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Analysis of Occupational Hazard of Fish Smoking Among Fisher-Folks in Coastal Areas of Ondo State, Nigeria

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Abstract— *The study analyzed the occupational health hazards of fish smoking among fisher-folks in the coastal areas of Ondo State, Nigeria and further proffered strategies for their management and control. Fish smoking combines the effects of drying, heating, and smoking coupled with salting. The pre-treatment involves gutting, splitting and smoking using firewood. Smoking is the oldest, convectional and most common methods used where the heat from the fire dries the fish while chemicals from the smoke impregnate the flesh. Simple random sampling technique was used in the selection of 120 fisher-folks as sample size. Descriptive statistics were used for the objectives while Pearson Product Moment Correlation was used to test the hypotheses. Fish processing, the activities associated with fish and fish products between the time fish were caught or harvested, and the time the final product is delivered to the customer is fraught with potential hazards and risks which are categorized into occupational, environmental, food safety and public health. In the study area, it was observed that female dominated the processing sector (70%) and majority are married and educated up to secondary level. They have spent 5-10 years in the fish smoking business. Results of correlation showed that positive and significant relationship existed between occupational health hazards and income loss. Major occupational hazards recorded in the study areas are; redness and swelling of the eyes which is the commonest, chronic obstructive respiratory diseases, stress related health problems sting from fish spines, knife cuts, snake bites 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). Fish smoking also has some challenges. Fish industry stakeholders should therefore ensure that guidelines and policies which promote an environmentally friendly and sustainable industry are instituted and enforced.*

Keywords— Occupational hazards, fish smoking, fisher-folks, Coastal areas, Ondo-State, Nigeria.

I. INTRODUCTION

Fish is an important source of protein, fish protein compare favorably with milk, eggs and meat in its amino acid composition and contain high levels of lysine and methionine both of which are lacking in tuber-based or cereal-based diet. This makes fish protein the cheapest of protein source in many countries where the staple diet consists of starchy foods like cassava, yam, rice, millet and sorghum. The increase in the World population has resulted in a significant increase in the need for animal protein. This is particularly important in developing countries such as Nigeria, Kenya, Ghana and other African and some Asian countries where the demand for animal protein far exceeds the supply. Fisheries may involve captured of wild fish or raising fish through fish farming or aquaculture. A varieties of method are used in this harvest, ranging from the hook and line by the small time fishers to the use of mechanized seines using big vessels like purse seiners, long liners, driftnets and other nets, captured fisheries can be broadly classified as industrial/commercial scale, small scale or artisanal, and recreational.

Close to 90% of the world's fishery catches come from oceans and seas, as opposed in inland waters (Omotayo *et al.,* 2006). Fishing is done on a continuous basis in coastal communities in Nigeria with a bumper harvest mostly during dry seasons Fish is highly perishable due to its high moisture content. Fish harvested from its natural environment is highly susceptible to deterioration without any preservation or processing measures (Okonta and Ekelemu, 2005). Immediately fish dies a number of physiological and microbial deterioration sets in and thereby degrades quality of fish which makes post-harvest losses to be high. Spoilage of fish occurs as a result of degradation of the tissue which is brought about by both endogenous enzyme and micro-organisms which are present

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on the surface of the skin, gills and the intestine. Spoilage of fish is more rapid than that of beef and pork meat due to the high load of bacteria in gills, skin and viscera part. Fish processing involve all activities associated with fish and fish products between the time fish are caught or harvested, and the time the final product is delivered to the consumer. A central concern of fish processing is to prevent fish from deteriorating (even when excess fish are caught in times of abundance "Peak Period"), and this remains an underlying concern during other processing operations. Fish processing highly involves very strict controls and measurements in order to ensure that all processing stages have been carried out hygienically. The commonest method of fish processing and preservation in Nigeria is the traditional smoking and drying. Fish in these rural coastal communities cannot be preserved by modern method of preservation such as canning and freezing because of unavailability of electric power supply. (Agbebi, 2008). Fish smoking has subsequently become a very popular method for preserving fish and is now practiced in all regions of the world. Fish smoking combines the effects of drying, heating, and smoking; coupled sometimes with salting.

