

A cross-sectional study to assess the occupational health hazards among fisherwomen in a metropolitan city

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ABSTRACT

Context: Research on the working conditions and health hazards of fishing communities in developing countries is scarce. **Aims:** 1) To assess the occupational health hazards among women fish vendors. 2) To understand the morbidity profile in them. 3) To analyze various challenges faced by them at the workplace in this occupation. 4) To suggest various measures including ergonomic solutions that they can take to reduce these health hazards. **Settings and Design:** Community-based observational cross-sectional study. **Methods and Material:** Eight fish markets comprising women fish vendors working for more than one year (age > 30 years) in Mumbai were selected. A cluster sampling method was used. The sample size was 225. The period of the study was 2 years. **Statistical Analysis Used:** Chi-square test **Results:** The majority of study subjects had diabetes mellitus (24%) and were overweight (54.7%). Of all participants, 55.1% had musculoskeletal pain of which low back pain (69; 30.7%) was most common. There was a significant association between musculoskeletal pain status and mode of carrying boxes, $\chi^2(1) = 56.35$ as well as with duration of occupation, $\chi^2(3) = 89.67$, $P < 0.001$. Of all participants, 90.2% got injured of which the majority had incisional wounds (124; 61.1%). Of all participants, 55.1% suffered from skin infections of which the majority (28; 12.4%) had itching and redness of hands and legs. There was a significant association between skin infections and duration of occupation, $\chi^2(3) = 140.53$ as well as with the use of gloves (63.2% participants), $\chi^2(1) = 20.395$, $P < 0.001$. **Conclusions:** Various measures including ergonomic solutions that women fish vendors can take to reduce these health hazards need to be addressed.

Keywords: Dockyard, ergonomics, incisional wound, musculoskeletal pain, occupational health, traditional Kolis, unorganized sector

Introduction

Fish trade is a traditional occupation in India and out of total fisherfolk in Maharashtra, around 0.18 million are women.^[1]

The most common health hazard faced by fisherwomen is musculoskeletal disorders (prevalence is 14.4%).^[2]

The original inhabitants of Mumbai with a coastline length of 150 km are “Kolis” who live in pockets called Koliwad. There are a total of 62 documented fish markets in the city.^[3]

Research on the working conditions and health hazards of fishing communities in developing countries is scarce. There is an urgent need to stress upon the ergonomic interventions that may help in improving their quality of life. Family physicians and primary care providers can advocate for the health and safety of fisherwomen by participating in local health committees or engaging with policymakers to ensure proper regulations and safety measures are in place within the fishing industry.

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Objectives

1. To assess the occupational health hazards among women fish vendors.
2. To understand the morbidity profile in them.
3. To analyze various challenges faced by them at the workplace in this occupation.
4. To suggest various measures including ergonomic solutions that they can take to reduce these health hazards.

Subjects and Methods

Study Design: This is a community-based observational cross-sectional study and was conducted in fish markets comprising women fish vendors over a period of 2 years, which was extended due to the lockdown during the COVID-19 pandemic in Mumbai. The study population comprised women above 30 years of age, who had been working (for more than 1 year) as fish vendors. There were no exclusion criteria.

The cluster sampling method was used for choosing the sample. Each fish market was considered a cluster. Eight out of these 62 fish markets in Mumbai were randomly selected by lottery method for the study. Each of them had approximately 50 fisherwomen and the sample size was distributed equally among them. Each fisherwoman was assigned a number and 30 fisherwomen from each market were selected by using a random number table.

Considering prevalence as 14.4% (women fish vendors facing occupational health hazards, i.e., musculoskeletal disorders in India),^[2] and the design effect to be 1.2 in this cluster sampling method, the sample size turns out to be 225.

Ethical clearance (EC/76/2019) was obtained from the Institutional Ethics Committee, which was recognized by SIDCER and compliant with FERCAP. After obtaining written informed consent, all women fish vendors fulfilling inclusion criteria were included in the study. The purpose of the study was explained to the women, and data was collected as a workplace survey as per their convenience, by a direct face-to-face interview. The interview schedule that was used for the interview was validated by an expert committee of the Department of Community Medicine.

Study Instruments

1. Interview Schedule
2. Physical Instruments

Interview Schedule

An interview schedule was designed comprising two parts.

PART A: Sociodemographic characteristics.

PART B: Occupational health related.

After the interview participants were asked to come to a side room (i.e., a storeroom for fish baskets, ice boxes, chopping

instruments, etc., inside the fish market) for clinical examination, and individual anthropometric measurements were taken.

