated with cuts wounds (Okojie and Isah, 2014; Jerie, 2016),

and these include virus infections, biological agents, and tetanus. Other health hazards and injuries faced by fish processors in Tombo are slipping and falling over loose objects, swollen legs and hands, watery eyes because of intense smoke and heat, and breaking of foot. Exposure to smoke hazards and musculoskeletal problems have also been reported by other authors (Nag and Nag, 2007; Kyei et al., 2016).

### **Subjects' health surveillance programme**

The result of this study indicated the need for the introduction of health surveillance programme among the fish processors in Tombo as only 33.3% of the subjects agreed to be trained and thus possess knowledge on how to prevent health problems in their workplace. Health surveillance according to WHO (2016) is "the continuous, systematic collection, analysis and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice. To assure the sustainability of the fish processing units and to safeguard the lives of the fish processors in Tombo as a subset and Sierra Leone as a larger entity, there is the need to put in place primary preventive measures.

Awareness raising among all fish processors, training on the risks and hazards associated with fish processing, provision of first aid kits at processing premises, and the use of personal protective wears are part of the measures recommended by Olaoye et al. (2015). These measures couple with sensitization and the provision of appropriate facilities and work environment would go a long way to minimize the exposure of processors to hazards and injuries, and ensure that they are in good state of health and frame of mind to continue their business.

### **Limitations of the study**

The strength of this research is that for the first time it has catalogue information on some of the hazards, injuries and risks fish processors are exposed to in Tombo; and will become the base for further research on occupational hazards, risks and injuries of Sierra Leone fisheries. The study is, however, weak in that it did not correlate the socio-economic factors of the processors with hazards, risks and injuries, neither did it evaluate the stress levels they are exposed to. Future studies need to capture other sources of hazards and stress besides those of processing and should take into account hazards associated with fish selling.

### **Conclusion**

The study examined the potential hazards, risks and

injuries associated with fish processing activities in Tombo, Sierra Leone. Like in other climate, fish processors in Tombo suffer from occupational hazards, risks and injuries, which were palpable. In this study, it was found out that Muslims constituted the dominant religion, with many females and married subjects. It was evident from the results that age and occupational demands of subjects significantly influence the type and severity of hazards, risks and injuries they are exposed to. Subjects' years of experience in the business appeared to predispose subjects more to hazards, risks and injuries; however, with the experience also come the knowledge on appropriate safeguards on known hazards and injuries. Smoking which is the preferred fish processing method contributed significantly to exposing subjects to elevated heat which predisposes them to insomnia, headaches, blocked nose, running nose and sneezing fits. The good news, based on the information retrieved from the subjects is the high awareness level of dangers associated with fish processing; the knowledge in first aid treatment and the need to go for periodic medical checkup is also high among the subjects. In a bid to ensure safety and sound health for the people living in Tombo, Government of Sierra Leone built a moderately equipped health facility in the community. Nonetheless, there is a need for the provision of first aid kits by responsible stakeholders and education of processors on their use. To reduce or minimize hazards and risks among the processors by encouraging them to use personal protective equipment especially fitting gloves. Improved workplace organization, including the formation of joint health and safety committees are important measures to be considered by the stakeholders overseeing the activities of fishers in Tombo. Stakeholders should not forget to improve on the prevention of musculoskeletal injuries. In conclusion, fish processors should be provided with basic education and training on the associated risks and hazards of their vocation, and on how to reduce risks of accidents or other workplace hazards.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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