ORIGINAL ARTICLE

Assessment of Hazards, Risks and Controls Associated with Fish Landing Jetty Workers' Activities in Kuantan, Pahang

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ABSTRACT

Introduction: The fishing industry significantly contributes to Malaysia's economic growth, yet it remains high-risk due to various occupational safety and health issues. Previous studies have shown that fishermen face higher injury, morbidity, and fatality rates than other industries, largely due to the physically demanding and hazardous conditions on fishing vessels and landing jetties. To date, only two hazard identification, risk assessment, and risk control (HIRARC) studies have been conducted at Malaysian fish landing jetties, with none in Pahang. This study aimed to assess hazards faced by purse-seine and trawler workers at the Kuantan fish landing jetty. **Materials and Methods:** A descriptive observational study was conducted using walk-through inspections with the HIRARC Assessment Form, adapted from Department of Occupational Safety and Health (DOSH) guidelines. **Results:** Physical hazards, such as slippery floors, were the most frequently reported across both fishing vessels. However, ergonomic hazards had the highest percentage of hazards with a significant relative risk (Purse-seine: 38.3%; Trawler: 42.6%), warranting a medium to high priority for intervention. Although purse-seine vessels had a greater total number of hazards, trawler workers faced a slightly higher risk of ergonomic hazards, primarily due to manual handling of heavier loads. The high ergonomic risk was evident across the main activities of both vessels (R score = 9), while physical hazards showed the lowest risk (R score = 4). **Conclusion:** Since the existing controls are inadequate, implementing the recommended controls is crucial to ensure the safety and well-being of fishermen and other fish landing jetty workers.
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INTRODUCTION

The fishing industry in Malaysia is vital for food security and economic growth, contributing RM16.5 billion to the Gross Domestic Product (GDP) in 2023 (1). This contribution is driven by small-scale and commercial fisheries, with operations that flow from offshore catch to fish landing jetties, where workers unload, sort, process, and pack catches before distributing them to markets (2). Within the commercial fishery, purse-seine vessels use large encircling nets to capture pelagic species such as mackerel and sardines, while trawlers use cone-shaped nets to haul along the seabed to harvest demersal species such as snapper (3) (**Fig. 1**).

Despite its economic importance, the fishing industry is recognised as a high-risk occupation (4, 6, 7), with a fatality rate of 27.32 per 100,000 workers in 2021 (5). While offshore fishing risks are well documented, workers at fish landing jetties face equally significant risks, yet remain underreported. These workers, including vessel owners and their crew members, fishing net repairers, and support staff, are exposed to ergonomic, physical, biological, chemical and psychosocial hazards due to physically demanding and inherently hazardous work environments (8, 9). The type and severity of these hazards may vary between vessel types, as differences in purse-seine and trawler designs influence both fishing operations and jetty procedures.

Hazard Identification, Risk Assessment, and Risk Control (HIRARC), established by the Department of Occupational Safety and Health (DOSH) Malaysia, provides a systematic framework for identifying hazards, assessing risk and implementing targeted controls. Although HIRARC has helped reduce accident rates in construction (10), its application in fisheries remains limited despite comparable occupational risks. To date, only two HIRARC studies have examined fish landing jetties, and none have been conducted in Pahang. Given that the state has the second-longest coastline in Peninsular Malaysia and that Kuantan is a major regional fishing hub, this gap leaves jetty workers without evidence-based safety guidance. Therefore, this study aimed to conduct an HIRARC assessment of purse-seine and trawler activities at the fish landing jetty in Kuantan, Pahang.

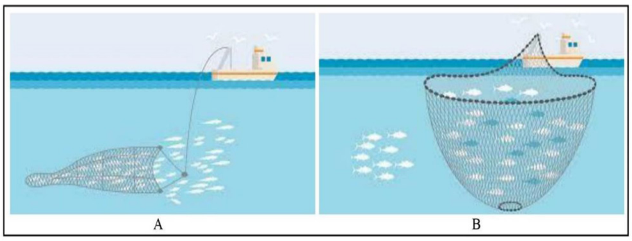

Fig. 1: Trawler (A) and Purse-seine Fishing Technique (Adapted from Marine Stewardship Council, n.d.)