Precautions were taken not to make the participants uncomfortable while taking measurements. Height and weight were measured using digital weighing machine and non-stretchable measuring tape, respectively, as per standard protocol.

Data entry was done using Microsoft Excel version 2019 and analyzed using SPSS version 22.0. The Chi-square test was used.

Results

Out of 225 respondents, 84.9% belonged to the traditional Koli communities. These Koli communities mostly are settled along the beach and earn their livelihood from fishing. Religion-wise, 94.7% were Hindus, and had a mean age of 45.3 years. Table 1 also reveals that 48.9% of respondents studied till the fifth standard. The mother tongue for 191 of the fisherwomen was Marathi (84.9%), for 12 (5.3%) it was Bengali, for 8 (3.6%) it was Tamil, for 7 (3.1%) it was Telugu, for 5 (2.2%) it was Odiya and for 2 (0.9%) it was Malayalam. The bulk of the workforce sold marine fish (97.8%) and only 5 (2.2%) sold freshwater fish as this study was conducted in the coastal districts. Table 1 shows that 22 (10.2%) of the fish sellers' husbands were jobless, 145 (67.5%) were practicing the same profession and 48 (22.3%) were in different professions. In the current study, 199 (88.5%) fisherwomen were selling fish at the market, 16 (7.1%) were cleaning fish, and 10 (4.4%) were auctioning fish at dockyards [Table 1].

In the current study, 140 (62.2%) fish vendors were sitting in the market for 5-10 hours duration, 75 (33.4%) worked for more than 10 hours and only 10 (4.4%) worked for less than 5 hours. Of all participants, the majority, 95 (68.3%), of the fish sellers who went to dockyard daily had musculoskeletal pain compared to 9 (23.1%) fish vendors who went to dockyard twice a week and 20 (42.6%) fish vendors who went to dockyard every 2 days [Table 2]. Of all the participants, 124 (55.9%) participants had experienced musculoskeletal pain in the last 6 months, whereas 101 (44.1%) had not experienced any such pain [Table 2]. The majority of women had low back pain (69; 30.7%), followed by knee pain (37; 16.4%), neck pain (11; 4.9%) and shoulder pain (7; 3.1%).

In our study, the majority (59; 80.8%) of the fish sellers who dipped their hands into stored water repeatedly got skin infections compared to 16 (21.3%) participants who washed their hands with running water each time after cutting fish, 27 (64.3%) who wiped their hands with a cloth and 22 (62.9%) fish vendors who did not clean their hands every time [Table 3]. It shows that participants who did not use splash gowns had a higher proportion of skin infections compared to those using them (71.7% vs. 20.5%). Similarly, participants who did not use gloves had a higher proportion of skin infections compared to those wearing gloves (63.2% vs. 27.5%) [Table 3].

Table 1: Sociodemographic profile of fisherwomen (n=225)

| Distribution of Participants by | % or Median (IQR) |
|---------------------------------|-------------------|
| Religion | |
| Hindu | 94.7% |
| Christian | 4.9% |
| Muslim | - |
| Others | 0.4% |
| Age-wise distribution | |
| 30–40 years | 84 (37.3%) |
| 40–50 years | 69 (30.7%) |
| 50–60 years | 66 (29.3%) |
| >60 years | 6 (2.7%) |
| Language (mother tongue) | |
| Marathi | 84.9% |
| Bengali | 5.3% |
| Tamil | 3.6% |
| Telugu | 3.1% |
| Odiya | 3.3% |
| Malayalam | 0.9% |
| Marital status of participants | |
| Married | 81.4% |
| Widowed | 9.3% |
| Separated | 4.9% |
| Unmarried | 4.4% |
| Educational status | |
| Illiterate | 84 (37.3%) |
| up to 5 th standard | 110 (48.9%) |
| 5-10 th standard | 28 (12.5%) |
| Above 10 th standard | 3 (1.3%) |
| Socioeconomic status | |
| Upper class | 5.3% |
| Upper middle class | 29.8% |
| Middle class | 46.2% |
| Lower middle class | 18.7% |
| Reason for being fisherwomen | |
| Traditional Kolis | 84.9% |
| Adopted profession | 15.1% |
| Nature of work | |
| Selling fish at the market | 88.5% |
| Cleaning fish | 7.1% |
| Auctioning fish | 4.4% |
| Type of fish sold by | |
| Marine | 97.8% |
| Freshwater | 2.2% |
| Husband's Occupation | |
| Same profession | 67.5% |
| Different profession | 22.3% |
| Jobless | 10.2% |

Discussion

Sociodemographic profile of women fish-vendors

Religion was included to understand the religious diversity among the women fish sellers. The study by Pataik *et al.*^[4] shows that traditional fishing communities have been in recent focus as the majority of fishermen go fishing and the women in their family process and sell those fish. A language-wise distribution shows cultural diversity in the fish vending business which is not limited to the traditional local Koli community.

