VIA MEDICA

ORIGINAL ARTICLE

Int Marit Health
2023; 74, 3: 143–152
10.5603/imh.96652
www.intmarhealth.pl

ISSN 1641-9251
eISSN 2081-3252

Health risk classification patterns among Filipino seafarers. Analysis from a pre-employment clinic in the Philippines: a 5-year review

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ABSTRACT

Background: *Seafaring is a demanding profession that exposes individuals to unique health risks and challenges. This study investigates risk classification patterns among seafarers who underwent physical and medical examination at the Nordic Medical Clinic, a pre-employment clinic in the Philippines.*

Materials and methods: *The analysis involved data obtained from medical records, including demographic information, diagnoses, medical risk classification, corresponding management, and occupational details. medical risk classification, based on guidelines from the Philippine Department of Labour and Employment, categorised fit to work seafarers into risk class A, B, or C. Descriptive statistics and statistical tests, with a significance level set at $p < 0.05$, were utilised for data analysis using R Studio (version 4.2.3).*

Results: *The study population consisted of 11,831 seafarers seen at the Nordic Medical Clinic between 2018 and 2022. The results revealed a significant proportion of seafarers falling into higher risk classifications, with risk class C being the most prevalent at 48.16%. Pre-employment medical examinations (PEME) to fit to work duration demonstrated a significant association with risk classification, revealing that lower-risk classes had shorter fit-to-work times compared to higher-risk classes. Moreover, risk classification exhibited uneven distribution across specific demographic and occupational characteristics, with older seafarers, males, married individuals, and those in higher-ranking positions having a higher proportion of risk class C.*

Conclusions: *Our findings highlight the need for comprehensive and customised pre-boarding medical screening standards for seafarers based on factors such as their specific role, vessel type, voyage, contract length, and work location. Moreover, health implementation of health promotion and preventive strategies that are based on the specific occupational and demographic needs of the seafarers are needed.*

(Int Marit Health 2023; 74, 3: 143–152)

Keywords: Nordic Medical Clinic, occupational health, pre-employment medical examinations (PEME) to fit to work, risk classification, seafarers

INTRODUCTION

Seafaring is a demanding profession that exposes individuals to unique health risks and challenges due to the nature of their work and living conditions onboard vessels [1, 2]. Seafarers may encounter uncomfortable living conditions, including exposure to noise and vibrations while onboard ships. Extreme weather conditions, ultraviolet radiation, motion sickness, exposure to infectious diseases are common

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Received: 25.07.2023 Accepted: 28.08.2023

issues experienced by seafarers. Furthermore, the lack of exercise opportunities, inadequate nutrition available on ships and poor sleep due to shifting schedules, can contribute to compromised health [3–5]. Seafarers work in shifts according to schedule when ships are sailing, in anchorage or berth. If personnel for the next shift cannot take over the work, seafarers on watchkeeping are required to continue to work [6]. Additionally, the demanding nature of their work for extended periods may result in psychological distress [7]. Work at sea is classified as one of ten most dangerous jobs in the world [8]. When faced with disease or injury, seafarers have poor access to healthcare due to the location of their vessels and unavailability of adequate medical facilities and certified medical personnel onboard non-passenger ships. Only ships with more than 100 people on board travelling for more than 3 days are required to have a qualified medical doctor on board [9]. When there is no doctor on board, at least one seafarer is in charge of medical care as part of their duties [9].

Consequently, it is important to evaluate seafarers' fitness for sea duty before they embark on their duties and board the ship. According to the International Labour Organization (ILO) Seafarer Service Regulations Article 832, the seafarer's employer is required to establish a health and safety prevention system which must include risk assessment of occupational health and safety of the seafarer, which includes training and instruction to seafarers [6].

The implementation of regular pre-employment medical examinations (PEME) plays an important role in identifying and addressing potential health issues for seafarers. Recognizing the significance of such examinations, the ILO has issued guidelines to provide medical practitioners with a framework for conducting thorough PEME [10].

The guidelines set by the ILO and the International Maritime Organization (IMO) published in 2013 on the medical examination of seafarers is a detailed set of standards that has been used under the provisions of the Maritime Labour Convention in 2006 and the Regulation I/9 and Section A-I/9 of the STCW code [10]. The assessment of fitness for service at sea are classified as:

— fit for sea service; or
— unfit for sea service; or
— fit with restrictions/limitations (e.g. no look-out duties).