MATERIAL AND METHODS

Study Design
This study employed an observational descriptive design with a semi-quantitative method approach. Ethical approval was obtained from the Kulliyyah of Allied Health Sciences Postgraduate and Research Committee (KAHS 45/24) and IIUM Research Ethics Committee (IREC) (IREC 2024-196).

Study Area and Population
This study was conducted at the fish landing jetty in Kuantan, Pahang, Malaysia, where approximately 1,000 workers are involved in the fish landing for commercial fishing vessels. The HIRARC assessment was conducted at two bays of Jetty Phase 2 between March and May 2024. Using a convenience sampling, the main activities of three purse-seines (approximately 25 workers per vessel) and four trawlers (approximately 15 workers per vessel) were observed during this period, from their arrival until departure from the bays.

Instrumentation and Assessors
The HIRARC assessment was conducted in accordance with the Guidelines for Hazard Identification, Risk Assessment, and Risk Control (11), using an adapted version of the DOSH HIRARC form as described by Ruslan et al. (12). Briefly, the standard 5-point Likert scale was reduced to a 4-point scale by merging the “Remote” and “Inconceivable” categories for likelihood and combining the “Fatal” and “Catastrophic” categories into a single highest severity level. This modification was intended to simplify field-based assessments and enhance rater consistency, although it may reduce sensitivity to subtle differences in risk levels (12).

The HIRARC assessment was conducted by two research students trained in the HIRARC guideline by the supervisory team, who had also observed the job tasks on-site. The assessment was supervised by qualified Occupational Safety and Health supervisors and by HIRARC-trained personnel with practical experience in conducting and reviewing workplace hazard identification, risk assessment, and control measures for occupational safety and health certification. A pilot study was conducted to ensure consistency between assessors prior to the actual assessment.

Data Collection and Analysis
Step 1: Classification of Work Activities
Purse-seines and trawlers are the main types of commercial fishing vessels operating at this jetty, each employing slightly different fishing and processing techniques. All main and sub-activities of these fishing vessels at the jetty were recorded based on Job Hazards Analysis (11). The recorded sub-tasks were then classified by work process phase and job task regularity (i.e., routine, non-routine, and ad hoc).

Step 2: Hazards Identification
During the walk-through survey, all potential hazards associated with each sub-activity that could affect the safety and health of fishermen and other workers at the fish landing jetty were identified and recorded. Face-to-face interviews with the workers and employers were also conducted to gather more detailed information and ensure a comprehensive understanding of these hazards.

All reported hazards (N) were then classified into four categories (i.e. physical, chemical, biological, ergonomic, and psychosocial), and the total count for each category (n) was derived by summing all occurrences within each vessel type. Percentages were calculated by dividing the number of hazards in each category by the total number of hazards reported for that vessel type, then multiplying by 100.

Step 3: Risk Assessment
Potential injuries associated with each hazard identified were documented. Then, the relative risk (R) level was determined for each identified hazard based on: i) Likelihood of hazardous exposure (occurrence), and ii) Severity of potential health impacts (consequences) from exposure. Likelihood (L) and Severity (S) were assigned numerical ratings using predefined criteria, and the relative risk score was calculated as $R = L \times S$. A risk matrix was used to estimate the outcome relative risk level and to determine the appropriate action plan (**Table I**). In this matrix, green indicates a non-significant risk with no priority, yellow indicates a significant risk with medium priority, and red represents a significant risk with high priority for intervention.

Step 4: Determination of Existing Control
The existing controls for each identified hazard were recorded and categorised based on the Hierarchy of Controls. Their effectiveness was determined through experience, expert consultation, and a literature review. Alternative controls were recommended where further risk reduction was possible.