The pretreatment involves gutting, splitting, salting, brining, cutting into chunks in case of very big fish and/or drying depending on the species, size, market trend, and or traditional considerations and smoking method. A combined heating/drying/smoking process entails application of smoke using suitable firewood; passing it over fish in a closed chamber at temperatures of about 65-120°C Fish smoking is traditionally performed in a thatched hut, in which a raised platform with bamboo mats are spread across, hot smoking is traditionally more practiced in coastal areas of African countries. According to (Agbebi, 2008), other materials that are used for smoking in these areas include saw-dust briquette, coconut husk and sugar cane. Phenolic compounds, acid and carbonyl present in wood smoke are believed to be responsible for this desired change (Price, 1997). The smoked fish are then packed and sent to the market for selling. Fish is smoked until the attainment of right color, texture and flavor as judged by the processors. Frying is another means of processing fish and is the act of introducing fish into hot oil to cook and remove its water content. Frying is mainly used to alter the taste and eating quality of fish. It also has a preservative effect as the heat destroys micro-organisms and enzymes and the surface of the fish dried out. Sun-drying is another popular way of processing fish in Nigeria and it involves the use of solar energy (sun), drying decreases the water activity level of the fish to minimize microbial growth, Drying processes can range from solar drying to temperature - and humidity - controlled drying rooms.

Dried fish typically has a moisture content of between 38 and 48 percent, depending on the product (FAO, 2012). All these methods do not include technologies which are more appropriate for capital – intensive medium and large-scale processing plants. Artisanal fisheries in Nigeria suffers high post harvest fish losses due to poor processing methods and lack of refrigeration facilities, poor rural infrastructure particularly, health water and sanitation facilities. All these constituted major occupational health hazards and they are detrimental to the growth and development of artisanal fish production in Nigeria. Summarily, occupational health hazards contribute to low level of artisanal fish production in Nigeria, it is therefore necessary to estimate the extent of economic days lost to fisher-folks due to injuries as this determines their productivity, output and household income. In view of this background, there is need therefore to analyze the occupational hazard of fish smoking among fisher-folks in the coastal areas of Ondo state, Nigeria

Specific objectives

1. To determine the socio-economic status of the respondents
2. Determine the income generated from their fish smoking business
3. Examine the connection between occupational hazards, labor loss and income generation.
4. Make recommendation based on the findings of the study.

Hypothesis

I. H_O There is no significant relationship between the socio-economic characteristics of the respondents and income loss

II. H_O There is no significant relationship between occupation hazard and loss of income

II. METHODOLOGY

Study area

The coastal area of Ondo state is been habited by Ilaje people. The Local Government area was carved out of the former Ilaje/EseOdo LGA on 1st October 1996. The total land area of the LGA is 2,300 square kilometres. It lies within 5°45′ - 6°15′ N and 4°30′ - 5°00′ E while the headquarters is located at Igbokoda town. The major tribe is Ilaje while the dominant occupation of the people is fishing and major festivals are Malokun and Ere. There are two dominant kingdoms namely the Mahin and the Ugbo kingdoms with minor kingdoms as Aheri and Etikan. Major settlements include Igbokoda, Ode-Ugbo, Ugbonla, Ayetoro, Ode-Mahin and Ode-Etikan. The study area as shown in figure 1 is bounded in the North by Okitipupa Local Government, in the East by Ese Odo Local

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Government, in the West by Ogun State and in the South by Atlantic Ocean. The area is characterized by a vegetation of white mangrove *Aucennia africana* and *Paspalum vaginatom*. Most of the flood plains of the lagoon are covered by *Typha avstrslis*, *Eichilochola* sp *and Eichhornia crassipes (*water hyacinth). (Akegbejo-Samson, 1995). The major means of transportation in the study area are motorized canoes, speed boats and paddled canoes. Most of the houses in the area are built on elevated platforms above water level. The Ilajes are one of the most dynamic and enterprising people in Nigeria. Their aquatic skill, coupled with their ability to adapt enabled them to conquer their harsh geographical environment and turn it to their advantage. Ayetoro for example in its hey-days had the highest per capita income in the whole of Africa due to its early discovery of crude petroleum, and attracted visitors, tourists and researchers from all over the world.