In the present study, the mean monthly income of participants is INR 8,671 with a minimum income of INR 4,000 and a maximum of INR 21,000. This is more than the study finding by P Tripathi *et al.*,^[2] where the salary ranged from INR 3,000–4,000. The reason for more annual income in the fisherwomen may be due to the area of study, which is a metropolitan city where the cost of living is high.

We also found that 91.1% of participants had gas connections, 69.3% had two-wheeler vehicles, 75.6% had water filters, 1.3% had washing machines, 40.4% had refrigerators, 92.9% had television sets, but none had air conditioners or computers in their homes. In the current study, 183 (81.4%) were married, 21 (9.3%) were widowed, 11 (4.9%) were separated, 10 (4.4%) were unmarried but none of them were divorced. This study finding was similar to the study by Shibaji Mandal *et al.*^[5] where 75% were married and 25% were unmarried.

It also shows that the majority (200; 88.9%) of fish vendors slept daily for more than 6 hours and 25 (11.1%) slept for less than 6 hours. The total weekly working hours were more than 48 hours, which is recommended by the Factories Act of 1948, the Minimum Wage Act of 1948^[6]; and the Shops and Establishment Act.^[7]

The study depicts that the joblessness of the participants' husbands might be the reason why women fish vendors who were not traditional Kolis were doing this business. In this study, the total number of fisherwomen having complications in at least one pregnancy was 58 (27%) and fish sellers having a single miscarriage was 22 (10.2%).

In our study, 168 (78.1%) fish sellers had institutional delivery and 47 (21.9%) had home delivery. Institutional delivery among fish sellers was much less than the institutional delivery in the general population of urban India, which was 93.8% according to NFHS 5 (2019–2021).^[8] The reason for the low proportion may be due to the age group of the participants who were mostly middle-aged and their deliveries were in earlier decades.

Occurrence of morbidities in women fish sellers

The study shows that 32 (14.2%) of the participants suffered from diabetes mellitus, 14 (6.2%) had thyroid disorders, 45 (20%) suffered from hypertension, 4 (1.8%) suffered from both diabetes mellitus and thyroid disorders, 9 (4%) had both diabetes mellitus and hypertension, 9 (4%) suffered from both diabetes mellitus and some other illness, 4 (1.8%) suffered from other illnesses and 105 (46.7%) participants did not have any chronic illnesses 32 (14.2%). Our findings are similar to a study by Müller Jdos S *et al.*,^[9] where the prevalence of hypertension is 27.3% but the prevalence of diabetes mellitus was 6.7%, which is much lesser than the study finding. The prevalence of hypertension is similar to the general Indian population (29.8%) in the study by R. Anchala *et al.*^[10] and lesser than that of the population in Mumbai, which is 36% (Mahadev D. Bhise *et al.*)^[11]

Table 2: Association of musculoskeletal pain with various variables

| Association of Musculoskeletal pain with | No. of participants (%) | Statistical results |
|--|-------------------------|--|
| 1. Mode of carrying boxes | | $\chi^2 (1) = 56.35, P<0.001,$ Cramer's V, $\phi = 0.5, P<0.001.$ |
| i) By themselves | 68 (73.1%) | |
| ii) By hired labourer | 30 (22.7%) | |
| 2. Duration of occupation | | $\chi^2 (3) = 89.67, P<0.001.$ Cramer's V=0.631, $P<0.001$ |
| i) 0–10 years | 2 (7.4%) | |
| ii) 10–20 years | 23 (28.8%) | |
| iii) 20–30 years | 77 (80.2%) | |
| iv) 30–40 years | 22 (100%) | |
| 3. Duration of sitting at the market | | $\chi^2 (2) = 50.7, P<0.001,$ Cramer's V=0.475, $P<0.001.$ |
| i) <5 years | 2 (20%) | |
| ii) 5–10 years | 56 (40%) | |
| iii) >10 years | 66 (88%) | |
| 4. Visits to the dockyard | | $\chi^2 (2) = 29.01, P<0.001.$ Cramer's V=0.359, $P<0.001.$ |
| i) Twice a week | 9 (23.1%) | |
| ii) Every two days | 20 (42.6%) | |
| iii) Every day | 95 (68.3%) | |