The Norwegian Maritime Authority has established a similar assessment guidelines called Guidance to the Regulations of Medical Examinations of Employees on Norwegian Ships and Offshore Units [11]. The assessment or "decision" classifies the issuance of:

— medical certificate without limitations;
— medical certificate with limitations (position, trade area or duration of validity);
— permanent unfitness;
— provisional unfitness;
— temporary unfitness;
— postponed execution.

These standards are consistent in their goal to arrive at the same outcome:

— assuring deployed seafarers are functional at work when at sea;
— assuring deployed seafarers with medical conditions do not affect their work and the work of people around them when at sea;
— prevention of medical emergencies especially the cases that cannot be handled while onboard ships.

Similarly, the Department of Labour and Employment (DOLE) in the Philippines has also taken proactive measures by issuing guidelines on occupational safety and health standards [12]. Within these guidelines, the DOLE outlines a risk classification system designed to assist medical examiners in assessing the health risks of workers. The risk classification system comprises four distinct classifications: risk class A denotes individuals who are deemed fit to work without medical intervention, risk class B indicates those requiring short-term medical intervention, risk class C includes individuals with manageable chronic diseases or in need of long-term medical intervention, and risk class D comprises individuals who are unfit to work. These classifications provide a structured framework for medical professionals to assess and categorize the health risks posed by seafarers, ensuring appropriate placement and support for each individual.

Issuance of fitness for sea duty prior exposure to a spectrum of different working conditions is crucial when access to healthcare is poor and should be performed by physicians with training and familiarisation with maritime medicine. Among a large number of scientific papers on maritime medicine, focus is health and safety on board ships, both on physical and mental aspects of life at sea. Working conditions vary in every country and does not reflect the general working condition [13]. The health condition of the seafarer after each contract, during shore leave, and before embarkation should be collected as well [14]. Knowledge of the health of the seafarer does not only encompass the physical and mental, it also entails the work and life environment, as well as the socio-economic factors that contribute to the over-all health of the seafarer. This is the holistic health care approach in management of the Filipino seafarer.

Understanding the distribution of risk classifications among seafarers can help in identifying health issues and implementing appropriate preventive measures and interventions. This research presents an exploration of the health risk classification patterns observed in seafarers who underwent physical and medical examinations at the Nordic Medical Clinic from 2018–2022. The distribution of risk classifications is examined in relation to demographic and occupational characteristics. Furthermore, we conduct-

ed an analysis to investigate the relationship between risk classification and PEME to fit-to-work durations.

MATERIALS AND METHODS

STUDY DESIGN AND POPULATION

This research employed retrospective observational study design and applied total population sampling. The medical records of seafarers who underwent physical and medical examinations at the Nordic Medical Clinic between the years 2018 and 2022 were reviewed. Seafarers who are deemed fit to work and have complete clinical and demographic data was included in the analysis.

DATA OBTAINED

Demographic information, including birthdate, age, sex, and civil status was obtained from the records. The seafarers' diagnoses (based on ICD-10 coding), medical risk classification, and corresponding management provided was collected. The date and time of the medical examination and the determination of fit-to-work status were recorded. Additionally, information on the seafarers' positions and the types of vessels they were assigned to was obtained.

RISK CLASSIFICATION

Risk classification of seafarers were based on the guidelines provided by the Department of Labour and Employment, Philippines. The study included risk classes with fit to work status namely class A, class B and class C. Risk class A included seafarers without any medical issues who could be immediately deemed fit to work. Risk class B consisted of seafarers with medical issues that could be resolved through short-term medical management. Risk class C encompassed seafarers with chronic diseases who could be deemed fit to work once their conditions were controlled, as well as seafarers requiring specialist care to be rendered fit to work.

DATA ANALYSIS

Descriptive statistics were employed to describe the distribution of health patterns among the seafarers. Means were calculated for continuous data, while proportions and percentages were used for discrete data. Mann-Whitney U test and Kruskal-Wallis test were employed to test differences between groups. The significance level was set at $p < 0.05$. The statistical analysis was conducted using R Studio (version 4.2.3).

