

Evaluation of occupational health management status and safety issues of the small-scale fisheries sector in Bangladesh

M.U.M. Abu Zakaria¹, Debabrata Paul¹, Raju Das¹,
 Shuva Bhowmik¹, Md. Sazedul Hoque², Abdullah-Al Mamun¹

¹Noakhali Science and Technology University, Noakhali, Bangladesh

²Patuakhali Science and Technology University, Dumki, Patuakhali-8602, Bangladesh

ABSTRACT

Background: Small-scale fishing is one of the most precarious occupations, with high rates of threats and hazards. The present study was undertaken to evaluate the health hazards and safety issues of fishers involved in small-scale fisheries (SSF).

Materials and methods: Fifty SSF fishers ($n = 50$) were surveyed by using a pre-tested questionnaire between October 2019 and March 2020 at the lower Meghna River in the northern tip of the Bay of Bengal, Bangladesh.

Results: Results revealed that 56% of SSF fishermen belong to a nuclear family, and 42% completed primary education. Forty per cent had an annual income of between 1,000 and 1,500 USD. Seventy-six per cent of fishermen were found to suffer from fever, and 72%, and 60% from diarrhoea and skin diseases over the last 5 years (2015–2020), respectively. During fishing, 78% of fishermen also suffered from red-eye problems, dizziness, and headache, and 68% struggled with musculoskeletal complaints during the last 5 years. Extreme cyclonic occurrences and sudden storms were experienced by 66% and 32% of fishermen, respectively, during the last 5 years. Local pharmacies were visited by 46% of fishermen for treatment due to ease of access. Sixty-four per cent of participants applied their local indigenous knowledge to treat health-related problems. Twenty-eight per cent and 32% of fishermen used a first aid box and stored medicine on board, respectively.

Conclusions: Most of the fishers are in great risk of medium- to high-range danger while fishing in the SSF sector in Bangladesh. Many countries have developed protocols for safe and responsible fishing. In Bangladesh, adequate attention is needed for the sustainable development of the SSF sector.

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Key words: occupational health hazards, small scale fisheries (SSF), health and safety issues, coastal fishermen, Bangladesh

INTRODUCTION

The global catch generated by fisheries is 96.4 million metric tons (MT), which is mostly driven by marine ecosystems [1]. Globally, 4.56 million fishing vessels (from small, undecked and non-motorised boats up to large industrial vessels) and 59.51 million individuals are engaged (on

a full-time, part-time, or incidental basis) within the essential segment of capture fisheries (39.0 million individuals) [1]. Fisheries support nourishment, livelihoods, trade, and food security [2, 3]. In Bangladesh, total marine fisheries production is 0.65 million MT, whereas artisanal/small-scale fisheries (SSF) contribute 82% of the total yield, and large-

✉ Abdullah-Al Mamun, PhD, Department of Fisheries and Marine Science, Noakhali Science and Technology University, Noakhali-3814, Bangladesh, e-mail: mamun_au22@yahoo.com

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scale fisheries contribute the rest, with an annual growth rate of 2.71% [4]. Fisheries and other natural-resource-based livelihoods are traditionally very important to coastal communities [5]. In coastal Bangladesh, around 484,000 families rely upon fishing [6]. In excess of 12% of the 165-million population of Bangladesh rely upon fisheries- and aquaculture-related activities for their livelihoods [6]. Bangladesh produces 86% of the world's total hilsa (*Tenualosa ilisha*) [7]. Hilsa is the species making up the highest proportion (around 12%) of the nation's total fish production [4]. Half a million fishermen in Bangladesh are involved in hilsa fishing [8].

Small-scale fisheries use low-tech fishing gear, such as hooks and line, nets, and traps, and dominate multi-species coastal fisheries [9, 10]. The intensity of any type of gear used is determined by the population of target fish [11]. Most people are unaware of how important small-scale fishing (within 40 m depth) is as a source of livelihood, food security, and national income. Small-scale fishermen use small fishing vessels with low capital investment and account for 90% of the 15 million people who participate in coastal and ocean fishing. Fishing is considered one of the oldest [12] and probably most daring occupations, with a high threat of professional hazard, specifically traumatic injury [13] and endemic diseases [14, 15]. Work-related injuries are more common in fishing than in any other occupation [16]. According to International Labour Organization and Food and Agriculture Organization, 7% of all labourer mortalities occur in the fishing industry [17]. These casualties and serious wounds put fishing as a profession at the top of the list of risk hierarchy. In a recent study, sea fishing mortality was recorded as 0.08% per year [18]. This is mainly due to the insecure working atmosphere [19]. Mortality and sickness among fishermen continue to be unsatisfactorily high, and fishermen and their families are regularly at risk due to their livelihood and social security frameworks [20]. Storms, floods, and climate change are only a few of the environmental, economic, and societal threats that many fishermen have faced over the years [21, 22]. Small-scale fishermen ignore high temperatures, lack safety measures during rainy season and tides, and have little or no sustenance during the fishing period, so they fight for their livelihoods [11].

Occupational health and safety is a multidisciplinary field that focuses on the security, health, and well-being of individuals who work. An occupational health and safety programme's purpose is to promote a safe and healthy working environment. In a developing country like Bangladesh, fishermen are one of the most vulnerable groups due to their livelihood opportunities [23]. Proper and available information on occupational health management and safety issues of SSF fishermen is still inconsistent in Bangladesh. There are no occupational health services or obligatory

health screening for these small-scale fishers, and occupational accidents and diseases are under-reported, as most of the fishers in this division are uninsured. Consequently, the present study was conducted to evaluate and identify the occupational health hazards affecting small-scale fishermen and their care-seeking behaviour related to these health difficulties.

