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Some Hazardous Practices Associated with Artisanal Fish Processing in Ogun Waterside Local Government Area of Ogun State, Nigeria

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ABSTRACT

The hazards associated with artisanal fish processing in Ogun Waterside local government area of Ogun State, Nigeria were accessed from March to May, 2014. Structured interview guide was used to collect information from 91 artisanal fish processors from 10 (out of 23) randomly selected fishing communities. Data collected were subjected to both descriptive and inferential statistics. Results revealed that higher proportion of the fish processors were married (85.7%), older than 40 years with mean age of 49.90±12.17 years, and had no formal education (67.0%). The mean household size and mean fish processing experience were approximately 9 persons and 25.7±4.27 years respectively. Furthermore, majority of the artisanal fish processors do processing of fish on a daily basis (85.7%) with hired labour (84.6%) using the Agbado type smoking kiln (87.9%). The study also found that higher proportion of the fish processors worked frequently with poorly designed equipment (63.7%), poorly maintained facilities (62.6%), poorly constructed equipment (53.8%) and under constrained neck posture (69.2%). This study revealed that chemical hazards were more common among artisanal fish processors in Ogun Waterside LGA. Common effects of occupational hazards felt by the fish processors included carpal tunnel syndrome, musculoskeletal problem, arthritis, dizziness, rheumatism and skin rashes. Significant association was found between the types of hazards experienced by the fish processors and the effect of those hazards on the fish processors ($\chi 2 = 15.581$, $p<0.01$). The study concluded that artisanal fish processors were suffering from serious health challenges due to their use of primitive processing techniques and poor working condition. The study recommended that financial assistance should be provided to artisanal fish processors so as to allow them make use of improved processing tools and equipment.

Key words: Ergonomic hazards, fish processors, injuries, rheumatism, smoking kiln

INTRODUCTION

Fisheries remain one of the reliable subsectors of agriculture that contributed significantly to the nation's Gross Domestic Product through agriculture (Federal Department of Fisheries – FDF, 2007). Its significance is further noted in the provision of cheap protein in human diet, employment generation through fishing and related activities (Omitoyin and Fregene, 2012. Ohen and Abang (2007) noted that fish also serve medicinal purposes due to its replenishment of human body with vitamins A and D; calcium, phosphorus and lysine; sulphur and amino acids.

Due to the increased gap between the demand for and supply of fish in Nigeria caused by increasing demand for fish, increasing population and insufficient domestic production, successive Nigerian governments had embarked on importation of fish and its products (Thompson and Mafimisebi, 2014). This has a negative effect on national development as expenses on importation would have been channeled towards developmental projects. The domestic fish production's inability to meet increasing fish consumption is further worsened as some of the insufficient domestic fish produced are usually left to spoilage through post-harvest losses. This loss is great due to the different microbial activities (of enzymes and bacteria) that take place in fishes immediately after harvest (Obasohan *et al.,* 2012). This implies that fish is a highly perishable fish commodity that requires urgent processing after harvest to avoid deterioration. The lack of adequate funds and infrastructural facilities that can aid post-harvest handling and management of fish also contributes to this post-harvest loss (Kolawole, 2001). A major means to prevent post-harvest loss of fish is processing.

Fish processing involves all the activities that are associated with fish and its products from time of fish harvest to the time the fish is on the consumer's table (Olaoye *et al.*, 2015). Several methods such as smoking, frying, boiling, drying, fermentation and canning have been used for processing. However, the most commonly used methods among the Nigerian small scale fish processors have been smoking and drying (Obasohan *et al.,* 2012). All fish processing activities are hazardous due to their nature, working environments were not optimal, necessary safety aids were not used, absence of improved fish processing technologies and the fact that trainings were not acquired on the different processing activities (Nag and Nag, 2007). El-Saadawy *et al.* (2014) also noted that there is increasing reports of occupational health problems such as asthma among fish processing workers due to increased levels of production and processing of seafood. Olaoye *et al.* (2015) identified and categorized the different hazards as physical, biological, chemical, ergonomic and psychosocial. Because of these, artisanal fish processors have been injured on several occasions while carrying out their day-to-day fish processing activities.