Table 3: Association of skin infection with various variables

| Association of skin infection with | No. of participants (%) | Statistical results |
|--|-------------------------|--|
| 1. Duration of occupation | | $\chi^2 (3) = 140.53, P<0.001$ Cramer's V=0.79, $P<0.001$ |
| i) 0–10 years | 2 (7.4%) | |
| ii) 10–20 years | 13 (16.3%) | |
| iii) 20–30 years | 87 (90.6%) | |
| iv) 30–40 years | 22 (100%) | |
| 2. Method of hand cleaning after cutting | | $\chi^2 (3) = 56.37, P<0.001,$ Cramer's V=0.5, $P<0.001$ |
| i) Wash it with running water | 16 (21.3%) | |
| ii) Dip it in stored water | 59 (80.8%) | |
| iii) Wipe it with a cloth | 27 (64.3%) | |
| iv) Do not wash their hands | 22 (62.9%) | |
| 3. Use of splash gown | | $\chi^2 (1) = 52.18, P<0.001,$ Cramer's V, $\phi=0.48, P<0.001$ |
| Yes | 15 (20.5%) | |
| No | 109 (71.7%) | |
| 4. Use of gloves | | $\chi^2 (1) = 20.395, P<0.001,$ Cramer's V, $\phi=0.301, P<0.001$ |
| Yes | 14 (27.5%) | |
| No | 110 (63.2%) | |

We found that 72 (32%) of fish vendors had normal BMI, 123 (54.7%) were overweight and 30 (13.3%) participants were obese. Our finding differed from a rural setting-based study by Pallavi Sengupta *et al.*,^[12] where obesity is absent and 6% were found to be overweight.

Occupational health hazards among women fish vendors

Out of the total 124 participants who had musculoskeletal pain, 16 (7.1%) were between 30–40 years, 51 (22.7%) were each between 40–50 years and 50–60 years of age and 6 (2.7%) were above 60 years of age. This finding is much less than the study by Gomathy Parasuraman *et al.*^[13] in which the prevalence of musculoskeletal problems was 14.4%.

Most of the participants had continuous pain (90; 40%), while 34 (15.1%) participants had intermittent pain. This higher prevalence of musculoskeletal pain (44.9%) among fisherwomen than the general population (25.9%) may be attributed to the

carrying of heavy loads on a daily basis, long sitting hours at the marketplace, and their posture while sitting. The body parts significantly involved depend on the kind of physical exertion during work.

Our study shows that 124 (55.1%) participants suffered from some skin infections while 101 (44.9%) did not have any skin infections. The possible explanation for the lesser prevalence of skin infections or changes in our study may be attributed to the use of personal protective measures and proper hand-washing techniques during work.

This study depicts that 53 (23.6%) of the participants suffered from headaches, 47 (20.9%) participants had tingling sensations in their hands or legs and 48 (21.3%) participants had numbness in their hands or legs. The possible reason for headaches may be a heavy workload. The tingling sensation and numbness of the hand may be due to dealing with ice, continuous emersion of hands into chilled water, or maybe the result of low calcium levels in women fish vendors.

The commonest occupational injuries included incisional wounds in 124 (61.1%) participants followed by bruises in 79 (38.9%) participants. The reason for injury was sharp objects in 124 (61.1%) participants and blunt objects in 79 (38.9%). Sharp objects may be fish knives, paring knives, botis, bill hooks, etc., and blunt objects may be hammers used to break ice bars [Figure 1]. After injury 177 (87.2%) participants took home remedies or self-medication and only 26 (12.8%) went to healthcare facilities for treatment. This finding was similar to a systematic review including four studies from developing countries showing proportions of nonfatal injuries between 55% and 61% among artisanal fisher folks.^[14] This shows that the health-seeking behaviour of these fish vendors was poor. The most common reason for not going to healthcare facility for treatment was loss of daily wages.

Challenges faced by fish vendors at the workplace

Among the 84 participants who travelled in public transport, 72 (85.7%) had opposition from co-passengers and the most common reason was the smell of fish and 12 (14.3%) faced no opposition. But as the daily cost of travelling was much lower in public transport such as buses or shared taxis, it was preferred over private transport.