MATERIALS AND METHODS

STUDY SITE AND PERIOD

Meghna is one of the largest rivers in Bangladesh and is interconnected by different channels. The present investigation was performed with the SSF fishers working adjacent to the lower Meghna River in the northern tip of the Bay of Bengal, Bangladesh (Fig. 1). The study area has abundant riverine fisheries resources. The data was collected between October 2019 and March 2020.

SELECTION OF PARTICIPANTS

There were no accessible measurements or records on occupational hazard components and security appraisal of the SSF sector. Data was randomly collected from 50 small-scale fishers (n = 50) on the site of landing.

QUESTIONNAIRE PREPARATION AND VALIDATION

The questionnaire was developed after a detailed literature review of personal experiences. In the neighbouring Lakshmipur district, piloting was carried out in a similar setting for SSF. During the pilot, a total of 10 small-scale fishermen participated. The questionnaire was reframed and retained chronology after piloting to collect data in a clear way. For easy processing, the questionnaire was produced in English and then translated into Bengali, the local language.

DATA COLLECTION

Information was collected during a face-to-face interview, utilising a semi-structured questionnaire after obtaining written consent. The questionnaire was partitioned into three segments. The primary area included data about socio-economic and demographic characteristics. The second section was outlined to gather information about the occupational attributes. The third section of the review was laid out to assemble information about occupational hazards and safety associated with their work that the interviewed crew endures. Participants were voluntarily interested in the research and were promised confidentiality after being given specifics of the study.

DATA ANALYSIS

The collected data were summarised and scrutinised carefully. After information collection, the data were aggregated and analysed using descriptive statistical tools using

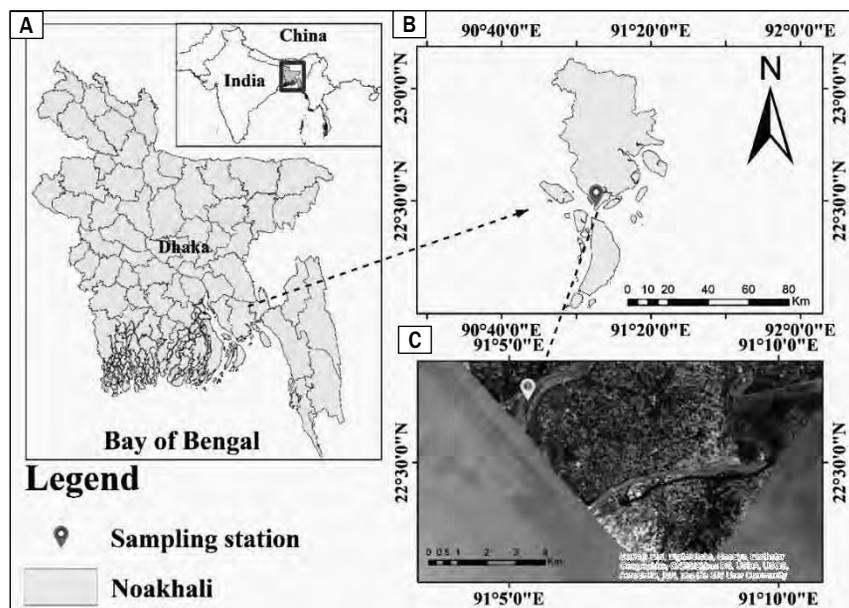


Figure 1. Geographical location of the study area; **A.** Map of Bangladesh; **B.** Map of Noakhali district; **C.** Satellite view of Chairman Ghat fish landing centre

MS Excel 2016. ArcGIS (version 10.3) was used for mapping the sampling stations.

RESULTS

SOCIO-ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS

Socio-economic and demographic characteristics included the age, family size and type, educational status, drinking water access, sanitary, electricity and housing facilities, and income of fishers. Forty-four per cent of small-scale fishermen were between 20 and 30 years of age, and 30%, 18%, and 8% were aged between 31 and 40 years, older than 40 years, and younger than 20 years, respectively (Table 1). More than half (56%) were from a nuclear family and the rest from joint family settings. Among the respondents, 58% of fishermen belonged to a medium-sized family, which consisted of 5–8 members. The study found that 42% of small-scale fishermen completed primary-level education, 20% were illiterate, and 34% could not complete primary education. Forty-eight per cent of fishermen lived in the *katcha* house, whereas only 12% of fishermen lived in the *pucca* house (Table 1). Forty-eight per cent of fishermen have their own tube-well for drinking water. In SSF, 94% of fishermen used tube-well water in the boat during fishing, which was carried by container or bottle. Thirty-four per cent of small-scale fishermen had sanitary toilet facilities at home. On the other hand, there were no sanitary facilities on board and they used an open system. Sixty per cent of fishermen had electricity facilities, whereas 16% and 24% used solar energy and kerosene in their households, respectively. Most

of the small-scale fishermen (40%) had an annual income of between 1,000 and 1,500 USD (Table 1).