This study posits that for post-harvest losses to be minimized through artisanal fish processing, it becomes a necessity to focus attention on the safety of the primary actors in rural areas. This study therefore investigated hazardous practices associated with fish processing. The specific objectives of this study were to: describe the socio-economic characteristics of the artisanal fish processors; investigate the fish processing characteristics of the fish processors; identify the working conditions of the artisanal fish processors; identify the different hazards associated with artisanal fish processing; and examine the effects of occupational hazards and injuries on artisanal fish processing. The study further tested if significant association exists between the occupational hazards and its effects on artisanal fish processing.

METHODOLOGY

The Study Area

The study was conducted in Ogun Waterside Local Government Area (LGA) of Ogun State, Nigeria. The LGA is located in the eastern part of Ogun State sharing boundaries with Ondo State in the north, Lagos State in the south and Ijebu East LGA in the west (Figure 1). A 15 kilometre seashore was located in Ogun Waterside Local Government Area and this makes the State to be a maritime coastal state. The seashore has a network of overflow canals through which it inundates at high tides. Between 50-75% of the length of the LGA is surrounded by water extending from Lagos State to Ondo State. The area comprises of over 50 towns and villages with headquarter at Abigi. The main towns in the LGA are Iwopin, Omi, Ibiade, Abigi, Efire, Ilushin, Makun-Omi, Ode-Omi and Lomiro. It has an area of 1000.0 Km^2 and a population of 72,935 (National Population Commission, NPC, 2006). The area is also characterized with a large expanse of fertile soil rich in organic matter, well-drained and deep which makes it to support plantation crops. This makes the major occupations of the inhabitants to be fishing and farming. Due to the fishing activities in the LGA, fish processing is also what most of the residents especially women go into.

Sampling procedure and sample size

Ninety-one artisanal fish processors were sampled with the aid of structured interview guide following a two-stage sampling technique described as follows:

Stage 1 involves the random selection of 10 out of the 23 fishing communities in Ogun waterside Local Government Area. The second stage involved the purposive sampling of all the fish processors that were available in the fishing communities chosen in stage 1 at the time of data collection. The fishing communities and number of sampled fish processors from each fishing communities is as summarized in Table 1.

Table 1: Sampled fish processors from the selected fishing communities

Fishing communities	Number of sampled fish processors
Odeomi	14
Awodikura	9
Okeoso	10
Iseku	11
Aborege	6
Ijegbe	5
Okunose	9
Ibeke	9
Obakata	10
Olosumeta	8
Total	**91**

