

Research Article

Assessment of Health Conditions of the Fish Handlers in the Two Fishing Communities of the Gambia

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Abstract

Introduction: Because of their jobs and work conditions, fish handlers are susceptible to several health problems. This study aimed to assess various health challenges faced by fish handlers in the Gambia. **Methodology:** This was a cross-sectional study in which 231 fish handlers were selected randomly from Tanji and Banjul fishing communities in the Gambia. Data on the various health problems common among them were gathered through focus group discussions and interviewer-administered questionnaires, and COHgb monitoring was done with a Rad 57 CO-oximeter. They were analyzed using the Statistical Package for Social Sciences (SPSS 20.0). Descriptive statistics were used to summarize the data, and an analytical statistical test was used to test for association using the chi-square at a 95% significance level. **Results:** The commonest health symptoms reported by the respondents in Tanji and Banjul were headache (85.7% and 81.8%); dizziness (74.7% and 61.0%); abdominal pain (51.3% and 80.5%); common cold (59.1% and 80.5%); tightness or discomfort in the chest (58.4% and 57.1%), eye irritation (49.4% and 57.1%). The commonest perceived factors reported in Tanji and Banjul were lack of sleep (72.7% and 59.7%); heavy smoke from boat engines (72.1% and 70.1%); poor diet (57.8% and 58.4%); Capsizing (68.85 and 51.9%); fish scaling process (72.1% and 70.1%) and Ergonomic (57.8% and 58.4%). Chi-square analysis revealed that the COHgb values of smoking and non-smoking fish smokers, fish traders, and fish dryers were not significantly different between Tanji and Banjul. However, the comparison of COHgb values of non-smoking fishermen in Tanji and Banjul was significant. **Conclusion:** findings from the study revealed several health issues facing fish handlers that need to be tackled. Therefore, the use of safety measures and periodic medical examinations should be encouraged among fish handlers.

Keywords

Assessment, Health Conditions, Fish Handlers, Fishing, The Gambia

1. Introduction

Fish handlers are exposed to lots of health problems. Findings on the occupational problems among fishermen revealed that "77 percent of the fishermen had too much sun exposure, 52 percent had back pain, and 38 percent had cramps and other work-related health concerns" [1]. Micro-

nutrient deficiency, such as Vitamin-A deficiency, is prevalent among various fishing communities [2]. Many known factors that affect the fishermen are physical, chemical, psycho-social, and mechanical [3].

Shibaji *et al.* [4] revealed that Bangladesh fishermen face a

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lot of natural hazards during fishing, such as cyclones, especially during the rainy season. In addition, they also encounter storms and sometimes heavy rainfall, which can interfere with their jobs, thereby exposing them to danger. Fishermen face more risks during the rainy season compared to the winter season. In the same study, about 56% of fishermen reported severe cyclonic events during fishing, while 22% reported sudden ocean storms. Also, they face a lot of physical hazards during and after fishing. Concerning Physical hazards during fishing, 75% of the total fishermen reported dizziness, 70% felt like vomiting, 55% reported fever; 33% faced acidity problems, 25% of the total fishermen suffered abdominal pain, 30% faced diarrhea and 10% felt the dehydration problem. After fishing, almost 90% of the fishermen experienced eye problems, often as a result of salt water and raindrops, such as redness of the eye, irritation, watering, sensitivity, visual impairment, reduced vision, and in most cases, cataracts. Also, eighty-five percent of the fishermen experienced dizziness while eighty-eight percent felt vomiting tendency 1 or 2 days after arriving from the sea.

Fishermen had a higher incidence of numerous health dangers than other fish handlers," according to the research. Several, (75%) had repetitive motion issues, few (37%) had severe stress; the majority (80%) of the fishermen were exposed to accidents during their work, 55% of them reported injuries, 25% had hearing issues and few (45%) of them had sunstroke". Long working durations and spending many years smoking fish can harm the health of women processors. Salvi and Brashier [5] revealed that smoke was a contributing factor to several respiratory conditions. It has been found that women fish smokers are more prone to developing Chronic Obstructive Pulmonary Disease (COPD) than non-fish smokers. [6]. Similarly, [7] 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. [8]. 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 CO poisoning reduces the amount of oxygen transported by the blood to tissues over time by forming carboxyhemoglobin.