OCCUPATIONAL CHARACTERISTICS

Fifty-two per cent of fishermen engaged with agriculture as their secondary occupation (in terms of time) during banning periods and lean seasons (months), whereas it was 18%, 6%, and 6% for day labourer, rickshaw puller, and driver (Auto, CNG), respectively (Table 2). Sixteen per cent of fishermen had more than 30 years of fishing experience. Most of the fishermen (84%) used to fishing more than two times per month. This frequency depends on the vessel type, engine capacity, and duration of each trip. Large boats stayed in the river for longer times compared to medium and small boats. Fishing trawlers stayed around 10 to 13 days, whereas *tempo* stayed for 5–7 days, and *choto tempo* made daily trips. Seventy-two per cent of fishermen fished all year except for the banning period, whereas only 18% of fishermen fished in the peak season (September to November). The present findings showed that 52% of fishermen had their own boat: 8% were single owners and 44% jointly owned their boats. The remaining 48% of fishermen worked under *mohajan*, who rent boats to the fishers or recruit fishers on a monthly/seasonal basis. Forty per cent of fishermen had *tempo* or *chandi* boat, whereas 32% and 28% had *choto tempo* and trawler, respectively. Four categories of gear, especially net, were used by the fishermen in the study area to catch fish. Among all SSF fishermen, 34% had *chandi jal*, 28% had *char suta jal*, 22% had current *jal*, and 16% had *lal jal* (Table 2).

Table 1. Socio-economic and demographic characteristics of small-scale fisheries at the lower Meghna river in Bangladesh (n = 50)

Variables	Sub-category	Frequency (n)	Percentage (%)
Age structure	< 20 years	4	8
	20–30 years	22	44
	31–40 years	15	30
	> 40 years	9	18
Family type	Nuclear family	28	56
	Joint family	22	44
Family size	Small family (< 5)	6	12
	Medium family (5–8)	29	58
	Large family (> 8)	15	30
Educational status	Illiterate	10	20
	Primary incomplete	17	34
	Primary complete	21	42
	Secondary	2	4
Housing condition	<i>Pucca</i>	6	12
	<i>Semi-pucca</i>	20	40
	<i>Katcha</i>	24	48
Drinking water facilities at household	Own	24	48
	Neighbour	12	24
	Government	14	28
Drinking water facilities on board	Tube well	47	94
	River	3	6
Sanitary facilities at household	Sanitary	17	34
	Closed	28	56
	Hanging	5	10
Electricity facilities	Electricity	30	60
	Solar	8	16
	Kerosene	12	24
Income (USD/year)	Less than 1000	5	10
	1000–1500	20	40
	1501–2000	18	36
	Above 2000	7	14

OCCUPATIONAL HEALTH HAZARDS

Seventy-two per cent of small-scale fishermen suffered from diarrhoea, and 76% suffered from fever. Sixty per cent of fishermen suffered from skin disease (rashes, itching, and scabies types) in the study area (Fig. 2).

The study found that 78% of the fishermen were exposed to accidents during fishing in the last 5 years, 52% of them reported injuries due to accident, and 38% of the fishermen were exposed to sunburn (Fig. 3). Seventy-eight per cent of small-scale fishermen suffered from dizziness and headache, and 68% suffered musculoskeletal complaints due to fishing.

HAZARDS DURING FISHING

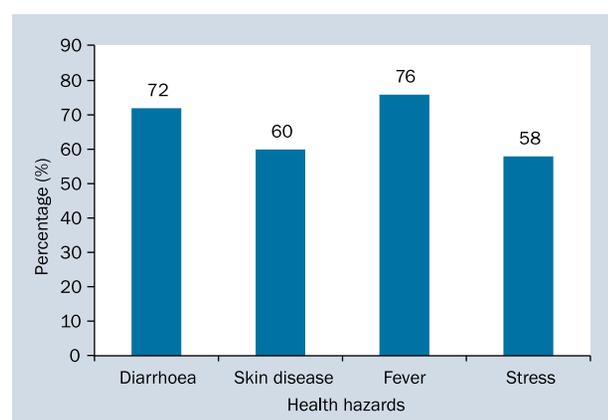
Fishermen principally confront tropical cyclones while fishing, mainly in the rainy season. They also confront over-

whelming rainfall and ocean storms, which can obstruct their daily activities and can be life threatening. During bad weather conditions, fishermen avoid deep-sea fishing and fish near the shoreline, as per government instruction. The risk during the rainy season is critically high compared to the winter and summer seasons due to natural calamity. About 66% of fishermen said that they confronted extreme cyclonic occurrences while fishing, whereas 32% have faced sudden storms caused by deep-sea depression. Fishermen lose their fishing nets and other equipment during these natural hazards. Fourteen per cent of fishermen confronted heavy rain, and 38% of fishermen faced bad weather conditions in the last 5 years (Table 3). Fourteen per cent of fishermen faced temporary or fatal loss of way due to impenetrable fog or a cloudy environment with unfamiliar wind direction.

Table 2. Frequency distribution of some occupational characteristics of small-scale fisheries at the lower Meghna River in Bangladesh (n = 50)

Variables	Sub-category	Frequency (n)	Percentage (%)
Secondary occupation	Agriculture	26	52
	Day labour	9	18
	Rickshaw puller	3	6
	Driver (Auto*, CNG**)	3	6
	Unemployed	9	18
Experience in fishing	< 10 years	19	38
	10–20 years	16	32
	21–30 years	7	14
	> 30 years	8	16
Frequency to go fishing per month in a season	One time	2	4
	Two times	6	12
	> two times	42	84
Types of fishermen	Seasonal	14	28
	Year-round	36	72
Fishing boat	<i>Choto tempo</i>	16	32
	<i>Tempo or Chandī</i>	20	40
	Fishing Trawler	14	28
Fishing gear	<i>Chandi jal</i>	17	34
	<i>Char suta jal</i>	14	28
	<i>Current jal</i>	11	22
	<i>Lal jal</i>	8	16

*Motorised version of pulled rickshaw; **CNG – compressed natural gas fuel-based vehicle

**Figure 2.** Occupational health hazards of the small-scale fisheries fishers at the lower Meghna River in Bangladesh in last 5 years (2015–2020) (n = 50)

BEHAVIOUR FOR SEEKING HEALTHCARE

Table 4 shows that the percentage of fishers who visit a doctor was 68%. Most of the small-scale fishermen like to visit a local pharmacy (46%) and *Kobiraj* (16%) compared to the government hospital (10%) and private hospital (6%) for their treatment (Table 4). Twenty-eight

per cent of fishermen visit the doctor only for diarrhoea, whereas 22% and 18% visit for vomiting and fever, respectively. Diarrheal disease mainly occurred due to the poor-quality drinking water on board. This study also revealed that the maximum number of respondents did not take medicine from specialists until they were confronted by serious illnesses.