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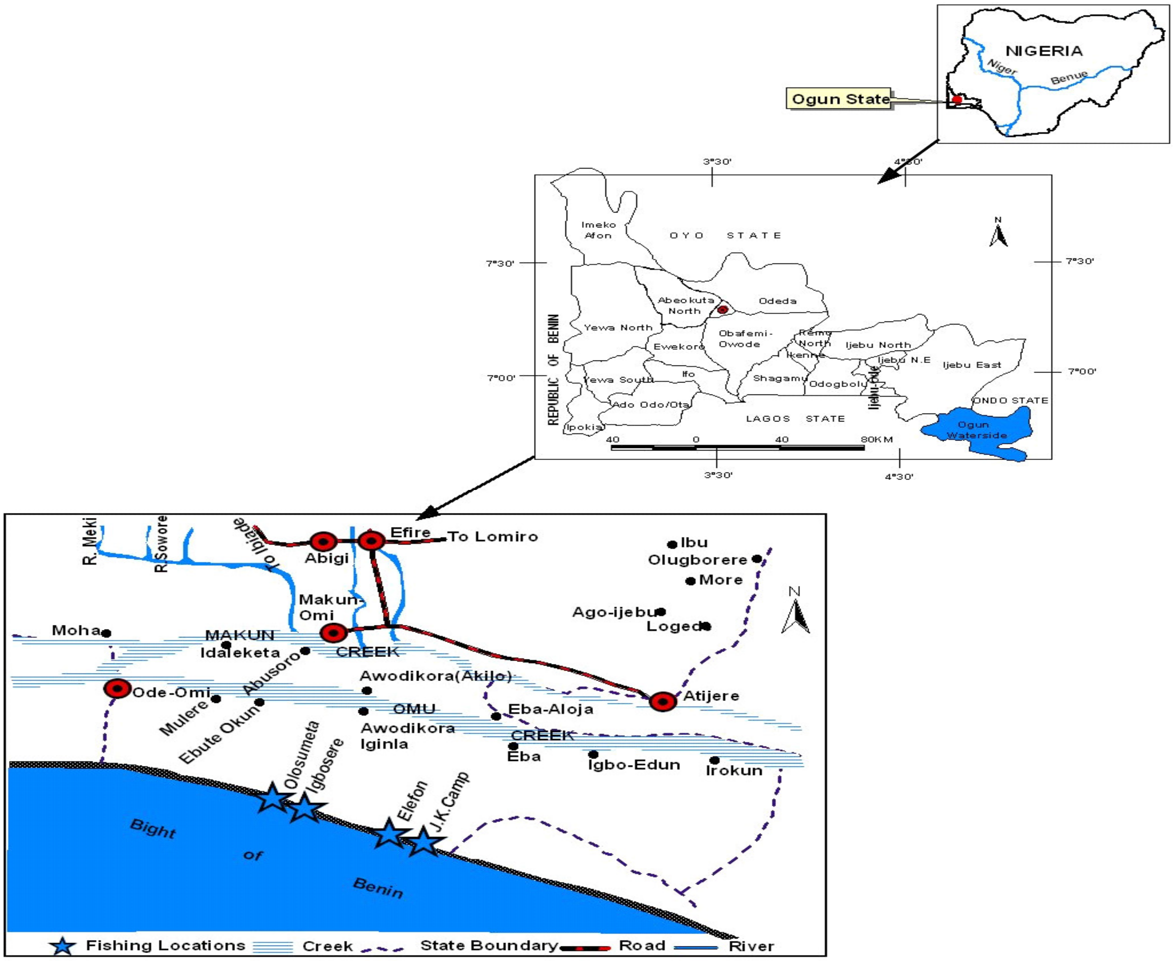

Figure 1: Map of Ogun Waterside Local Government Area

Data collection and analysis

Data were collected from the artisanal fish processors through the use of structured interview guide on the specific objectives of the study. Collected data were then subjected to descriptive and inferential statistics. Descriptive statistics such as frequency counts, percentage, mean and standard deviation were used to analyze the data while Chi-square serves as the inferential statistics used to test the hypothesis of this study at 5% level of significance. The results obtained were then presented in form of tables

RESULTS AND DISCUSSION

Table 2 shows that about 30.8% of the fish processors were in the age range of 41-50 years, 27.5% were between 51 and 60 years old, while 15.4% and 18.7% were in age ranges of 31 - 40 years and older than 60 years respectively. The mean age was found to be 49.90±12.17 years. A similar result was reported in earlier studies carried out among fishing communities in different states of southwest, Nigeria (Omitoyin and Fregene, 2012; Baruwa *et al.*, 2012; Olasunkanmi, 2012). This could imply that artisanal fish processors were still within the active work force although some of them were ageing as they were older than 60 years. Majority (85.7%) of the fish processors were revealed to be married while 11.0% were widows. Only about 2.2% and 1.1% were divorced and single (unmarried) respectively. This is in line with the findings of Adewuyi *et al.* (2010) which reported that only about one-quarter of fish farmers in Ogun State were not married and this is an indication that marriage is a highly cherished institution in the study area and Ogun State in general. Table 2 further shows that 49.5% and 50.5% of the fish processors were Christians and

Table 2: Socio-economic characteristics of artisanal fish processors (n = 91)

Socioeconomic characteristics	Frequency	Percentage	Mean	Standard deviation
Age (Years)				
≤30	7	7.7		
31-40	14	15.4	49.90 years	12.17
41-50	28	30.8		
51-60	25	27.5		
>60	17	18.7		
Marital status				
Single	1	1.1		
Married	78	85.7		
Divorced	2	2.2		
Widowed	10	11		
Religion				
Christianity	45	49.5		
Islam	46	50.5		
Educational attainment				
No formal education	61	67		
Primary education	30	33		
Secondary education	0	0		
Household size (Persons)				
≤5	12	13.2		
6-10	60	66	8.75	1.89
11-15	15	16.5		
16-20	4	4.4		
Secondary occupation				
Garri processing	87	95.6		
Farming	4	4.4		
Fish processing experience (Years)				
11-20	24	26.4		
21-30	35	38.5	25.7 years	4.27 years
31-40	18	19.8		
41-50	8	8.8		
>50	2	2.2		
Membership of organization				
Members	34	37.4		
Non-members	57	62.7		