Possible problems with sun drying include; lack of control over drying times, exposure to attack by insects or vermin, the likelihood of contaminants such as sand and dirt, loss of quality due to the contaminants, low protein, and discoloring due to exposure to the sun. There are many risks that fish dryers face, including cuts, stings from fish spines, and sprains [9]. Other hazards include the following: Damage to the Eyes, heat exhaustion, heat stroke, sunburn, Rash from the

heat, skin cancer, skin wrinkles/ aging [3, 9-15]

Findings from the study by [16] revealed that the majority of fish traders spent a lot of time sitting down (67.1%), working in a noisy setting (58.4%), selling in the rain (44.3%), selling under the sun (52.3%), and sitting in poor posture (36.2%). It was concluded that quite a large number of fish marketers were subjected to occupational risks, which were mostly caused by respiratory system irritation, body odor, stress, back discomfort, headaches, sun exposure, heat exposure, rashes on the skin, and skin irritations. It demonstrates that most fish traders (72.5%) always suffered from back pain. The majority (69.8%) reported having headaches all the time, whereas 48.3% always had colds and 45% always experienced sunlight. Additionally, 74.5% consistently experienced tension, 60.4% consistently experienced skin rashes, and 64.4% consistently had body odor. The majority of the frozen fish merchants also occasionally reported experiencing skin irritation (51%), whitlow (75.2%), and cuts from sharp items (80.5%). According to the mean values, stress ($x = 1.750.44$), back discomfort ($x = 1.720.45$), skin rashes ($x = 1.520.65$), and body odor ($x = 1.520.73$) were the hazards that were most commonly experienced. Also, according to [17], in addition to having slimy and damp floors, foul smells, deposits of fish waste, poor drainage, a high mosquito population, and stray animals like dogs, fish markets are typically dirty and unclean.

Conducted a study on the hygienic practices of fish market vendors in south-central Bangladesh and found several health issues among them [18]. These consist of;

Cough as a result of constant use of water and melting of ice, Common Cold, Diarrhea due to a lack of proper hand washing with soap and water, Lesions on different parts of the body, such as on hands, were common among the fish retailers, affecting about 57%. Because of the increased humidity and damp weather, that occurs in the rainy season, these lesions were worsened by secondary infection through the fungus., at the ends of the fingers, Lesions between fingers, Lesions between toes: Approximately 23% of fish sellers, according to the research, had lesions between their toes due to the unhygienic condition of the environment and improper management of waste water, Lesions on the nail and tip of toes: Findings from [18] showed that about 13% of fish retailers had a lesion at the ends of the toes and the nail as a result of bacterial infection from waste water. And skin diseases on legs: [18] revealed that about 10% of the fish retailers had diseases on their legs. This disease occurred as a result of a wet condition, leading to a fungal infection. Damages to the skin of the legs were also observed, which eventually turned into a whitish and blackish color.

2. Methods

2.1. Study Area

The Gambia is a country in West Africa that is largely

surrounded by Senegal, with a small stretch of coastline that runs along the Atlantic Ocean on its western end. The Gambia is located on both sides of the Gambia River, which runs through the country's center and drains into the Atlantic Ocean. Its area is 11,300 square kilometers with a population of 2,321,123 million according to the World Population Prospects. Banjul is the capital of Gambia, and Serekunda and Brikama are the two major cities.

The research was conducted in Tanji, which is a town in The Gambia, along the Atlantic coast and is the most populated district in the Local Gambia Authority (with 14,531 inhabitants based on the 2013 Census. 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. It is also known as the Tanji Fishing Village. Tanji lies 30 kilometers from Banjul, the capital city, and 12 kilometers southwest of Kololi resort, on the Kombo Coastal Road.

Banjul, which is the capital city of the Gambia, was originally called Bathurst and has a population of 31,301. 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) [19].

2.2. Study Design

A cross-sectional study was conducted. Data was collected among fish handlers (both male and female) in the selected communities. One hundred and fifty-four respondents were randomly selected from Tanji and seventy-seven from Banjul.

2.3. Data Collection Methods

Data were collected using Focus group discussion and a semi-structured interviewer-administered questionnaire. The FGD guide was developed and suggestions from the participants on the Perception of factors affecting their health and safety were also noted during the discussion. Findings from the FGD contributed to the information that was presented in the final report. A semi-structured interviewer-administered questionnaire was also used to collect data on the sociodemographic information of the respondents. Research assistants were trained to collect the data from selected fish handlers within the community through interviews. The interview was conducted in Mandinka, Serere, and Wolof as these are the major languages of the fish handlers in the study site. The researcher supervised the data collection. Before the commencement of the questionnaire administration, permission was first sought from the two fishing community leaders and then from the leaders of each fish handler (fishermen, fish smokers, fish dryers, and fish traders). These group leaders helped to mobilize their members.

2.4. Carboxyhaemoglobin (COHgb) Monitoring

COHgb monitoring was done with a Rad 57 CO-oximeter. The CO-oximeter is a non-invasive instrument, and when placed on the finger of the research subject, it uses different wavelengths of infrared light to record levels of oxyhemoglobin and carboxyhemoglobin in the bloodstream. The co-oximeter sensor was placed on the finger, and after 60-90 seconds, the percentage CO saturation was obtained and recorded.