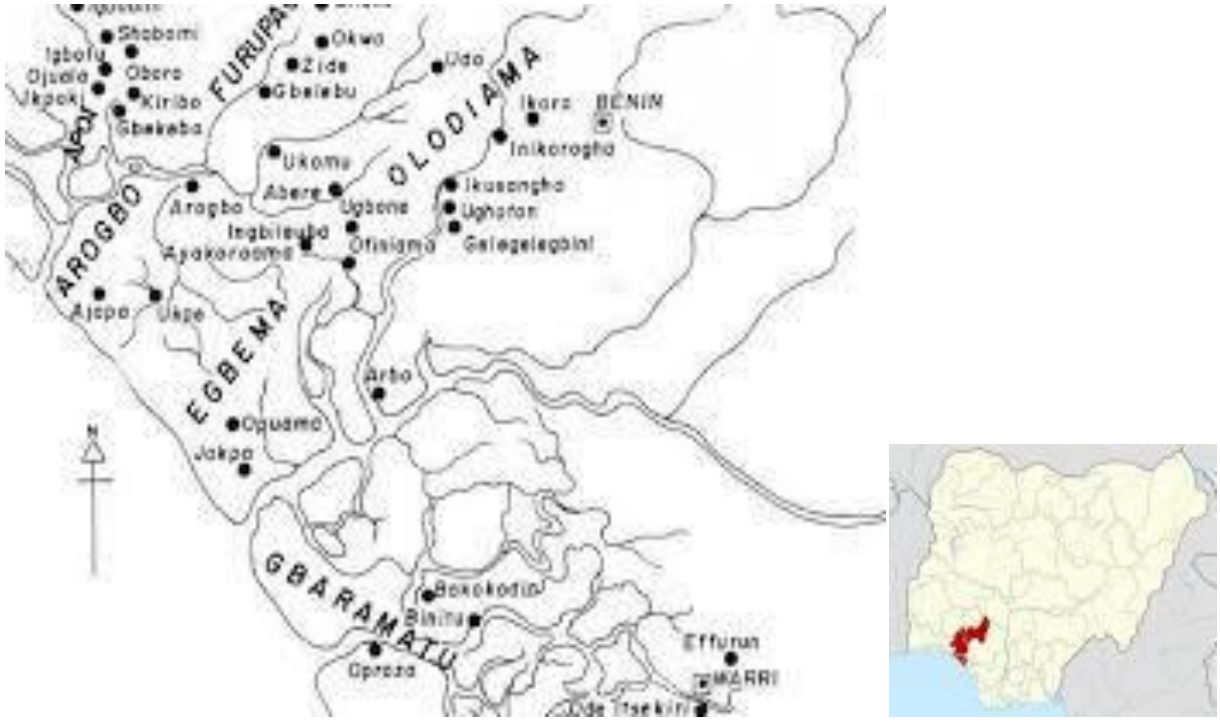

Fig.1: Map of study area

Sampling technique and sample size

Five (5) fishing villages namely; Abereke, Ayetoro, Araromi, Ugbo-nla and Ilepete were purposely selected for the study based on their intensity in processing and marketing of fishery products. Twenty five (25) respondents who are actively involved in processing were randomly selected from each village making a total of 125 respondents in all. Descriptive statistics were used for the objectives while Pearson Product Moment Correlation was used to test the hypotheses.