Source: Field survey 2014

Muslims respectively. This is an indication that the artisanal fish processors in the study area were almost equally divided into Christianity and Islam. Also, about two-thirds (67.0%) of the artisanal fish processors had no form of formal education while about one-third (33.0%) had primary education with none of the fish processors having secondary education. This implies that none of the sampled fish processors had complete basic education. Low level of education has also been previously reported among fishing communities in southwest, Nigeria (Omitoyin and Fregene, 2012) and hence explains the use of primitive means of processing. This is because educational attainment is a determinant of farmers' willingness to adopt improved technologies.

Table 2 reveals that about two-thirds (66.0%) of the artisanal fish processors had household sizes between 6 and 10 persons with about 20% having more than 10 persons per household. The mean household size of approximately 10 (8.75±1.89) persons implies that the artisanal fish processors were blessed with family labour source due to the relatively large family size. This concurs with the findings of Baruwa *et al.* (2012). In addition to fish processing 95.6% of the artisanal fish processors also process *garri* while an additional 4.4% were into farming. This implies that additional sources of income for the respondents were revenue from *garri* processing and farming. Table 2 also reveals that just about 37.4% of the artisanal fish processors were members of fish processing associations. This also explains why it may be difficult to educate fish processors in the study areas on measures to be taken in preventing occupational hazards associated with fish processing.

Table 2 further reveals that close to two-fifths (38.5%) of the fish processors had 21-30 years, more than one-quarter (26.4%) and 19.8% of the artisanal fish processors had 11-20 and 31-40 years of fish processing experience while only about 11% had over 40 years of fish processing experience. The mean fish processing experience of 25.7±4.27 years indicated that the fish processors started fish processing activities at about 25 years of age.

Fish processing characteristics of fish processors

Table 3 reveals that majority (85.7%) of the artisanal fish processors were processing fishes on daily basis. With respect to the type of smoking kiln used by the fish processors, majority (87.9%) made use of the *Agbado* type while about 39.6% used the drum type. While a significant proportion (27.5%) of the fish processors made use of both kiln type, the most commonly used smoking kiln among the fish processors remains the *Agbado* type. This implies that the primitive means of smoking is still in operation in the study area and corroborates the view of Adeokun *et al.* (2006) which characterized artisanal fishery by low technology application.

Table 3: Fish processing characteristics of fish processors (n = 91)

Fish processing characteristics	Frequency	Percentage (%)
Frequency of processing fish		
Daily	78	85.7
Twice in a week	2	2.2
Thrice a week	9	9.9
More than thrice	2	2.2
Smoking kiln		
Drum type	36	39.6
Agbado type	80	87.9
Source of labour		
Self	14	15.4
Hired	77	84.6
Family	0	0
Transportation of fish after purchase		
Immediately	82	90.1
After some time	9	9.9
Availability of clean water for processing		
Available	83	91.2
Not available	8	8.8
Disinfection of tools and equipment		
Yes	61	67
No	30	33
Fish handling		
Placed on the ground	63*	69.2
Cooled/iced	17	18.7
Degutting	80	87.9

*multiple response; Source: Field survey, 2014

Majority (84.6%) of the fish processors made used of hired labour while only 15.4% do all fish processing activities by themselves. Considering the large household size of the fish processors, one would have expected majority to make use of both self and family labour. A concrete explanation for this situation is that most youths from the study area had migrated to urban cities like Abeokuta where they ride motorcycle and carry out other economic activities. Hence, fish processing in the study area can be said to be unsustainable since the youths are not available to take up the business from the elders.

Table 3 also shows that majority (90.1%) of the artisanal fish processors do transport their fresh fishes from point of purchase from landing sites immediately. This could imply a reduced rate of contamination and thus might make fish safe for human consumption. Furthermore, Table 3 reveals that the majority (91.2%) of the artisanal fish processors had clean water available for fish processing activities. About two-third (67.0%) usually disinfect their tools and equipment. This is an indication that most of the fish processors in the study area made use of hygiene practices in their processing activities.