The following guidelines were used as a baseline for detecting SpCO levels:

Non-Smoker: <3% Normal

Smoker: $\leq 12\%$ Normal

(Miller and Jehn 2004)

2.5. Data Analysis

A survey questionnaire was cross-checked to ensure they were properly filled and accurate. Data were analyzed using SPSS software version 22 and Stata13.0. Descriptive statistics were used to summarize the data. The t-test was used to compare the mean values of the parameters among the two communities.

3. Results

3.1. Sociodemographic Features of the Respondents

The sociodemographic information is displayed in Table 1. Interviews were conducted with 154 and 77 fish handlers in Tanji and Banjul, respectively. In Tanji, the average age of fish handlers was 34.2 ± 10.7 years, whereas in Banjul, it was 35.86 ± 10.86 years. In Tanji and Banjul, the majority were male (75.1%) and 92.2%, respectively, with 64.9% and 71.4% of the population being married. Fish handlers in EG and CG included fishermen (56.5% and 80.5%), fish dryers (5.8% and 2.6%), fish smokers (27.9% and 11.7%), and fish brokers (9.7% and 5.2%). While 37.7% of respondents in Banjul were Wolof, several respondents in Tanji (37.0%) were Mandinka. In Tanji and Banjul, respectively, the majority of fish handlers had an informal education, or madrasa, accounting for 31.2% and 35.1% of the total. The monthly income for 60.3% (Tanji) and 71.4% (Banjul) was between D1000 and D10,000 Dalasis (Gambian Currency). More over half said they don't smoke cigarettes: 62.3% in Tanji and 55.8% in Banjul. According to the chi-square analysis, there was no discernible difference between Tanji and Banjul in terms of age groups, marital status, or cigarette smoking status. But there was a big disparity between Tanji and Banjul in terms of respondents' sex, ethnicity, income, and educational attainment.

Table 1. Baseline Socio-demographic features of the fish handlers (N=231) in the study.

Demographic Characteristics	Baseline (N=231)		Statistical Test	P-Value
	Tanji (n=154) No. (%)	Banjul (n=77) No. (%)		
Age Group				
≤ 24	31(20.1)	13 (16.9)	χ^2	0.836
25-42	91(59.1)	47 (61.0)		
43-66	32(20.8)	17(22.1)		
Mean age	34.2±10.7	35.8±10.8		
Sex				
Male	116(75.1)	71(92.2)	χ^2	0.002*
Female	38(24.7)	6(7.8)		
Marital Status				
Single	50(32.5)	22(28.6)	†	0.352
Married	100(64.9)	55(71.4)		
Widow	4(2.6)	0(0.0)		
Status				
Fishermen	87(56.5)	62(80.5)	†	0.004*
Fish dryers	9(5.8)	2(2.6)		
Fish smokers	43(27.9)	9 (11.7)		
Fish traders	15(9.7)	4(5.2)		
Ethnicity				
Mandinka	57(37.0)	17(22.1)	†	0.011*
Fula	15(9.7)	8(10.4)		
Wolof	41(26.6)	29(37.7)		
Jola	13(8.4)	1(1.3)		
Serere	28(18.2)	22(28.6)		
Educational Status				
Primary	50(32.5)	10(13.0)	χ^2	0.013*
Secondary	39(25.3)	27(35.1)		
Tertiary	17(11.0)	13(16.9)		
Madarasa	48(31.2)	27(35.1)		
Income Level				
<D1000	51(33.1)	1(1.3)	†	0.000*
D1000 -D10000	93(60.3)	55(71.4)		
D11000-20000	10(6.5)	12(15.6)		
>D20000	0(0.0)	9(11.7)		
Smoking Status				
Yes	58(37.7)	34(44.2)	χ^2	0.342
No	96(62.3)	43(55.8)		

Demographic Characteristics	Baseline (N=231)	Statistical Test	P-Value
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* =Statistical significance at $p < 0.05$

†Fisher's exact test

χ^2 = pearson chi-square

3.2. Health Symptoms Experienced by the Respondents During the Last 12 Months

Figures 1 and 2 show the reported health symptoms experienced by the respondents in the last 12 months of their various fishing activities. The commonest health symptoms reported by the respondents in Tanji and Banjul were headache (85.7% and 81.8%); dizziness (74.7% and 61.0%); abdominal pain (51.3% and 80.5%); common cold (59.1% and 80.5%); tightness or discomfort in the chest (58.4% and 57.1%), eye irritation (49.4% and 57.1%). However, headache was reported as the highest symptom in Tanji and Banjul (85.7% and 81.8%). Conversely, Common cold and abdominal pain were reported to be higher (80.5% and 80.5%) in Banjul compared to Tanji (59.1% and 51.3%).