III. RESULTS

Table.1: Socio-economic status of respondents (n=125)

Variables	Number of respondents	Percentage Frequency
Age		
11-20	15	60
21-30	30	24
31-40	45	36
41-50	20	16
51-60	15	12
Gender		
Male	25	20
Female	100	80
Marital status		
Single	15	12
Married	75	60
Divorced	17	13.6
Widowed	18	14.4
Educational level		
No formal education	20	16.6
Adult literacy school	5	4

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Primary education	80	64
Secondary education	20	16
Household size		
0-5	15	12
6-10	63	50.4
11-15	25	20
16-20	22	17.6
Level of experience (yrs)		
0-5	10	8
6-10	70	56
11-15	35	28
>15	10	8
Average income in a month (₦)		
50,000 - 60,000	60	48
61,000 – 70,000	23	18.4
71,000 – 80,000	12	9.6
81,000 – 90,000	13	10.4
91,000 – 100,000	10	8
Above 100,000	7	5.6

From Table 1 above, the belief that the age of an individual affects his/her mental attitude to risk taking and new ideas, risk aversion is said to increase with age. 45% of the respondents are between the ages of 31-40years. These fisher-folks are at their active age and they have high mental alertness and physical stability. Fisher-folks in this category are within the economically active population and therefore constitute a good labor force for fishery enterprise with the expectation that they would be good managers of limited available resources and can withstand rigors associated with the fishing activities. Majority (80%) of the respondents were female while male were just 20%. This is an indication that the processing and marketing sector of the artisanal fisheries is been dominated by female. This is in agreement with Agbebi and Fagbote, 2012. Most (64%) of the respondents had primary school education while 16% had tertiary education. However, 6.6% of the respondents did not have any formal education. This indicates that the fisher-folks are semi-literate which in turn may affect the rate of adoption of innovations in the study area as educational level is a very important determinant in adoption of innovation. The high percentage of married women (60%) among the respondents is an indication that the women are permanent settlers in the area, all their activities revolve around the community and migration is a very rare occurrence among them.

Majority of the respondents (50.4%) had large household size of between 6-10 people. This is consistence to the fact that majority of the fishing families are polygamous and this translates to higher responsibilities and lots of pressure on the finances of the family as against the earlier belief of cheap or un-remunerated family labor. 56% of the fisher-folks had 6-10 years experience in fish smoking. This implies that fish smoking is not a new means of livelihood to the people in the study area. 48% of the respondents had an average monthly income of N50, 000 – N60, 000. This implies that the respondents are living slightly above poverty level and cannot afford to be away from their job due to occupational hazards.

Table.2: Occupational hazards experienced by the respondents in the study area

Types of hazards	Hazards	Effects
Physical	Minor cuts, scraps, fall injury, sting from fish spines	This injury is simple and mostly non-fatal. When they occur, they do not lead to prolonged loss of work. Improper treatment of cut and scrapes areas open a gateway to many viruses, diseases, infections and whitlow.
	Exposure to heat and cold	This leads to increase in body temperature and headache. Also low temperature of work environment causes frequent respiratory irritation (frequent sneezing and/or coughing, Numbness of fingers and toes, blanching of fingers, shock

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	Eye hazard and injury Burns injury, Fall injury (Sprain and fracture) Excessive noise and vibration Snake bite	Eye redness or blood shoot eyes due to direct smoke contact during smoking sometimes causes itching, mucus discharge, pain, or vision problem (blurred vision). This affects the epidermal tissue of the skin This can cause temporary or permanent hearing damage depending on noise level and how long people are exposed to the noise, daily and the number of years. Bite from venomous snake can be deadly
Biological	Leeches and parthogens, nematodes, cestodes and other parasites	All these has adverse effects on humans
Chemical	Smoke from firewood	This can cause asthma and other respiratory ailments. Also workers were exposed to smoke particles that contain carcinogens such as polycyclic aromatic hydrocarbons (PAHs).
Ergonomic	Internal injuries, broken bone or dislocation, back sprain or strain	pain and tenderness, difficult in moving and breathing, swelling or bruising and also discoloration of the skin, muscle cramping or spasm
Psychosocial	Work-related stress included excessive working time and over work. Bullying, which may include emotional and verbal abuse , mental demand	loss of appetite, disturbed sleep, constantly sulking, fatigue (muscle fatigue) or loss of energy; indecisiveness and poor concentration