On fish handling, close to 70 percent of the fish processors usually place fish on the ground before it is been immediately transported to their processing "centers" while very few (18.7%) do make use of refrigerator to ice the fishes. This to a certain extent is likely to prolong the shelf life of the fishes provided there is constant electricity supply. Hence, there is the need for fish processing through the older traditional means such as sun drying, smoking and frying. As also shown in Table 3, about 87.9% of the fish processors usually practice degutting "removal of fish guts" during processing activities

Working conditions of artisanal fish processors

Table 4 shows that higher proportion of the fish processors worked very frequently with poorly designed equipment (63.7%), poorly maintained facilities (62.6%), poorly constructed equipment (53.8%), under constrained neck posture (69.2%) and with poor hand tools (47.3%). Furthermore, poor lifting technique was frequently used by close to two-thirds (65.9%) of the artisanal fish processors. In addition, higher proportions of the artisanal fish processors occasionally work under high temperature (49.5%), with unstable footwear (65.9%). This implies that the sampled fish processors work under highly hazardous conditions. These conditions might have negative implication on their health and consequently may affect their processing hours because they may take off some days or weeks to take care of their health. This in return will lead to reduced fish processing activities and contribute to postharvest losses of fish and its products.

Common occupational hazards associated with fish processing

Physical hazard: As revealed in Table 5, close to half (48.4%) of the fish processors do frequently experience heat during fish processing activities. More than half (51.6%) however, frequently experience lacerations. Also, about 38.5% of the fish processors frequently experience sparkles burn. Cut is also been experienced by another 38.5% of the artisanal fish processors. The mean values in Table 5 indicated that heat (2.23) and sparkles burn (1.60) were the most common sources of physical hazards in artisanal fish processing. This is because fish processors are usually exposed to heat over a long period of time during their processing activities. Also, if care is not taken burns can occur at times.

Table 4: Working conditions of artisanal fish processors (n=91)

Working conditions	Frequency of occurrence				Mean
	Very frequent	Frequent	Occasional	Not at all	
Wet or slippery floor	5 (5.5)	15 (16.5)	18 (19.8)	53 (58.2)	0.69
Pothole	2 (2.2)	15 (16.5)	7 (7.7)	67 (73.6)	0.47
High temperature	12 (13.2)	33 (36.3)	45 (49.5)	1 (1.10	1.62
Poorly designed equipment	58 (63.7)	17 (18.7)	12 (13.2)	4 (4.4)	2.42
Poorly maintained facilities	57 (62.6)	18 (19.8)	14 (15.4)	2 (2.2)	2.43
Poor constructed equipment(s)	49 (53.8)	24 (26.4)	17 (18.7)	1 (1.1)	2.33
Poor lifting technique	12 (13.2)	60 (65.9)	15 (16.5)	4 (4.4)	1.22
Constrained neck posture	63 (69.2)	12 (13.2)	13 (14.3)	3 (3.3)	2.48
Unstable footwear	6 (6.6)	17 (18.7)	60 (65.9)	8 (8.8)	1.87
Poor hand tools	43 (47.3)	25 (27.5)	19 (20.9)	4 (4.4)	2.18

Source: Field survey, 2014

Table 5: Occupational Hazards and Injuries common with fish processing (n = 91)