Table 2 shows the general health conditions of the re-

spondents in Tanji and Banjul in the last 12 months. The commonest eye conditions reported weekly in Banjul were eye redness 33.8%, eye inflammation 31.2%, and watery discharge from the eye 33.8%.

Respiratory conditions: dry cough 33.1% and 31.2% were recorded in Tanji and Banjul on a weekly and monthly basis. The tightness of the chest accounted for 30.5% in Tanji.

Musculoskeletal conditions reported were neck pain (30.5% weekly, and 33.8% monthly in Tanji, 40.3% monthly in Banjul); chest pain (31.8% weekly and 30.5% monthly in Tanji 50.6% monthly in Banjul); Shoulder pain (31.2% and 39.0% in Banjul on a weekly and monthly basis); hand pain (30.5% weekly in Tanji and 57.1% monthly in Banjul); Finger Pain (37.7% weekly in Tanji and 42.9% in Banjul monthly); Back pain (35.1% and 41.6% in Banjul on a daily and monthly basis)

Concerning Skin Problems, 47.8% in Banjul reported skin irritation monthly; dermatitis 34.4% in Tanji monthly.

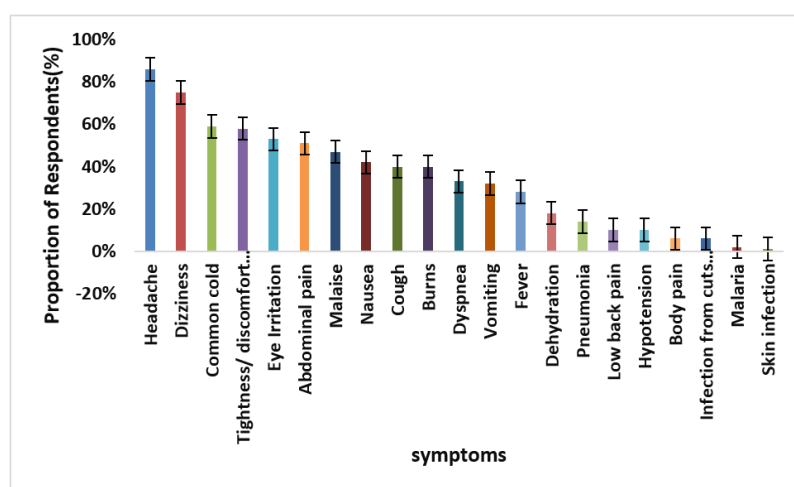


Figure 1. Respondents reported health symptoms in Tanji.

Table 2. General Health conditions of the respondents in Tanji and Banjul.

Health Conditions	Tanji (N=154)			Banjul (N=77)		
	Daily (%)	Weekly (%)	Monthly (%)	Daily (%)	Weekly (%)	Monthly (%)
Eye condition						
Eye redness	9(5.8)	36(23.4)	30(19.5)	14(18.2)	26(33.8)	22(28.6)
Eye Inflammation	23(14.9)	28(18.2)	18(11.7)	8(10.4)	24(31.2)	16(20.8)

Health Conditions	Tanji (N=154)			Banjul (N=77)		
	Daily (%)	Weekly (%)	Monthly (%)	Daily (%)	Weekly (%)	Monthly (%)
Cataract	22(14.3)	50(32.5)	20(13.0)	11(14.3)	5(6.5)	5(6.5)
watery discharge	28(18.2)	37(24.0)	32(20.8)	4(5.2)	26(33.8)	12(15.6)
Foreign object in the eye	16(10.4)	39(25.3)	60(39.0)	9(11.7)	16(20.8)	22(28.6)
Respiratory conditions						
Dry cough	19(12.3)	51(33.1)	45(29.2)	4(5.2)	8(10.4)	24(31.2)
Chest tightness	21(13.6)	31(20.1)	47(30.5)	11(14.3)	11(14.3)	10(13.0)
Cough with Phlegm	17(11.0)	21(13.6)	30(19.5)	17(22.1)	13(16.9)	7(9.1)
Throat Irritation	36(23.4)	15(9.7)	26(16.9)	21(27.3)	4(5.2)	8(10.4)
musculoskeletal Condi- tion						
neck pain	26(16.9)	47(30.5)	52(33.8)	23(29.9)	9(11.7)	31(40.3)
chest Pain	27(17.5)	49(31.8)	47(30.5)	12(15.6)	9(11.7)	39(50.6)
Shoulder Pain	16(10.4)	39(25.3)	38(24.7)	7(9.1)	24(31.2)	30(39.0)
Hand Pain	32(20.8)	47(30.5)	43(27.9)	14(18.2)	9(11.7)	44(57.1)
Finger Pain	16(10.4)	58(37.7)	44(28.6)	17(22.1)	7(9.1)	33(42.9))
Back Pain	40(26.0)	43(27.9)	30(19.5)	27(35.1)	4(5.2)	32(41.6)
Leg/hip/Knee	19(12.3)	59(38.3)	54(35.1)	12(15.6)	14(18.2)	21(27.3)
Skin problems						
Skin Irritation	30(19.5)	28(18.2)	32(20.8)	10(13.0)	4(5.2)	36(47.8)
Burning sensation	31(20.1)	16(10.4)	61(39.6)	9(11.7)	9(11.7)	10(13.0)
Unusual flaking of skin	18(11.7)	25(16.2)	35(22.7)	8(10.4)	6(7.8)	18(23.4)
Skin sore	34(22.1)	13(8.4)	33(21.4)	9(11.7)	2(2.6)	21(27.3)
Skin Discoloration	19(12.3)	27(17.5)	29(18.8)	6(7.8)	4(5.2)	2(2.6)
Dermatitis	16(10.4)	2(1.3)	53(34.4)	1(1.3)	4(5.2)	1(1.3)
Skin Rashes	16(10.4)	17(11.0)	31(20.1)	6(7.8)	3(3.9)	1(1.3)