Table.3: Occupational health hazard and income loss of the respondents (n= 125)

Hazard	Frequency	Percentage (%)	Estimate amount loss (₦) per month
Excessive Exposure to heat and cold	123	98.4	15,000
Burns	90	72	18,000
Smoke inhalation	120	96	20,000
Stings and bites	80	64	13,000
Cuts and wounds	100	80	10,000
Broken bone or dislocation	60	48	10,000
Back sprain or strain	115	92	19,000
Eye problem	90	72	15,000
Whitlow	40	32	8,000
Diarrhea	30	24	5,000

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Health is an important indicator explaining an individual's productivity, and good health reduces morbidity, increases longevity, and decreases sickness absence, resulting in a longer career. Poor health, on the other hand, can affect individual and social welfare by reducing earning capacity and hours worked, especially for informal workers in low- and middle-income countries. Some previous research quantified the losses from poor health, and others showed that an individual's level of skills is determined by his/her innate ability and investment in human capital (education and training), which is a function of marginal rate of return and marginal cost of financing. Such studies suggest that individuals suffering from illness may be frail, not capable of working and generally unable to support the livelihood of their children and other dependants. Consequently, a high disease burden may have an adverse impact on a country's productivity, growth, and ultimately, economic development.

An individual with good health is able to increase his/her output, which can be translated into increases in labor productivity and standard of living. The result in the study area showed that all the fisher-folks were affected by occupational hazard in one way or the other ranging from excessive exposure to heat and cold (98.4%), burns (72%), smoke inhalation (96%), cuts and wounds (80%), back sprain or strain (92%) and so on. As shown in Table 3, as a result of these hazards and subsequent breakdown, a lot of substantial amount were lost ranging from N5, 000 – N20, 000 depending on the type of injury and the days lost to the injury. An estimate of these values was given by the respondents.

Test of Hypothesis 1

Table.4: Pearson Product-Moment Correlation for Socio-economic Characteristics and Income Loss

Variable	r value	p value	Remarks
Age	0.657	0.039	Significant
Household size	-0.203	0.574	Not significant
Years of experience	-0.297	0.404	Not significant

The result of the Pearson Product-Moment Correlation is presented on Table 4. The null hypothesis which stated that there was no significant relationship between socio-economic characteristics and income loss was rejected at 5% significance level for age with r value of 0.657 and p value of 0.039. The alternative hypothesis was therefore accepted that significant relationship exist between age of the fisher-folks and income loss.

In contrast, household size and years of fishing experience had no significant relationship with income loss with r-value of 0.203(p=0.574) and 0.297(p=0.404), respectively at 5% level of significance. Therefore, the null hypothesis was accepted implying that there is no significant relationship between these variables and income loss.

Test of Hypothesis 2

The hypothesis that there is no significant relationship between health hazards and income loss was also subjected to Pearson Product Moment Correlation. The result of the analysis shows r value of 0.842 and p value of 0.02. Therefore, the null hypothesis is also rejected. This implies that there is significant relationship between health hazards and income loss.

IV. CONCLUSION AND RECOMMENDATION

Hazards and risks have the potential of affecting people and all human activities have this inherent capacity. Ill health, in addition to productivity loss, can cause large levels of out-of- pocket healthcare expenditure, which reduces current and accumulated household savings and pushes individuals into impoverishment and poverty. The physical, chemical, biological and psychological hazards in fish smoking sector were identified. Skin rashes, eye problem, back ache, asthma and allergies are some of the common work related hazards in the study area. These occupational hazards in the area contributed significantly to the occurrence of work related diseases and significant income loss mainly due to the valuable time lost to sicknesses. It is therefore recommended that Government should provide more functional and fully equipped health care facilities to cater for the people. Also the extension workers should educate the people more on safety precautions to take to reduce to the minimum these occupational hazards.

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