Types of hazards and injuries	Frequency of occurrence				Mean
	Very frequent	Frequent	Occasional	Not at all	
Physical Hazards					**1.12**
Heat	44 (48.4)	26 (28.6)	19 (20.9)	2 (2.2)	2.23
Cold	0 (0.0)	13 (14.3)	26 (28.6)	52 (57.2)	0.57
Cut	0 (0.0)	28 (30.8)	35 (38.5)	28 (30.8)	1
Lacerations	2 (2.2)	47 (51.6)	30 (33.0)	14 (15.4)	1.41
Blanching of the hand	14 (15.4)	8 (8.8)	12 (13.2)	57 (62.6)	0.77
Spine puncture	4 (4.4)	12 (13.2)	29 (31.9)	45 (49.5)	0.71
Pointed stick puncture	6 (6.6)	7 (7.7)	29 (31.9)	49 (53.8)	0.67
Sparkles burn	29 (31.9)	35 (38.5)	19 (20.9)	8 (8.8)	1.6
Chemical Hazards					**1.54**
Smoke	77 (84.6)	3 (3.3)	10 (11.0)	1 (1.1)	2.71
Vapour	10 (11.0)	22 (24.2)	36 (39.6)	33 (36.3)	1.21
Dust	2 (2.2)	16 (17.6)	13 (14.3)	60 (66.0)	0.56
Fumes	40 (44.0)	34 (37.4)	14 (15.4)	3 (3.3)	2.22
Mist	4 (4.4)	18 (19.8)	6 (6.6)	63 (69.3)	0.59
Gases	26 (28.6)	39 (42.9)	23 (25.3)	3 (3.3)	1.97
Biological Hazards					**0.43**
Pathogenic infestation	1 (1.1)	18 (19.8)	3 (3.3)	69 (75.8)	0.46
Parasitic infestation	1 (1.1)	16 (17.6)	1 (1.1)	73 (80.2)	0.4
Ergonomic Hazards					**1.39**
Repetitive movement	3 (3.3)	4 (4.4)	28 (30.8)	55 (60.4)	0.64
Uncomfortable posture	25 (27.5)	13 (14.3)	52 (57.2)	1 (1.1)	1.68
Poor ventilation	5 (5.5)	18 (19.8)	11 (11.0)	57 (62.6)	0.68
Prolonged standing	5 (5.5)	11 (12.1)	41 (45.1)	34 (37.4)	0.86
Prolong sitting	49 (53.8)	13 (14.3)	27 (29.7)	2 (2.2)	2.2
Pulling of load	28 (30.8)	36 (39.6)	17 (18.7)	10 (11.0)	1.9
Pushing of load	29 (31.9)	10 (11.0)	14 (15.4)	38 (41.8)	1.33
Lifting of load	31 (34.1)	21 (23.1)	33 (36.3)	5 (5.5)	1.85
Psychosocial Hazards					**1.19**
Stress	45 (49.5)	14 (15.4)	30 (33.0)	2 (2.2)	2.12
Excessive work	2 (2.2)	7 (7.7)	48 (52.7)	34 (37.4)	0.75
Discrimination	4 (4.4)	25 (27.5)	2 (2.2)	60 (66.0)	0.7

Source: Field survey, 2014

Chemical hazards: Higher proportion of the artisanal fish processors were very frequently having smoke (84.6%) and fumes (44.0%) as common chemical hazards. Also, gases were a source of chemical hazard that frequently affect 42.9% of the fish processors. Also, Table 5 reveals that 39.6% of the artisanal fish processors had vapor as a source of chemical hazard. This is because smoke, gases and vapour are usually emitted during smoking and drying of fishes. Olaoye *et al.* (2015) posited that smoke inhaled by fish processors is of serious health risks as it can cause asthma and other respiratory ailments. These chemical sources had mean values greater than 1.50 as shown in Table 5.

Biological hazards: Table 5 however shows that pathogenic and parasitic infestations were not sources of biological hazards to majority (75.8% and 80.2%) of the artisanal fish processors. The mean values shown in Table 5 also proved that both sources of biological hazards were not common among the fish processors.

Ergonomic hazards: Table 5 shows that more than half (53.8%) of the fish processors experienced prolonged sitting while undergoing their fish processing activities. Pulling of load is however frequently done by 39.6% of the artisanal fish processors. Table 5 further reveals that higher proportions of the fish processors reported to have been working under prolonged standing (45.1%) and uncomfortable postures (57.2%). The mean values in Table 5 also show that uncomfortable posture (1.68), prolonged sitting (2.20), pulling of load (1.90) and lifting of loads (1.83). Hence, uncomfortable posture, prolonged sitting, pulling and lifting of loads constitute ergonomic hazards in fish processing.

Psychosocial hazards: As regards psychosocial hazards, about half (49.5%) of the fish processors experienced stress very frequently while more than half (52.7%) also occasionally work extremely. A mean value of 2.12 shown in Table 5 reveals that stress is a major psychosocial hazard associated with artisanal fish processing. The stress must have resulted from other hazards such as prolonged sitting, pulling and pushing of loads, lacerations and sparkles burn experienced during fish processing.