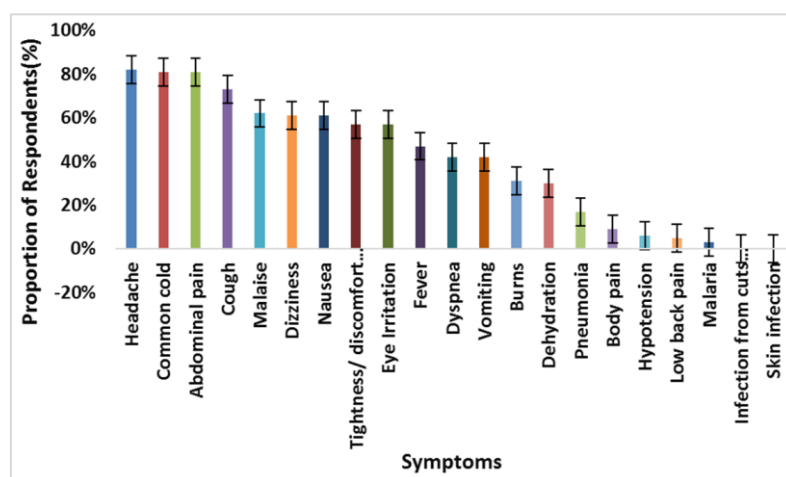


Figure 2. Respondents reported health symptoms in Banjul.

3.3. Perception of Factors Affecting Their Health and Safety: Data from FGD

Several factors were mentioned during the discussion that affect their health and safety. These included the lifting of heavy fishing materials, long-standing under the sun, lack of shade/tent in the fishing boat, spending long days in saltwater, High tide, cigarette smoking to keep warm in the cold breeze, and constantly being beside a fire or Smoke. One of the fish handlers stressed that the long time sitting affects their body, and a lack of proper PPE, especially gloves to use when working, affects their hands. Other factors mentioned were the effect of the ice block they use when selling and the insecurity of the place. Some of their statements are shown below;

“When the river is unstable and the waves are higher, fall becomes the order of the day” (Tanji fishermen)

“The smoke and constantly being beside fire also affects us as well as the lack of PPE use” (Tanji and Banjul Fish smoker)

“The long time sitting affects our body, lack of proper PPEs, especially gloves to use when working, e.g. salt affects my hands, and if I have proper gloves, it will prevent me from it and injuries. Another factor is the insecurity of the place”

(Tanji and Banjul Fish dryers)

“The ice block we use when selling, insecurity of the place, lack of proper PPEs when selling, and poor condition of the environment affect our health and safety” (Tanji and Banjul Fish traders)

The questionnaire survey on the perceptions of the factors affecting their health and safety in Tanji and Banjul communities is shown in Table 3. The commonest perceived factors reported in Tanji and Banjul were lack of sleep (72.7% and 59.7%); heavy smoke from boat engine (72.1% and 70.1%); poor diet (57.8% and 58.4%); Capsizing (68.85 and 51.9%); fish scaling process (72.1% and 70.1%) and Ergonomic (57.8% and 58.4%). Other perceived factors recorded among the Tanji were lack of exercise (70.1%); Insufficient breaks (59.7%); Cold working condition (58.4%); Drowning (53.2%); Carrying and lifting heavy load (59.7%); slips and fall (85.1%); Not having time to eat (79.9%); bending and twisting (54.5%); equipment breakdown (62.3%); Smoke (59.7%) and Burn Injury (58.4%).