Table I: Risk matrix

Likelihood / Severity	1 Negligible	2 Minor	3 Major	4 Fatality
4 Very likely	4	8	12	16
3 Likely	3	6	9	12
2 Unlikely	2	4	6	8
1 Highly unlikely	1	2	3	4

Green indicates a non-significant risk with no priority; yellow indicates a significant risk with medium priority; and red represents a significant risk with high priority for intervention.

Statistical Analysis

Intra- and inter-rater reliability for pilot study risk ratings was assessed using Cohen's kappa coefficient in SPSS version 29. The analysis followed McHugh's (13) benchmarks, with a Cohen's kappa (κ) value of 0.80 or above considered acceptable reliability. For the main study, descriptive analysis was performed to report the frequency and percentage of hazards identified in each main activity of both fishing vessels.

RESULTS

Intra- and Inter-Rater Reliability

The pilot study demonstrated high intra- and inter-rater reliability (Cohen's κ = 0.8884 and 0.844). According to McHugh (13), this value indicated 'almost perfect' agreement, confirming high reliability and consistency of the assessment methodology for the subsequent analyses.

Description of Main and Sub-Activities

The fish landing operation at the jetty, Kuantan, Pahang, was involved in five main activities, starting with i) transferring catch from the vessel to the jetty, ii) sorting catch, iii) weighing catch, iv) packing catch, and v) transporting catch for distribution or selling.

Although the main activities were similar, the number of sub-activities and their execution differed slightly between purse-seine and trawler fishing vessels. For instance, purse-seine workers used a hoist crane to transfer catches, whereas trawler workers did not. During sorting, purse-seine workers stood around fixed tables to categorise catches by type and size, whereas the trawler workers had pre-packed catches in plastic bags and only rearranged them on the jetty floor. Another difference was the weight of the iceboxes: purse-seine workers handled heavier boxes (140 kg) than trawler workers (80 kg).

The workforce requirements also varied. Transferring involved four to five workers; sorting required more than five workers (for purse-seine) or two (for trawler); weighing/transferring involved up to two workers (for purse-seine) or four (for trawler); and packing/loading required two to three workers.

Classification of Hazards

Purse-seine (N=81) presented more identified hazards than the trawler (N=68) (**Fig. 2**). The most common category of hazards for both fishing vessel activities was physical (e.g. slippery floors), followed by ergonomics (e.g. push, pull, lift and lower full catches). Trawler work activities (n=29, 42.6%) showed a slightly higher percentage of ergonomic hazards than the purse-seine activities (n=31, 38.3%). In contrast, only purse-seine workers were exposed to psychosocial (e.g. prolonged and odd working hours) and biological hazards (e.g. fish toxins).

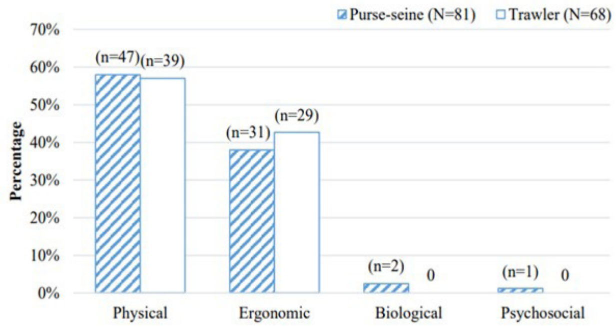

Fig. 2: Classification of Hazards

Relative Risk Levels Across Main Activities

In the following section, HIRARC findings for each main task are presented. Only the most common sub-activities for both fishing vessels that pose the highest relative risks are highlighted for each category of hazard.

Activity 1- Transferring Catches

Table II summarises the hazards identified during catch transfer from the vessel to the jetty. R scores ranged from 4 to 9, with the highest risks associated with ergonomic hazards from lifting/pushing loads of up to 100 kg (R score = 9), resulting in back and shoulder discomfort. Physical hazards, such as slippery floors (R score = 4), were common across both fishing vessels and all main activities. Although most workers wore safety rubber PVC boots, installing anti-slip epoxy-coated flooring may further reduce the risk of fall-related injuries, such as fractures and sprains. Biological hazards were unique to purse-seine workers due to the use of a hoist crane (R score = 6), which posed risks of tetanus and other infections.