Table 5 reveals that chemical hazard with mean value of 1.54 is the most common form of hazards associated with artisanal fish processors. This is because artisanal fish processors were likely to be able to prevent other forms of hazards than chemical hazards.

Effects of occupational hazards on artisanal fish processing

Table 6 reveals that rheumatism is a very frequent effect of occupational hazards experienced by 38.5% of the artisanal fish processors. Higher proportion of the fish processors also reported headache (51.6%), sneezing/coughing (41.8%), dizziness (41.8%), arthritis (37.4%), musculoskeletal problem (52.7%), skin rashes (46.2%) and carpal tunnel syndrome (42.9%) as frequently experienced effects of fish processing. Table 5 further shows that occasionally, wrist pain (50.5%), elbow pain (40.7%), neck pain (47.3%), lower backache (47.3%) and whitlow (45.1%) affected higher proportion of the artisanal fish processors with mean values greater than 1.50.

Table 6: Effect of occupational hazards on fish processing (n = 91)

Effects of occupational hazards in fish processing	Frequency of occurrence				Mean
	Very frequent	Frequent	Occasional	Not at all	
Headache	0 (0.0)*	47 (51.6)	33 (36.3)	11 (12.1)	1.4
Sneezing/coughing	15 (16.5)	38 (41.8)	30 (33.0)	8 (8.8)	1.66
Dizziness	26 (28.6)	38 (41.8)	24 (26.4)	3 (3.3)	1.96
Arthritis	31 (34.1)	34 (37.4)	18 (19.8)	8 (8.8)	1.97
Musculoskeletal problem	21 (23.1)	48 (52.7)	21 (23.1)	1 (1.1)	1.98
Skin rashes	20 (22.0)	42 (46.2)	21 (23.1)	8 (8.8)	1.81
Eye disturbance	10 (11.0)	16 (17.6)	37 (40.7)	28 (30.8)	1.09
Allergies	1 (1.1)	16 (17.6)	6 (6.6)	68 (74.7)	0.45
Wrist pain	10 (11.0)	25 (27.5)	46 (50.5)	10 (11.0)	1.38
Elbow pain	14 (15.4)	29 (31.9)	37 (40.7)	11 (12.1)	1.51
Neck pain	1 (1.1)	26 (28.6)	43 (47.3)	21 (23.1)	1.08
Lower backache	3 (3.3)	24 (26.4)	43 (47.3)	21 (23.1)	1.1
Carpal tunnel syndrome	34 (37.4)	39 (42.9)	14 (15.4)	4 (4.4)	2.13
Sprain	5 (5.5)	4 (4.4)	37 (40.7)	45 (49.5)	0.66
Fracture	1 (1.1)	16 (17.6)	3 (3.3)	71 (78.1)	0.42
Whitlow	15 (16.5)	26 (28.6)	41 (45.1)	9 (9.9)	1.52
Rheumatism	35 (38.5)	26 (28.6)	20 (22.0)	10 (11.0)	1.95

*figures in parentheses () are expressed in percentages.

Table 7: Test of association between types of occupational hazards and the effect on fish processors

Variable	χ^2	df	p-valve	Decision
Type of occupational hazards and effect of hazards	15.581**	5	0	Significant

Table 6 reveals that sneezing, dizziness, arthritis, musculoskeletal problem, skin rashes, elbow pain, carpal tunnel syndrome, whitlow and rheumatism were major effects of artisanal fish processing in the study area. El-Saadawy *et al.* (2014) also reported that musculoskeletal complaints were common among the fishermen in Alexandria city. These are serious health issues that can easily limit the fish processors' processing ability if prompt attention is not paid to reducing these effects.

Association between the types of occupational hazards and the effects on fish processors

Result in Table 7 indicates that a significant association existed between the types of hazards experienced by the fish processors and the effect of occupational hazards on the fish processors (χ^2 = 15.581, df = 5, p<0.01). This implies that the different types of occupational hazards will affect the fish processors differently. That is, chemical hazards for instance will affect the fish processors more negatively than biological hazards since chemical hazards from smoke, fumes and gases are more frequently experienced than other types of hazards which occur less frequently.