OCCUPATIONAL HEALTH SAFETY

Respondents were asked about their choices regarding methods they have taken to manage health risks. Sixty-four per cent of fishermen used local indigenous knowledge for treating health-related issues (Table 5). According to the findings, 32% of fishermen stored medicine (Paracetamol™ as painkiller, Omeprazole® to treat acidity, Ranitidine® to treat stomach ulcers), and 28% of fishermen used first aid (bandage, cotton, Savlon®, ORsaline-N®, Salve® – antiseptic) on board. Before starting the journey for fishing, 68% of fishermen took floatation aids such as a lifejacket, raincoat, or extra fishing net ball for use, if necessary, in any lifesaving situation. Seventy-six per cent of fishermen used a mobile phone to get regular updates on weather forecasts and contact other fishermen and family members on board, in case of sudden catastrophes.

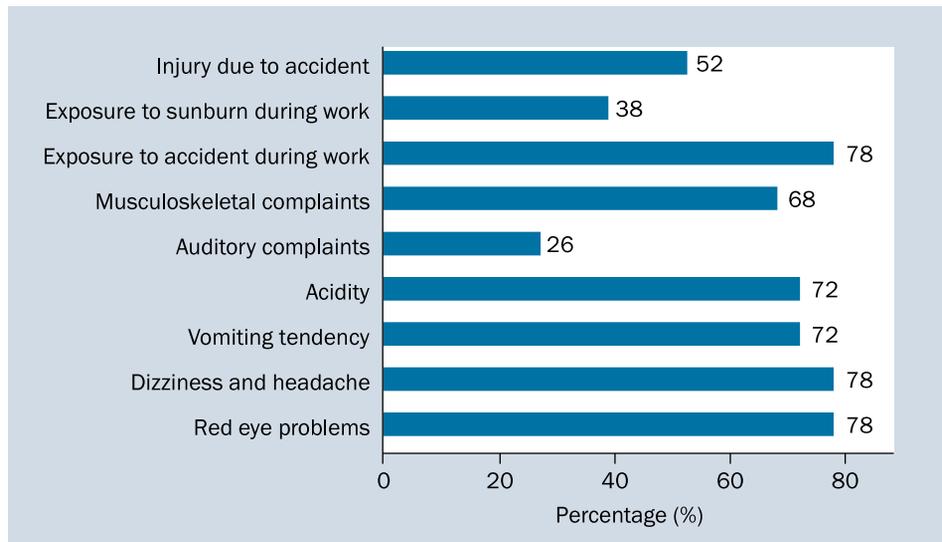


Figure 3. Other occupational health hazards related to small-scale fisheries in last 5 years (2015–2020) in Bangladesh (n = 50)

Table 3. Hazards associated with fishing of the small-scale fisheries fishers at the lower Meghna River in Bangladesh in last 5 years (2015–2020) (n = 50)

Variables	Sub-category	Frequency (n)	Percentage (%)
Accidents associated with the natural calamity	Cyclone	33	66
	Heavy rain	7	14
	Foggy	14	28
	Bad weather	19	38
	Storms	16	32
Accidents associated with navigation	Loss of power	8	16
	Loss of way	7	14
	Collisions	5	10
Accidents associated with fishing operations	Injuries from fish	3	6
	Injury by deck machinery and equipment	12	24

DISCUSSION

SOCIO-ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS

Age is a critical variable in fisheries activities. The present study showed that a young age group (44%) was dominant, which is similar to the findings of Pravakar et al. (2013) [24] in the Shahrasti sub-district under Chandpur district and the findings of Minar et al. (2012) [25] in the Kirtonkhola River near the town of Barisal. Family size has considerable influence on the income and expenditure of the family. In the case of the fisher community, it was found that most fishermen had nuclear rather than joint families, which was similar to the findings of Dey et al. (2010) [26]. The educational level of Bangladeshi fishermen is generally very low [27]. Only 42% of small-scale fishermen completed primary-level education. The present study found that most of the

families are unable to maintain the educational expenses of their school-age children. Low levels of education are an obstacle for the implementation of the fishing sector's safety and health programmes. The study indicates that the housing conditions of the small-scale fishermen were very poor. 48% of fishermen lived in the *katcha* house, which was similar to the findings of Sunny et al. (2019) [28]. Most of the fishermen (40%) had an annual income of between 1,000 and 1,500 USD. Pravakar et al. (2013) [24] found that most fish farmers (34%) earned between 900 and 1,200 USD per year, which is similar to the present study. Fishermen were paid a percentage of the harvest value, so their incomes were dependent on the number of fish caught. As a result, if boat owners decided to leave their boats offshore, the harvest was reduced, resulting in lower salaries and even job losses.