There was non-use of gloves in the majority of participants 174 (77.3%) [Figure 2], 73 (32.4%) did wear splash gowns (reusable), and only 5 (2.2%) wore some kind of gear to protect eyes. All participants wore chappals to protect their feet but none of them wore gumboots or shoe covers. Our findings showed better practices than those in the study by Amaravathi Thirumoorthy *et al.*,^[15] where 15% of women wore aprons at work, 23% wore gumboots, and 6% wore gloves in both hands.

Thirt-seven (16.4%) participants had faced verbal abuse by buyers, 1 (0.4%) participant had faced harassment by male co-workers and 2 (0.9%) participants had been threatened by co-sellers. These findings concur with the findings by P. Tripathi *et al.*,^[2] where 14.6% of workplace violence was reported in the past

1 year, including 8% physical assault, 4% sexual harassment and 88% verbal abuse.

The majority of participants (156; 69.3%) changed to selling fish available during monsoon season, 38 (16.9%) participants switched over to some other business rather than selling fish and 31 (13.8%) participants did not do anything during this season. Mostly during monsoon, due to fluctuating sea-level and high tides fishing is banned by the government as per Md. Monirul Islam *et al.*^[16]

Most of the participants 121 (53.8%) invested their savings into their child's education, 61 (27.1%) invested in buying gold, 33 (14.7%) saved it as fixed deposits in banks and the rest 10 (4.4%) invested it on others. None of the participants invested money in real estate. These fish vendors consider gold ornaments as their security that helped them tide over situations of catastrophic expenditure by re-selling or mortgaging them.

Association between risk factors and occupational health hazards

Participants carrying boxes on their own had a higher proportion of the presence of musculoskeletal pain as compared to those who hired labourers to carry boxes (73.1% vs. 57.5%). This is similar to the study by Jillian L. Kadota *et al.*,^[17] where 64.8% (95% CI: 44.8–84.7) of those in the high load weight category experienced low back pain versus 32.6% (95% CI: 13.7–51.6) of those in the low load weight category. This study shows that as the duration of occupation and duration of sitting at the workplace increases, the frequency of musculoskeletal pain also increases, which was statistically significant.

We conclude that as the duration of occupation increases, the proportion of skin infections also increases. This finding is similar to the study by Feng Le *et al.*^[18] in which there was a significant association ($P = 0.018$) between the period of working years and the presence of hand dermatitis.



Figure 1: Use of sharp objects for cutting fish



Figure 2: Non-use of protective gear such as gloves and splash gowns

Conclusion

To avoid physical injuries, they should be made aware of the importance of protective gloves, and wooden block during cutting and cleaning fish. Various measures including ergonomic solutions that women fish vendors can inculcate to reduce these health hazards need to be addressed. As there is an increased number of skin infections or skin changes, they should be advised to use protective gear such as reusable splash gowns, gloves, foot covers and spectacles for eyes whenever possible. Participants who carry their boxes should try to pool in together with other such participants and hire labourers to carry boxes. In this way, there will be a decreased proportion of musculoskeletal pain and minimal daily expenditure. They can be also advised to use mechanical equipment instead of manual labour such as two-wheelers with carrier boxes on them or device to carry boxes that uniformly distributes weight throughout the body.

As most of the participants are either obese or overweight; hence, lifestyle modifications such as a balanced diet, eating food at proper time and avoiding street food should be recommended.

At the marketplace, there should be separate clean toilet facilities for women fish vendors, proper drainage of waste water, separate disposal of dry and wet waste by the municipal corporation and availability of first aid kits that were not available at fish markets in this study [Figure 3].

Primary care providers can advise fisherwomen to maintain good postures, take small breaks in between and do some pain-relieving exercises in view of their long hours of sitting at the marketplace. Physicians can help in the management of physical injuries and chronic diseases, provide mental health support, conduct ergonomic assessments at the workplace and initiate ergonomic sitting arrangements for fisherwomen. Routine oral cancer screening and regular awareness sessions by family physicians should be arranged for them considering their increased tobacco use.



Figure 3: Improper water disposal and open drain

Limitations

Our data collection period was during the COVID-19 pandemic, so it was inconvenient to do a detailed general and systemic examination of each participant. Except for weight and height, other anthropometric measurements could not be done.

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Key Messages

There is an urgent need to stress upon the prevention of occupational hazards in fishing communities which is an unorganized sector in India. This study recommends different ergonomic solutions to prevent these hazards along with conducting awareness sessions and screening camps at fish markets to empower women fish vendors.

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Conflicts of interest

There are no conflicts of interest.

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