CONCLUSION AND RECOMMENDATIONS

The study found that majority of the artisanal fish processors were older than 40 years of age, had low level of education, and had large family sizes; substantial years of fish processing experience and were non-members of fish processing associations. It could also be concluded that the fish processors work under poor working conditions with the use of primitive facilities. The poor working conditions and use of primitive tools and equipment made fish processing hazardous to the artisanal fish processors. Furthermore, of the different types of occupational hazards in fish processing, chemical hazards seem to be more felt by the fish processors. From the tested hypothesis, it could also be concluded that specific types of occupational hazards are more common and have more negative effects on the health of the fish processors.

It is therefore recommended that financial assistance should be provided to artisanal fish processors in the study area. This will enable them to make use of improved fish processing equipment and tools. This also has the tendency to make them work under improved conditions in order to be able to reduce the hazards that are inherent in fish processing. Sensitization and training programmes on the use of safety materials such as wearing of boots, hand gloves and nose guards is also recommended based on the outcome of this study. This could be easily achieved if the fish processors are in groups, hence, the study also recommended that fish processors should form organize themselves into groups in their different fishing communities.

REFERENCES

Adeokun, O. A., Adereti, F. O. and Opele, A. I. (2006). Factors influencing the adoption of fisheries innovations by artisanal fishermen in coastal areas of Ogun State, Nigeria. *Journal of Applied Science Research, 2*(11): 966-971.

Adewuyi, S. A., Phillip, B. B., Ayinde, I. A. and Akerele, D. (2010). Analysis of profitability of fish farming in Ogun State, Nigeria. *Journal of Human Ecology, 31*(3): 179-184.

Baruwa, O. I., Tijani, A. A. and Adejobi, A. O. (2012). Profitability and constraints to fishery enterprises: A case of artisanal and aquaculture fisheries in Lagos State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment, 8*(1): 52-58.

El-Saadawy, M. E., Soliman, N. E., El-Tayeb, I. M., Hammouda, M. A. (2014). Some occupational health hazards among fishermen in Alexandria city. *Gaziantep Medical Journal, 20*(1): 71-78.

Federal Department of Fisheries – FDF. (2007). *Fishery statistics of Nigeria (4th edition).* Federal Department of Fisheries. 49Pp.

Kolawole, O. D. (2001). Local knowledge utilization and sustainable rural development in the 21st century. *Indigenous Knowledge Development Monitor, 9*(3): 13-15.

Nag, P. K. and Nag, A. (2007). Hazards and health complaints associated with fish processing activities in India—Evaluation of a low-cost intervention. *International Journal of Industrial Ergonomics, 37* (2): 125–132.

National population Commission – NPC. (2006). *Population census of the Federal Republic of Nigeria*. Analytical report at the national Population Commission, Abuja, Nigeria.

Obasohan, E., Emmanuel, O., Edward, E. and Oronsaye, J. A. O. (2012). A survey on the processing and distribution of smoked catfishes (*Hetrobranchus and Clarias spp.*) in Ekpoma, Edo State, Nigeria. *Research Journal of Recent Sciences, 1*(8): 23-28.

Ohen, S. B. and Abang, S. O. (2007). Economics of catfish farming in Rivers State, Nigeria. *Academic Journal of plant Science, 2:* 56-59.

Olaoye, O. J., Odebiyi, O. C. and Abimbola, O. T. (2015). Occupational hazards and injuries associated with fish processing in Nigeria. *Journal of Aquatic Science, 3*(1): 1-5.

Olasunkanmi, J. B. (2012). Economic analysis of fish farming in Osun State, South-western, Nigeria. *IIFET 2012 Tanzania Proceedings.*

Omitoyin, S. A. and Fregene, B. T. (2012). Potential impacts of climate change on livelihood and food security of artisanal fisher folks in Lagos State, Nigeria. *Journal of Agricultural Science, 4*(9): 20-30.

Thompson, O. A. and Mafimisebi, T. E. (2014). Profitability of Selected Ventures in Catfish Aquaculture in Ondo State, Nigeria. *Fisheries and Aquaculture Journal, 5*(2): 90-96.

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