Table 4. Health care seeking behaviour of the of the small-scale fisheries fishers at the lower Meghna River in Bangladesh in last 5 years (2015–2020) (n = 50)

Variables	Sub-category	Frequency (n)	Percentage (%)
Visit to doctor		34	68
Doctor's types	Government hospital	5	10
	Private hospital	3	6
	Village doctor	8	16
	<i>Kobiraj</i>	11	22
	Local pharmacy	23	46
Disease that was the reason to visit the doctor	Diarrhoea	14	28
	Skin disease	6	12
	Vomiting	11	22
	Fever	9	18
	Dizziness and headache	4	8
	Musculoskeletal complaints	2	4
	Others	4	8

Table 5. Occupational health safety strategies by the small-scale fisheries at the lower Meghna River, Bangladesh (n = 50)

Strategies	Frequency (n)	Percentage (%)
Sought treatment	21	42
Applied local indigenous knowledge	32	64
Storage of medicine	16	32
First aid box	14	28
Floating materials	34	68
Mobile	38	76
Dependent to other on all above issues	5	10

OCCUPATIONAL CHARACTERISTICS

Seasonality in fishing access tends to be a factor in livelihood diversification [5]. Most of the fishermen (84%) fish more than two times per month in a single season, whereas Mandal et al. (2017) [29] found that 77.5% fish two times in a single fishing year. Thirty two per cent of fishermen had 10 to 20 years of fishing experience, which was similar to the findings of Zytoon (2012) [30]. The study revealed that 72% of small-scale fishermen fish in the deep-sea year-round, except for during the banning period. The amount of time people spent fishing differed depending on location and season [5]. The present study also revealed that most of the fishermen (78%) were associated with small-scale fishing, which was supported by the findings of El-Saadawy et al. (2014) [13]. *Chandi jal* (34%) and *tempo or chandi boat* (40%) were used by the SSF fishers for catching fish in the present study, which was similar to the findings of Haque et al. (2017) [31].

OCCUPATIONAL HEALTH HAZARDS

About 72% and 60% SSF fishers suffered from diarrhoea and skin disease, which is higher than the findings of Man-

dal et al. (2017) [29] at Kachua Upazila and the Bagherhat district and Laraqui et al. (2018) [32] at Morocco. This is mainly caused by the incognizance of fishermen. According to John et al. (2016) [33], people who work outdoors are more susceptible to an augmented skin cancer risk compared to those who work indoors. In addition, Burke et al. (2006) [34] revealed that the threat of skin and eye damage was exceptionally high due to the unobstructed reflection of the sunlight on the river. There are also many harmful types of bacteria in river water, which can cause skin rashes and itching.

During fishing, fishermen suffered from various occupational injuries. In this study, 78% of fishermen reported that they have experienced occupational accidents, whereas in Frantzeskou et al. (2012) [14] of Greek fisherman, 28% reported experienced accidents. Most of the hazards occurred due to their inability and less conscientious use of protective tools. Thirty-eight per cent of small-scale fishermen were exposed to sunburn during their long hours of river work, which was supported by the findings of Warthan et al. (2003) [35]. According to most respondents (78%), red-eye is a sig-

nificant issue while fishing within the considered area, which is caused basically by air stream and results in obscuration of distant objects. Due to this air stream, fishers' eyes become inflamed and discharge water. Another cause of the decreased visualising power of eyes was utilising saline water while fishing. As a result, fishermen's eyes became inflamed, and water was discharged.

The working environment is not relaxed, as fishers need to remain working during long trips on the vessel. Other factors that might reduce security in the workplace include isolated locations, days with little rest, exposure to cold, considerable physical exertion, equipment failure, constant financial pressure, and regular mental stress. All of these components may increase the chance of harmful symptoms in fishermen. Fishermen endure diverse physical and mental stresses [19]. Most of the fishermen suffered from dizziness (78%) and vomiting (72%) during fishing due to the swinging of the boat by waves, which was similar to the findings of Mandal et al. (2017) [29]. Due to irregular eating habits, 72% of fishermen faced stomach acidity problems while fishing. The present study also revealed that 68% of SSF fishers suffered from musculoskeletal disorders, which was less than the findings of Mandal et al. (2017) [29], El-Saadawy et al. (2014) [13] and Percin et al. (2012) [36]. Twenty-six per cent of the fishermen had auditory complaints due to long periods of being in close proximity to machines and vessel engines, whereas Mandal et al. (2017) [29] and Percin et al. (2012) [36] found 25% and 21% of fishermen reported such complaints, respectively.

HAZARDS DURING FISHING

The risks of hazards were high in the rainy season compared to those during winter and summer, which was supported by the study of Mandal et al. (2017) [29]. The highest number (66%) of fishermen said they had encountered extreme cyclonic events while fishing, whereas Mandal et al. (2017) [29] found that 56% of fishermen in the Boga community at Kachua, Bagerhat reported encountering such events.

BEHAVIOUR FOR SEEKING HEALTHCARE

In Bangladesh, healthcare providers have been visited by more people with strong education and economic backgrounds than by those who are poorly educated and have less-advantaged financial backgrounds [37]. According to the present study, most of the small-scale fishermen had a primary-level education, which made them less knowledgeable about their illnesses and visits to facilities for health services. The present study revealed that 68% of fishermen visited a doctor for their treatment, which was much higher than the findings of Al Noman et al. (2020) [38]. Ten per cent of fishermen preferred to visit the government hospital, which was similar to the findings of Al Noman et

al. (2020) [38]. The highest proportion of fishermen liked to visit the local pharmacy (46%) and *Kobiraj* (22%) due to ease of access and lower cost. According to Anwar et al. (2020) [39], fishermen and their families confront a variety of health-awareness issues, many of which are likely to have major negative effects on their health.