Activity 2- Sorting Catches

Table III shows that purse-seine workers faced more hazards during sorting than trawler workers, as trawler sorting was mainly conducted onboard during offshore operations. Due to the high volume of catches, purse-seine workers were exposed to prolonged standing and repetitive motions (R score = 9), time pressure (R score = 4), and a risk of skin infection and envenomation during sorting activities (R score = 6). Although PPE, such as nitrile gloves and safety rubber PVC boots, were used, ergonomic sorting workstations with adjustable-height tables, job rotation, and revised schedules were

Table II: HIRARC of Transferring Catch

Hazard Identification			Risk Assessment					Risk Control
Classification of Hazard	**Common Sub-activities (Hazards)**	**Potential Health Impact**	**Most Affected Vessel**	**Existing Controls**	**L**	**S**	**R**	**Recommended Control**
Ergonomic	Lifting or pushing 65-100kg loads (Manual handling overload)	Back/shoulder discomfort	Both	Teamwork (2 workers), power-assisted hoist, trolley	3	3	9	**Engineering:** Use well maintained wheeled trolley with load limit label displayed **Administrative:** Conduct manual handling training
Biological	Handling a rusty hook with an open wound (Contaminated metal exposure)	Infection by *Clostridium tetani*	Purse-seine only	Latex / Knitted gloves	2	3	6	**Engineering:** Replace to a stainless steel hook **Administrative:** Tetanus vaccination **Personal Protective Equipment:** Use nitrile or Kevlar gloves
Physical	Walking on a slippery floor (Slip and fall)	Slip or fall related injuries (sprains, fractures)	Both	Safety rubber PVC boots, warning signage	2	2	4	**Engineering:** Recoat the floor with anti-slip epoxy coating

L: Likelihood (probability of occurrence), S: Severity (expected impact of harm), R: Relative Risk (L x S).
R level: Yellow = medium risk with medium priority for intervention; Red = high risk with high priority for intervention.

Table III: HIRARC of Sorting Catch

Hazard Identification			Risk Assessment					Risk Control
Classification of Hazard	**Common Sub-activities (Hazards)**	**Potential Health Impact**	**Most Affected Vessel**	**Existing Controls**	**L**	**S**	**R**	**Recommended Control**
Ergonomic	Sorting catches in standing position for >2h. (Static and sustained body posture)	Back/shoulder discomfort, fatigue	Purse-seine only	Teamwork (>5 workers)	3	3	9	**Administrative:** Job rotation **Engineering:** Provide adjustable height and tilting sorting tables
Biological	Direct contact with the fish during sorting (Exposure to fish toxin)	Infection by fish toxin (envenomation)	Purse-seine only	Latex / Knitted gloves	3	2	6	**Administrative:** Conduct fish handling training **Personal Protective Equipment:** Use nitrile or Kevlar gloves
Physical	Walking on a slippery floor (Slip and fall)	Slip or fall related injuries (sprains, fractures)	Both	Safety rubber PVC boots, warning signage	2	2	4	**Engineering:** Recoat the floor with anti-slip epoxy coating
Psychosocial	Rushing work due to odd working hours (Fast-paced work)	Stress, burn-out	Purse-seine only	Support from other workers	2	2	4	**Administrative:** Adjust work schedule

L: Likelihood (probability of occurrence), S: Severity (expected impact of harm), R: Relative Risk (L x S).
R level: Yellow = medium risk with medium priority for intervention; Red = high risk with high priority for intervention.

recommended.

Activity 3- Weighing Catch
Lifting 65 kg baskets was a common sub-activity among purse-seine and trawler workers during weighing catch at the jetty, with the R score of 9 (**Table IV**). Manual team lifting was performed by 2 to 4 workers. However, providing a lift-assist device and conducting manual handling training are recommended to minimise the risks of back pain, muscle strain, and cumulative musculoskeletal disorders.