The mean perception scores were 32.1 ± 3.8 and 30.5 ± 2.8 in Tanji and Banjul, respectively. Several (60%) in Tanji had a positive perception, while few (41%) in Banjul had a positive perception regarding the factors affecting their health and safety.

Table 3. Perception of factors affecting fish handlers' health and safety.

Perception statements	Tanji (N=154)		Banjul (N=77)	
	Positive (%)	Negative (%)	Positive (%)	Negative (%)
lack of sleep	112(72.7)	42(27.3)	46(59.7)	31(40.3)
Lack of exercise	108(70.1)	46(29.9)	15(19.5)	62(80.5)
Insufficient Breaks	92(59.7)	62(40.3)	26(33.8)	51(66.2)
Cold conditions	90(58.4)	64(41.6)	16(20.8)	61(79.2)
heavy smoke from engine	111(72.1)	43(27.9)	54(70.1)	23(29.9)
worry about bad weather	67(43.5)	87(56.5)	18(23.4)	59(76.6)
Poor Diet	89(57.8)	65(42.2)	45(58.4)	32(41.6)
Drowning	82(53.2)	72(46.8)	31(40.3)	46(59.7)
Working when injured	48(31.2)	106(68.8)	27(35.1)	50(64.9)
Collision	74(48.1)	80(51.9)	27(35.1)	50(64.9)
Carrying/lifting heavy baskets	92(59.7)	62(40.3)	31(40.3)	46(59.7)
Slips/ Falls	131(85.1)	23(14.9)	31(40.3)	46(59.7)
Not having time to eat	123(79.9)	31(20.1)	32(41.6)	45(58.4)
Capsizing	106(68.8)	48(31.2)	40(51.9)	37(48.1)
Bending or twisting	84(54.5)	70(45.5)	36(46.8)	41(53.2)
Equipment Breakdown	99(62.3)	55(37.7)	21(27.3)	56(72.7)
Smoke	92(59.7)	62(40.3)	26(33.8)	51(66.2)
Burn injury	90(58.4)	64(41.6)	16(20.8)	61(79.2)

Perception statements	Tanji (N=154)		Banjul (N=77)	
	Positive (%)	Negative (%)	Positive (%)	Negative (%)
Scaling fish	111(72.1)	61(27.9)	54(70.1)	23(29.9)
Cutting fish	67(43.5)	87(56.5)	18(23.4)	59(76.6)
Ergonomic	89(57.8)	65(42.2)	45(58.4)	32(41.6)
Dehydration	82(53.2)	72(46.8)	32(41.6)	45(58.4)
Percentage Score (%)	60%	40%	41%	59%
Mean scores	32.1 ±3.8		30.5 ±2.8	

3.4. Carboxyhaemoglobin (COHgb) Monitoring

Table 4 shows the COHgb values of the respondents in Tanji and Banjul. Some of the respondents, 23.4% and 23.4% in Tanji and Banjul, who smoke cigarettes, had normal COHgb and 14.3% and 20.8% had COHgb. Among the non-smokers, 46.1% and 48.1% had normal COHgb. Very few, 16.2% and 7.85 had high COHgb >3%. The mean COHgb of fish handlers was 4.66 ±4.26% in Tanji and 6.36 ±2.28% in Banjul

COHgb values among individual fish handlers in Tanji and Banjul are shown in Table 5. Among the fishermen who smoked, 8.0% and 29.0% had COHgb values 0-12%, while 11.5% and 22.6% had COHgb >12%. Non-smokers, 63.2% and 48.4% in Tanji and Banjul had a 0-3% COHgb range,

while 17.4% in Tanji had a >3% value. The majority, 65.1% of the fish smokers that smoke in Tanji had COHgb within the normal range of 0-3%, and 25.1% and 11.1% had >12% value. Among the non-smoking fish smokers in Banjul, 33.3% had a normal value of 0-5% and 55.6% had a high COHgb value of >12%. Very few, 6.7% and 25.0% of fish traders that smoked in Tanji and Banjul had normal COHgb (0-12%). However, among non-smokers, 60.0% and 50.0% had normal values. Concerning non-smoking fish dryers, 66.7% and 100.0% had normal COHgb values. Chi-square analysis revealed that the COHgb values of smoking and non-smoking fish smokers, fish traders, and fish dryers were not significantly different between Tanji and Banjul. However, the comparison of COHgb values of non-smoking fishermen in Tanji and Banjul was significant.

Table 4. CO-Hgb values among the respondents.