OCCUPATIONAL HEALTH AND SAFETY

For the most part, fishermen are at risk for multiple infections because they remain in an isolated aquatic setting for long periods of time [40]. Fishing can be a particularly dangerous occupation, with a high probability of work-related and endemic infections [14]. Forty-two per cent of the respondents looked for any treatment by local medical providers who are known to them, offer services 24 hours a day, are trusted and willing to negotiate payment, and who facilitate the purchase of pharmaceuticals from their dispensaries. According to the present study, 64% of SSF fishermen used their indigenous knowledge to treat health problems (headache, reflux, and fever), which was similar to the findings of Mandal et al. (2017) [29]. According to Rafnsson (1998) [41], good boat design and construction, appropriate navigation and communication equipment, personal life-saving devices (flotation devices, life buoys, and rescue sailboats), and swimming capabilities are crucial to mitigate the potentially catastrophic effects of accidents and ensure survival.

CONCLUSIONS AND RECOMMENDATIONS

The SSF fishers on Bangladesh's rivers are mostly dependent on fishing for their livelihoods. They are exposed to many risks, including skin problems, fever, musculoskeletal complaints, and problems with the auditory system, which lead to many diseases. Moreover, it appears that most small-scale fishermen suffer from high stress and sunburn, and there remains the hazard of accidents and injuries. Other risk factors associated with these problems were found to be long working hours, in particular on small, insecure boats and with a lack of personal protective equipment. In the rainy season, each fishing team faces natural hazards, mainly tropical cyclones. They experience long-term effects after facing numerous natural hazards and suffer health problems that decrease their work productivity after a certain age. They bring few medications or life-saving equipment for temporary health safety. Even the top fishermen have not received any training in their trade, which increases the risk of mortality while fishing. However, following few recommendations can be drawn based on our research findings and the existing context of small-scale fisheries sector in Bangladesh for the improvement of socio-economic status of fishermen:

- Increase access to education of children of fishermen;
- Provide better facilities for available pure drinking water, improve housing and electricity facilities;

- Government subsidies to fishers should be improved to help them get rid of *dadon* and on a soft-term basis, institutional loans should be offered to fishers;
- Arrangements for alternative income-generating activities for fishermen during lean and ban fishing periods should be created;
- Minimum or interest-free bank loan should be offered to support livelihood of SSF;

For the improvement of fishing practice following suggestions should be considered:

- Fishermen should use personal protective equipment (floating equipment, life jackets with reflective tapes or active lighting systems, lifeboats), and goggles to protect themselves from hazards;
- Good design and construction of boats, as well as adequate navigation and communication equipment, are essential to mitigate the potentially catastrophic effects of an accident;
- Fishers must be aware of and strictly follow the weather forecast to avoid accidents associated with natural calamities.

To improvement of physical/health safety of fishermen following recommendations should be ensured:

- To provide medical and health care services, health and safety guidelines must be formulated, focusing on issues such as expanding health insurance coverage and building up occupational health and safety units in major fishing ports;
- The government should provide training on how to improve safety and health by detecting hazards, assessing risks, and taking action to mitigate them through safety management and regular consultations on safety and health issues should be ensured by the government;
- Availability of first-aid kit boxes and primary medicine for the immediate health care of fishermen.

Additionally, some time demanding following options are recommended as guidance for the government agencies:

- The government should develop standard guidelines for safe (e.g. safety at sea for small-scale fisheries in developing countries) and responsible (e.g. code of conduct for responsible fisheries) fishing and safety (e.g. best practices to improve safety at sea in the fisheries sector) of fishermen must be maintained by increasing the number of coast guards and police officers on patrol;
- Secure the license of fishermen and fishing vessels, and enforcement of fishing rules according to Marine Fisheries Ordinance, 2020 to avoid illegal, unreported and unregulated fishing.
- Make sure monitoring control and surveillance system for the safety of SSF;
- Governments should encourage to engage in awareness development and capacity building activities such as

courses, workshops and training on occupational safety and hazards, and awareness should be raised through seminars, posters, banners, television programmes, radio programmes, social media etc.