Activity 4- Packing Catch
During packing catch, both purse-seine and trawler workers were required to lift and tilt a 65 kg basket to pour their contents into iceboxes (**Table V**). This task was typically performed by a team of two or three workers. However, due to limited workspace, this task was carried out with restricted body movement, which increased the risk of severe shoulder and back pain (R score = 9).

Activity 5- Transporting Catch
Table VI shows that the highest R score was associated with the task of lifting and lowering iceboxes weighing up to 140 kg (R score = 9). Although forklifts and adjustable lifting devices were used to transfer the iceboxes and load them onto the truck, manual handling was still required to guide and rearrange them. Hence, use of a hoist crane with a load limit label per icebox, and implementing job rotation, is recommended to minimise the risk of severe shoulder and back pain.

DISCUSSION

Fish landing operations at the jetty involve five main activities with multiple sub-activities, which vary slightly between purse-seine and trawler vessels due

Table IV: HIRARC of Weighing Catch

Hazard Identification			Risk Assessment					Risk Control
Classification of Hazard	Common Sub-activities (Hazards)	Potential Health Impact	Most Affected Vessel	Existing Controls	L	S	R	Recommended Control
Ergonomic	Lifting 65kg baskets (Manual handling overload)	Back/shoulder discomfort	Both	Teamwork (2 workers)	3	3	9	**Engineering:** Use lift-assist device **Administrative:** Conduct manual handling training
Physical	Walking on a slippery floor (Slip and fall)	Slip or fall related injuries (sprains, fractures)	Both	Safety rubber PVC boots, warning signage	2	2	4	**Engineering:** Recoat floor with anti-slip epoxy coating

L: Likelihood (probability of occurrence), S: Severity (expected impact of harm), R: Relative Risk (L x S).
R level: Yellow = medium risk with medium priority for intervention; Red = high risk with high priority for intervention.

Table V: HIRARC of Packing Catch

Hazard Identification			Risk Assessment					Risk Control
Classification of Hazard	Common Sub-activities (Hazards)	Potential Health Impact	Most Affected Vessel	Existing Controls	L	S	R	Recommended Control
Ergonomic	Pushing/pulling trolley with 2-5 baskets (>50m) (Manual handling overload)	Back/shoulder discomfort	Both	Trolley	3	3	9	**Engineering:** Use well maintained wheeled trolley with load limit label displayed **Administrative:** Conduct manual handling training, Job rotation
Physical	Walking on a slippery floor (Slip and fall)	Slip or fall related injuries (sprains, fractures)	Both	Safety rubber PVC boots, warning signage	2	2	4	**Engineering:** Recoat the floor with anti-slip epoxy coating

L: Likelihood (probability of occurrence), S: Severity (expected impact of harm), R: Relative Risk (L x S).
R level: Yellow = medium risk with medium priority for intervention; Red = high risk with high priority for intervention.

Table VI: HIRARC of Transporting Catch

Hazard Identification			Risk Assessment					Risk Control
Classification of Hazard	Common Sub-activities (Hazards)	Potential Health Impact	Most Affected Vessel	Existing Controls	L	S	R	Recommended Control
Ergonomic	Lifting/lowering 80-140kg iceboxes (Manual handling overload)	Back/shoulder discomfort	Both	Teamwork (2 workers)	3	3	9	**Engineering:** Use hoist crane with load limit label displayed **Administrative:** Job rotation
Physical	Walking on a slippery floor (Slip and fall)	Slip or fall related injuries (sprains, fractures)	Both	Safety rubber PVC boots, warning signage	2	2	4	**Engineering:** Recoat the floor with anti-slip epoxy coating

L: Likelihood (probability of occurrence), S: Severity (expected impact of harm), R: Relative Risk (L x S).
R level: Yellow = medium risk with medium priority for intervention; Red = high risk with high priority for intervention.

to differences in vessel design. Both vessel types are exposed to multiple hazards, most of which are common across the activities and vessel types. Therefore, the following discussion focuses on the hazards with the highest relative risks in each category, specifying the associated activities only when they are particularly relevant.