Variables%	Tanji (n=154) No (%)	Banjul (n=77) No (%)	Statistical Test	P-value
Smoker				
0-12	36(23.4)	18(23.4)	χ^2	0.39
>12	22(14.3)	16(20.8)		
Non-Smokers				
0-3	71(46.1)	37(48.1)	χ^2	0.32
>3	25(16.2)	6(7.8)		
Total	154	77		
Mean/std. dev	4.66 ±4.26	6.39 ±4.28	-	
95%conf. interval				
Lower limit	3.98	5.42		
Upper limit	5.34	7.36		
t-value	2.90			
Deg of freedom	229			

Smokers ≤12%=Normal, >12% =high; Non-smoker: <3%=Normal; >3%=high, χ^2 =pearson chi square

Table 5. COHgb values for different activities.

Variables%	Tanji (n=154) No (%)	Banjul (n=77) No (%)	Statistical Test	P-value
Fishermen				
Smoker				
0-12	7(8.0)	18(29.0)	χ^2	0.32
>12	10(11.5)	14(22.6)		
Non-smoker				
0-3	55(63.2)	30(48.4)	†	0.005*
>3	15(17.4)	0(0.0)		
Fish smokers				
Smoker				
0-12	28(65.1)	0(0.0)	†	0.30
>12	11(25.6)	1(11.1)		
Non-smoker				
0-3	1(2.3)	3(33.3)	†	0.59
>3	3(7.0)	5(55.6)		
Fish Traders				
Smoker				
0-12	1(6.7)	0(0.0)	†	0.67
>12	1(6.7)	1(25.0)		
Non-smoker				
0-3	9(60.0)	2(50.0)	†	0.71
>3	4(26.7)	1(25.0)		
Fish Dryers				
Smoker				
0-12	0(0.0)	0(0.0)	†	0.00
>12	0(0.0)	0(0.0)		
Non-smoker				
0-3	6(66.7)	2(100.0)	†	0.51
>3	3(33.3)	0(0.0)		
Total	154	77		

* =Statistical significance at $p < 0.05$

†Fisher's exact test

 χ^2 =pearson chi-square

Logistic regression analysis was done to find out the relationship between COHgb, smoking status, and health symptoms of the respondents in Tanji and Banjul, as shown in Table 6.

Smokers have 66% higher chances of exposure to COHgb than non-smokers. The Respondent with dizziness, malaise, and fever are at 92%, 6%, and 7% greater risk of having high COHgb.

Table 6. Multivariate Logistic regression of CO-Hgb against smoking status and health symptoms of Tanji and Banjul fish handlers.

Variables	Odd Ratio	95%conf. interval Lower limit	Upper limit
CO-Hgb			
Smoking status (ref) non-smoker			
Smoker	1.34	0.76	2.38
Health symptoms			
Headache	0.94	0.42	2.08
Dizziness	1.92	0.61	2.32
Malaise	1.06	0.56	2.01
Nausea	0.70	0.37	1.34
Vomiting	0.93	0.49	1.78
Tightness of the chest	0.88	0.50	1.56
Fever	1.07	0.54	2.10

*=significant

4. Discussion

4.1. Health Symptoms Experienced by the Respondents

Fish handlers work for long hours and this usually exposes them to a lot of health problems. This study showed that the commonest health symptoms reported by the respondents in Tanji and Banjul were headache, dizziness, abdominal pain, common cold, tightness or discomfort in the chest, and eye irritation. This agreed with the study by [1], which revealed that fisherfolk experienced lots of health problems as a result of the nature of their job. The outcome of the focus group discussion further supported this. Also, [18] stated that illnesses like the common flu, cough, and sores on the tips and between the fingers were frequently contracted by fish merchants. Also, [4] revealed that fishermen encountered some health conditions during fishing, such as vomiting, fever, abdominal pain, acidity, and dehydration.

The commonest eye conditions reported weekly in Banjul were eye redness, eye inflammation and watery discharge from the eyes. This concurs with the findings by [7], which revealed that the smoke can cause some health conditions, such as redness/swelling of the eyes and poor vision. Similarly, [4] revealed that about 90 percent of the total fishermen reported eye problems often after arriving from the sea as a result of salt water and raindrops.

Musculoskeletal conditions reported were neck pain, chest pain, Shoulder pain, hand pain, Finger Pain, and Back pain. Concerning Skin Problems, 47.8% in Banjul reported skin irritation monthly, and dermatitis 34.4% in Tanji monthly. A

descriptive study conducted by [1] disclosed that the majority (52%) of the fisherfolk had back pain, while 38% had muscle cramps.

The study carried out by [12] showed that fishermen are at risk of many hazards, which make them prone to many diseases, including musculoskeletal problems and hearing issues. Long working durations and spending many years smoking fish can harm the health of women processors. Also, [5] revealed that smoke was a contributing factor to several respiratory conditions.