Conflict of interest: None declared

REFERENCES

1. Food and Agriculture Organization. The State of World Fisheries and Aquaculture 2020. Sustainability in action. Rome.
2. Choo MKK, El-Bassel N, Adam PCG, et al. Prevalence and correlates of HIV and hepatitis C virus infections and risk behaviors among Malaysian fishermen. *PLoS One*. 2015; 10(8): e0118422, doi: [10.1371/journal.pone.0118422](https://doi.org/10.1371/journal.pone.0118422), indexed in Pubmed: [26244844](https://pubmed.ncbi.nlm.nih.gov/26244844/).
3. Rahman M, Schmidlin T. The perception and impact of natural hazards on fishing communities of Kutubdia Island, Bangladesh. *Geogr Rev*. 2019; 104(1): 71–86, doi: [10.1111/j.1931-0846.2014.12005.x](https://doi.org/10.1111/j.1931-0846.2014.12005.x).
4. Department of Fisheries. Yearbook of fisheries statistics of Department of Fisheries Bangladesh. *Fish Resour Surv Syst (FRSS)*, Dep Fish Bangladesh Minist Fish. 2018; 35: 129.
5. Mills D, Tilley A, Pereira M, et al. Livelihood diversity and dynamism in Timor-Leste; insights for coastal resource governance and livelihood development. *Marine Policy*. 2017; 82: 206–215, doi: [10.1016/j.marpol.2017.04.021](https://doi.org/10.1016/j.marpol.2017.04.021).
6. Department of Fisheries. Yearbook of fisheries statistics of Department of Fisheries Bangladesh. *Fish Resour Surv Syst (FRSS)*, Dep Fish Bangladesh Minist Fish. 2019; 36: 139. 2019.
7. Mahmud, I. "Bangladesh produces 86 per cent of the world's hilsas" 2020 [Online]. <https://en.prothomalo.com/bangladesh/good-day-bangladesh/bangladesh-produces-86-per-cent-of-the-worlds-hilsas> (Accessed: 12-Dec-2021).
8. Hossain MAR, Das I, Genevier L, et al. Biology and fisheries of Hilsa shad in Bay of Bengal. *Sci Total Environ*. 2019; 651(Pt 2): 1720–1734, doi: [10.1016/j.scitotenv.2018.10.034](https://doi.org/10.1016/j.scitotenv.2018.10.034), indexed in Pubmed: [30316090](https://pubmed.ncbi.nlm.nih.gov/30316090/).
9. Halim A, Wiryawan B, Loneragan N, et al. Developing a functional definition of small-scale fisheries in support of marine capture fisheries management in Indonesia. *Marine Policy*. 2019; 100: 238–248, doi: [10.1016/j.marpol.2018.11.044](https://doi.org/10.1016/j.marpol.2018.11.044).
10. McDonald G, Campbell S, Karr K, et al. An adaptive assessment and management toolkit for data-limited fisheries. *Ocean Coast Manag*. 2018; 152: 100–119, doi: [10.1016/j.ocecoaman.2017.11.015](https://doi.org/10.1016/j.ocecoaman.2017.11.015).
11. Rana MU, Salam A, KM SN, et al. Hilsa fishers of Ramgati, Lakshmi-pur, Bbangladesh: an overview of socio-economic and livelihood context. *J Aquac Res Dev*. 2018; 9(541), doi: [10.4172/2155-9546.1000541](https://doi.org/10.4172/2155-9546.1000541).
12. Udolisa R, Akinyemi AA, Olaoye OJ. Occupational and Health Hazards in Nigerian Coastal Artisanal Fisheries. *J Fisheries Aquatic Sci*. 2012; 8(1): 14–20, doi: [10.3923/jfas.2013.14.20](https://doi.org/10.3923/jfas.2013.14.20).
13. El-Saadawy M, Soliman N, ElTayeb I, et al. Some occupational health hazards among fishermen in Alexandria city. *Gaziantep Med J*. 2014; 20(1): 71, doi: [10.5455/gmj-30-44689](https://doi.org/10.5455/gmj-30-44689).
14. Frantzeskou E, Kastania AN, Riza E, et al. Risk factors for fishermen's health and safety in Greece. *Int Marit Health*. 2012; 63(3): 155–161, indexed in Pubmed: [23129097](https://pubmed.ncbi.nlm.nih.gov/23129097/).
15. Rodrigues D, Kiran U. A pilot study on knowledge & practice regarding prevention of occupational hazards and attitude towards utilisation of safety measures among fishermen working at a selected harbor. *J Health Allied Sciences NU*. 2020; 3(3): 68–71, doi: [10.1055/s-0040-1703681](https://doi.org/10.1055/s-0040-1703681).