Physical Hazard

Physical hazards refer to environmental conditions that can cause injury (14). In the present study, slippery decks and jetty floors were identified as the most common physical hazards to both fishing vessels and across all main activities. HIRARC assessment rated these hazards as moderate risk (R score = 4), as the use of safety boots provides a primary control measure against slips and falls. Similar findings show that slip-resistant footwear halves the incidence of slips among healthcare workers, while laboratory studies indicate that floor coatings further enhance the slip resistance of safety boots, particularly on polyurethane surfaces (15, 16). Thus, combining safety boots with engineering measures such as non-slip floor coatings and anti-slip mats can significantly reduce slips and falls in this workplace.

Ergonomic Hazard

Ergonomic hazards are physical factors or conditions that contribute to musculoskeletal injuries (14). In the present study, they accounted for the highest proportion of hazards with a significant relative risk, requiring medium- to high-priority interventions. Trawler workers experienced slightly higher exposure than purse-seine workers, though relative risks were comparable. Based on the analysis of their sub-activities, these workers were subjected to three main ergonomic risk factors: i) Forceful exertion, ii) Static and sustained work posture, and iii) Repetitive motion.

Forceful Exertion and Repetitive Motion
Forceful exertion (i.e. pushing, pulling, lifting, lowering, and carrying heavy loads) was the main ergonomic hazard observed at the jetty. Workers frequently moved full-catch baskets (~65 kg) and iceboxes (80–140 kg) over short distances manually or in pairs. At the same time, trolleys were used for longer distances but were often overloaded and operated by a single worker. Trawler workers faced higher risks because manual lifting/lowering was required to transfer the catch from the fishing vessel to the jetty, unlike purse-seine workers, who used hoist cranes.

The Department of Occupational Safety and Health (17) recommends a maximum pushing/pulling force equivalent to 100 kg on even surfaces with well-maintained aids, and a lifting/lowering load of 10–20 kg for men. These limits are frequently exceeded, especially when surfaces are uneven, slopes are steep, tasks are repetitive, or hand positions are awkward. Lifting/lowering tasks were observed more frequently and consequently posed a higher relative risk than pushing/pulling, consistent with studies reporting a greater prevalence of back disorders from lifting (18, 19).

Improper manual handling is strongly associated with work-related musculoskeletal disorders (WMSDs) such as back pain, joint injuries, and carpal tunnel syndrome (20). Previous research in fisheries has reported high prevalence rates of lower back pain (92.4%), shoulder pain (64.8%), and knee pain (31%) among workers (21), underscoring the need for intervention.

Although controls such as trolleys, hoist cranes, and team lifting were in place, they were inadequate given the excessive loads and repetitive nature of the tasks. Recommended measures include limiting loads to ≤25 kg, redesigning workflow and floor layout, implementing job rotation, and providing training in safe manual handling techniques. These measures have been shown to reduce WMSD risks among fishery and other industrial workers (7, 22).

Static and Sustained Body Posture
Static posture refers to maintaining the same position for extended periods (23). At the jetty, purse-seine workers were particularly exposed during sorting, which involved prolonged standing and repetitive movements for up to four hours. Similar high risks of static posture have been reported among fishermen elsewhere (7). Prolonged standing is associated with musculoskeletal pain in the legs, neck, waist, and shoulders, as well as chronic conditions such as venous insufficiency and carotid atherosclerosis (24, 25). Mitigation measures include engineering controls, such as lift- and tilt-sorting tables to reduce awkward postures; administrative controls, such as job rotation alternating standing and sitting tasks to relieve lower limb stress; and ergonomic footwear to reduce muscle fatigue (24, 26, 27).