4.2. Respondents' Perception of Factors Affecting Their Health and Safety

From this study, fish handlers attributed the accidents or health problems to various causes. This was also confirmed by the Focus group discussion result where the participant mentioned, lifting of heavy fishing materials, long-standing under the sun, lack of tent in the fishing boat, saltwater that they spend a long day in, the pulling of the net from a long distance in the river, cigarette smoking which they do to help keep warm in the cold breeze, smoke and constantly being beside fire also affects us as well as lack of PPE use, long time sitting affects our body, salt applied on fish before drying affects my hands, insecurity of the place, the ice block they use when selling and poor condition of the environment as some of the factors affecting their health and safety.

Questionnaire survey revealed some factors that affect their health and safety in Tanji and Banjul, including lack of sleep, heavy smoke from boat engines, poor diet, Capsizing, fish scaling process, and Ergonomic. Other perceived factors recorded among the Tanji were lack of exercise, Insufficient breaks, Cold working conditions, Drowning, Carrying and

lifting heavy loads, slips and falls, not having time to eat, bending and twisting, equipment breakdown, Smoke and Burn Injury. This concurs with the findings by [4], which revealed slippery or loss of balance, fall from a height, bad weather, etc, as the causes of casualties among fishermen. [20] in her study also observed that fish handlers, especially fishermen, were predisposed to a lot of factors affecting their health, such as lack of knowledge, poor weather, economic pressure, worries of not catching enough fish to buy or pay for new equipment, fatigue, stress, etc. [22] also found that slipping occurred repeatedly among her study participants. Also, Injuries involving falls were found in another study by [21] to be the most common cause of serious accidents in Swedish fishing, and slips were the mechanism behind 15 percent of serious accidents in fishing reported to the Swedish Labor Market No-fault Liability Insurance in 12 years. [23] in their study on occupational injury and fatigue risk factors in Gulf of Mexico seafood harvesters revealed the major risk factors to be insufficient sleep on fishing boats, flooding and collisions with other boats, bad weather, slips on the deck, contact with the gear, failure to wear personal flotation devices, insufficient swimming abilities, and fishing alone on a boat on the deck... According to the average perception score, most respondents in Tanji had favorable perceptions, while relatively few had negative perceptions. However, in Banjul, few of them had a positive perception, while more than half of the respondent had a negative perception regarding the factors affecting their health and safety. This study revealed that the contributing factors need to be acknowledged when designing the content of prevention education for fish handlers.

4.3. Carboxyhaemoglobin (COHgb) Levels

Some of the respondents in Tanji and Banjul who smoked cigarettes had normal COHgb (0-12%). Among the non-smokers, most of them had normal COHgb (0-3%) while very few had high COHgb >3%. Both the smoking and non-cigarette smoking fishermen had normal COHgb. Among the non-smoking fish smokers in Banjul, the majority had a high COHgb value. Chi-square analysis revealed that the COHgb values of smoking and non-smoking fish smokers, fish traders, and fish dryers were not significantly different between Tanji and Banjul. However, the comparison of COHgb values of non-smoking fishermen in Tanji and Banjul was significant.

Logistic regression analysis on the relationship between COHgb, smoking status, blood pressure, BMI, and health symptoms of Tanji and Banjul showed that Smokers have a 66% greater chance of exposure to COHgb than non-smokers, hypertensive for systolic blood pressure has a 65% greater risk of COHgb than non-hypertensives. Odd ratio > 1. However, there is a 46% lower likelihood of having high diastolic blood pressure as a result of exposure to COHgb. Those who are underweight and obese are 48% and 42% at risk of having higher COHgb than those who are normal (odd ratio >1). A respondent

with dizziness, malaise, and fever is at 92%, 6%, and 7% greater risk of having high COHgb. [26] revealed that COHgb values rose with daily cigarette consumption and were greater in RBC packs from smokers (8%) than non-smokers (2%). Also, [24] indicated that a median value of COHgb levels in non-smokers was 0.81% and in smokers, 5.33%. A strong negative correlation (Pearson's $r = -0.529$) was obtained between COHgb levels and the time interval between the last smoked cigarette. Also, there were significantly higher COHgb levels in smokers who had their last cigarette ≤ 30 minutes before blood sampling. Generally, the higher the COHgb levels, the more severe the symptoms. When the level is low, the most common symptom is a headache, and later, malaise, nausea, and dizziness may occur [25].

5. Conclusion

Fishing and fish processing have a lot of health hazards that need to be tackled because of the implications it has for health as well as a significant income loss, mainly due to the time lost to sicknesses. Consequently, it is recommended that all fish handlers undergo in-depth instruction on the health problems unique to their field of work and possible safety procedures.

Abbreviations

CO	Carbon Monoxide
COHgb	Carboxyhaemoglobin
COPD	Chronic Obstructive Pulmonary Disease
FGD	Focus Group Discussion
PPE	Personal Protective Equipment

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Author Contributions

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Conflicts of Interest

The authors declare no conflicts of interest.

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