16. Chauvin C, Le Bouar G. Occupational injury in the French sea fishing industry: a comparative study between the 1980s and today. *Accid Anal Prev.* 2007; 39(1): 79–85, doi: [10.1016/j.aap.2006.06.006](https://doi.org/10.1016/j.aap.2006.06.006), indexed in Pubmed: [16962060](https://pubmed.ncbi.nlm.nih.gov/16962060/).
17. Antão P, Almeida T, Jacinto C, et al. Causes of occupational accidents in the fishing sector in Portugal. *Safety Sci.* 2008; 46(6): 885–899, doi: [10.1016/j.ssci.2007.11.007](https://doi.org/10.1016/j.ssci.2007.11.007).
18. Conway GA, Mode NA, Wopat P. Proceedings of the Second International Fishing Industry Safety and Health Conference, September 22-24, 2003, Sitka, Alaska, USA. National Institute for Occupational Safety and Health; 2006.
19. Jeżewska M, Grubman-Nowak M, Leszczyńska I, et al. Occupational hazards for fishermen in the workplace in Polish coastal and beach fishing: a point of view. *Int Marit Health.* 2012; 63(1): 40–48, indexed in Pubmed: [22669811](https://pubmed.ncbi.nlm.nih.gov/22669811/).
20. Grainger CR. Hazards of commercial fishing. *World Health Forum.* 1993; 14(3): 313–315, indexed in Pubmed: [8397749](https://pubmed.ncbi.nlm.nih.gov/8397749/).
21. Allison E, Perry A, Badjeck MC, et al. Vulnerability of national economies to the impacts of climate change on fisheries. *Fish Fish.* 2009; 10(2): 173–196, doi: [10.1111/j.1467-2979.2008.00310.x](https://doi.org/10.1111/j.1467-2979.2008.00310.x).
22. Béné C. Are fishers poor or vulnerable? Assessing economic vulnerability in small-scale fishing communities. *J Dev Stud.* 2009; 45(6): 911–933, doi: [10.1080/00220380902807395](https://doi.org/10.1080/00220380902807395).
23. Farhana Z, Naser MN. Livelihoods of the two fishermen communities from Sirajganj and Chandpur districts of Bangladesh. In: Abstracts, 2nd Fisheries Conference and Research Fair. 2006. p. 73–74.
24. Pravakar P, Sarker BS, Rahman M, et al. Present status of fish farming and livelihood of fish farmers in Shahrasti upazila of Chandpur district, Bangladesh. *Am J Agric Environ Sci.* 2013; 13(3): 391–397, doi: [10.5829/idosi.ajeaes.2013.13.03.66116](https://doi.org/10.5829/idosi.ajeaes.2013.13.03.66116).
25. Minar MH, Rahman A, Anisuzzaman M. Livelihood status of the fisherman of the Kirtonkhola River nearby to the Barisal town. *J Agrofor Environ.* 2012; 6: 115–118.
26. Dey SC, Sarker BS, Saha D, et al. Impacts of Banning Period on the Socio-Economic Condition of Hilsa Fishermen of Monpura Island, Bangladesh. MS Thesis, Department of Fisheries And Marine Science, NSTU, Noakhali; 2010.
27. Mazid MA. Development of fisheries in Bangladesh: plans and strategies for income generation and poverty alleviation. 2002.
28. Sunny AR, Ahamed GS, Mithun MH, et al. Livelihood status of the Hilsa (*Tenualosa ilisha*) fishers: the case of coastal fishing community of the Padma River. *Bangladesh J Coast Zo Manag.* 2019; 22(2): 469.
29. Mandal S, Hasan I, Hawlader NH, et al. Occupational health hazard and safety assessment of fishermen community in Coastal zone of Bangladesh. *Int J Heal Econ Policy.* 2017; 2(2): 63–71, doi: [10.11648/j.hep.20170202.14](https://doi.org/10.11648/j.hep.20170202.14).
30. Zytoon M. Occupational injuries and health problems in the Egyptian Mediterranean fisheries. *Saf Sci.* 2012; 50(1): 113–122, doi: [10.1016/j.ssci.2011.07.010](https://doi.org/10.1016/j.ssci.2011.07.010).
31. Haque MA, Hossain MD, Jewel MAS. Assessment of fishing gears crafts and socio-economic condition of Hilsa (*Tenualosa ilisha*) fisherman of Padma River, Bangladesh. 2017.
32. Laraqui O, Manar N, Laraqui S, et al. Prevalence of skin diseases amongst Moroccan fishermen. *Int Marit Health.* 2018; 69(1): 22–27, doi: [10.5603/IMH.2018.0004](https://doi.org/10.5603/IMH.2018.0004), indexed in Pubmed: [29611610](https://pubmed.ncbi.nlm.nih.gov/29611610/).
33. John SM, Trakatelli M, Gehring R, et al. CONSENSUS REPORT: Recognizing non-melanoma skin cancer, including actinic keratosis, as an occupational disease - A Call to Action. *J Eur Acad Dermatol Venereol.* 2016; 30 Suppl 3: 38–45, doi: [10.1111/jdv.13608](https://doi.org/10.1111/jdv.13608), indexed in Pubmed: [26995022](https://pubmed.ncbi.nlm.nih.gov/26995022/).
34. Burke W, Griffith D, Scott C, et al. Skin Problems Related to the Occupation of Commercial Fishing in North Carolina. *North Carolina Med J.* 2006; 67(4): 260–265, doi: [10.18043/ncm.67.4.260](https://doi.org/10.18043/ncm.67.4.260).
35. Warthan MM, Sewell DS, Marlow RA, et al. The economic impact of acute sunburn. *Arch Dermatol.* 2003; 139(8): 1003–1006, doi: [10.1001/archderm.139.8.1003](https://doi.org/10.1001/archderm.139.8.1003), indexed in Pubmed: [12925386](https://pubmed.ncbi.nlm.nih.gov/12925386/).
36. Percin F, Akyol O, Davas A, et al. Occupational health of Turkish Aegean small-scale fishermen. *Occup Med (Lond).* 2012; 62(2): 148–151, doi: [10.1093/occmed/kqr181](https://doi.org/10.1093/occmed/kqr181), indexed in Pubmed: [22113895](https://pubmed.ncbi.nlm.nih.gov/22113895/).
37. Chowdhury RI, Islam MA, Gulshan J, et al. Delivery complications and healthcare-seeking behaviour: the Bangladesh Demographic Health Survey, 1999-2000. *Health Soc Care Community.* 2007; 15(3): 254–264, doi: [10.1111/j.1365-2524.2006.00681.x](https://doi.org/10.1111/j.1365-2524.2006.00681.x), indexed in Pubmed: [17444989](https://pubmed.ncbi.nlm.nih.gov/17444989/).
38. Al Noman M, Sharmin T, Shoshi F, et al. Occupational hazards and health care seeking behavior of fishermen. *Asian J Med Biol Res.* 2020; 6(1): 38–43, doi: [10.3329/ajmbr.v6i1.46477](https://doi.org/10.3329/ajmbr.v6i1.46477).
39. Anwar WA, Mostafa NS, Hakim SA, et al. Health literacy strengths and limitations among rural fishing communities in Egypt using the Health Literacy Questionnaire (HLQ). *PLoS One.* 2020; 15(7): e0235550, doi: [10.1371/journal.pone.0235550](https://doi.org/10.1371/journal.pone.0235550), indexed in Pubmed: [32673345](https://pubmed.ncbi.nlm.nih.gov/32673345/).
40. Chauvin C, Le Bouar G, Lardjane S. Analysis of occupational injuries in the sea fishing industry according to the type of fishery and the fishing activity. *Int Marit Health.* 2017; 68(1): 31–38, doi: [10.5603/IMH.2017.0006](https://doi.org/10.5603/IMH.2017.0006), indexed in Pubmed: [28357834](https://pubmed.ncbi.nlm.nih.gov/28357834/).
41. Rafnsson V. Health problems and disease patterns. In: Stellmann JM. *The ILO Encyclopaedia of Occupational Health and Safety* 1998; 3: 66.1-66.20.