Biological Hazard
Unlike trawler operations, where catches are manually transferred, purse-seine workers use hoist crane hooks, exposing them to rusty metal surfaces. During subsequent manual sorting, they are also exposed to other biological hazards, such as fish toxins and spines. Direct contact between open wounds and rusty hooks or fish toxins/spines can pose a significant biological hazard if proper interventions are not implemented.

Contaminated rusty hooks and marine toxins can introduce tetanus bacteria (Clostridium tetani) through open hand wounds. Initial symptoms include severe pain, swelling, and erythema, potentially progressing to necrosis and tissue damage (28). Without prompt treatment, infections may lead to septic shock and death.

While tetanus cases at this jetty remain undocumented, Khan et al. (29) found that men are more vulnerable to tetanus due to high-risk occupations, such as fishing. Studies by Laraqui et al. (6) and Saadon et al. (7) confirm fishery workers' susceptibility to bacterial infections and venomous fish poisoning during retrieval and sorting activities. Recent research on Batam Island fishermen identified fish spine injuries as the third-most-prevalent hazard (30).

To reduce the risk of tetanus exposure, workers should wear appropriate gloves, such as nitrile or Kevlar gloves, when handling rusty equipment or sorting catches, providing protective barriers against punctures that can introduce bacteria. Current practices are adequate but require medium-priority improvements. Regular replacement and maintenance of rusty hooks, especially in corrosive marine environments, and tetanus vaccinations for all workers, as per the 2017 WHO guidelines (29), are recommended.

Psychosocial Hazard
Psychosocial hazards are work aspects that cause psychological and physical harm, leading to distraction, mistakes, burnout, and stress (14, 31). This study identified a significant relative risk requiring medium-priority intervention among purse-seine workers exposed to irregular and extended working hours, hazards not experienced by trawler workers.

The fish landing jetty operations run from 3 a.m. to 3 p.m., requiring workers to work nearly 12 hours daily for over three days weekly, exceeding Malaysia's Employment Act 1995 limit of 10 hours per day (32). However, worker interviews revealed that breaks are permitted during working hours, and these activities are supported by dedicated jetty workers who do not go offshore.

The irregular, extended hours may disrupt workers' circadian rhythms, leading to stress, fatigue, and work-life balance issues. Research shows Australian commercial fishermen experience twice the psychological stress of the general population (33). In Alexandria, 62.9% of 124 fishermen reported experiencing nervous tension due to working over 10 hours daily (34). Such occupational health issues decrease work performance and quality (35). Preventive measures include improving work schedules through better workflow and effective time management (36).

LIMITATIONS OF THE STUDY

This study has three main limitations. First, it used a modified HIRARC Assessment Form adapted from DOSH guidelines, with risk rating scales reduced from 5- to 4-Likert points for likelihood and severity (12). Consequently, relative risk levels may be lower than those in studies using standard DOSH forms, requiring careful interpretation when comparing across studies. Second, unlike manufacturing or oil & gas sectors, no Standard Operating Procedures exist for fish landing activities. Hazard identification relied primarily on observation, with variations noted between companies. Only the most common practices were reported to minimise observational bias. Third, the risk ratings were based solely on observations, interviews, and expert discussions. Lack of quantitative data on past incidents may affect the accuracy of risk assessments.

CONCLUSION

This study found that the fish landing jetty workers were exposed to physical, ergonomic, psychological, and biological hazards. Physical hazards, such as slippery floors, are most common, but ergonomic hazards pose the greatest significant risk, requiring medium to high-priority intervention. Trawler workers faced greater risk than purse-seine workers due to repetitive manual lifting when unloading catches and pushing heavier iceboxes from packing areas to trucks. Most existing controls are inadequate and require additional measures.

Workplace safety is a shared responsibility. Employers and authorities must provide safe work environments that comply with occupational safety and health regulations. Employees must adhere to safety protocols, including i) wearing appropriate personal protective equipment, ii) attending safety training on procedures, hazardous material handling, hazard prevention, and first aid, and iii) promptly reporting hazards to supervisors. Fulfilling these respective roles creates a safety culture that minimises accident risk, ensuring a secure and productive work environment.

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