RESULTS

DEMOGRAPHIC AND OCCUPATIONAL PROFILE OF SEAFARERS UNDERGOING PEME

A total of 11,831 seafarers who underwent physical medical examination (PEME) at the Nordic Medical Clinic between 2018 and 2022 were included in this study (Table 1). The age distribution of the seafarers revealed

Table 1. Demographic characteristics of Nordic Medical Clinic seafarers who underwent physical examination and medical examination from 2018–2022

Characteristic	Frequency	Percentage
Total	11831	
Age group:		
< 30	2129	18.00%
30–39	3115	26.33%
40–49	3858	32.61%
> 50	2729	23.07%
Sex:		
Female	645	5.45%
Male	11186	94.55%
Civil status:		
Married	8504	71.88%
Single	3327	28.12%
Department/position:		
Deck department	5395	45.60%
Engine department	2918	24.66%
Master mariner	226	1.91%
Medic/admin	101	0.85%
Steward's department	3191	26.97%
Risk classification:		
Class A	476	4.02%
Class B	5657	47.82%
Class C	5698	48.16%
Vessel type:		
Accommodation vessel/platform	157	1.33%
Bulk	986	8.33%
Cable layer	83	0.70%
Cargo	165	1.39%
Chemical/oil tanker	2330	19.69%
Container	421	3.56%
Crane ship	27	0.23%
Crew boat	47	0.40%
Drilling vessel	40	0.34%
Gas	1311	11.08%
No vessels assigned	88	0.74%
Passenger vessel	1987	16.79%
Pipe layer	312	2.64%
Research/survey vessel	753	6.36%
Standby safety vessel	26	0.22%
Supply/support vessel	2723	23.02%
Vehicles carrier	318	2.69%
Well stimulation vessel	57	0.48%

that the majority fell within the 30–39 and 40–49 age groups. Out of the total, approximately 11,186 were male seafarers, outnumbering female seafarers by a ratio of more than 17 to 1. The majority of seafarers were married, with a smaller proportion being single. All of the seafarers included in this study are employed under the same maritime manning agency.

In terms of occupational assignments, the deck department accounted for the highest number of seafarers, while the medic and administrative office had the fewest participants. When considering the type of vessels, the majority of seafarers worked on tankers (including gas, chemical, or oil tankers), followed by passenger vessels and offshore supply and support vessels.

Upon classifying the seafarers based on risk, it was observed that medical risk class C (48.16%) comprised the largest group of seafarers who underwent the PEME at the Nordic Medical Clinic. Risk class B (47.82%) closely followed in terms of the number of seafarers, while only a small number of seafarers were classified as risk class A (4.02%).

FIT TO WORK AND DEMOGRAPHIC CHARACTERISTICS OF SEAFARERS

Mean fit-to-work days were assessed in relation to seafarer demographics. Notably, risk class A exhibited the shortest time, whereas risk class C demonstrated the longest duration. Younger age groups exhibited faster fit-to-work times compared to older age groups. Additionally, female seafarers displayed slightly faster fit-to-work times compared to their male counterparts. Furthermore, single individuals exhibited slightly quicker fit-to-work times compared to married individuals (Table 2).

Linear regression analysis was conducted to investigate the relationship between fit-to-work time and various demographic characteristics, aiming to identify predictors of fit-to-work duration (Table 3). Among the predictors examined, only risk classification yielded a statistically significant association.

RISK CLASSIFICATION

The distribution of risk classes as a percentage of the total number of seafarers remained relatively constant throughout the years (Fig. 1). Risk class C consistently represented the highest percentage, ranging from 46.9% to 49.0% of the total seafarers per year. In contrast, there was a slight increase in the proportion of risk class B seafarers from 2018 to 2021, with the percentage rising from 41.79% in 2018 to 51.2% in 2021. Conversely, a noticeable decrease in the proportion of risk class A seafarers was observed during the same period, declining from 9.81% in 2018 to 0.65% in 2021. In the year 2022, there was

Table 2. Fit to work days according to seafarer demographic characteristics and risk classification. Kruskal-Wallis test (three groups or more) and Mann-Whitney U test (two groups) were utilized for statistical test

Characteristics	Fit to work mean time [days]	P-value
Risk classification:		**< 0.001**
Class A	4.43	
Class B	13.39	
Class C	18.22	
Age group:		**< 0.001**
< 30	14.08	
30–39	13.88	
40–49	15.79	
> 50	17.42	
Gender:		0.2875
Female	14.68	
Male	15.4	
Civil status:		**< 0.001**
Married	15.67	
Single	14.53	

Table 3. Linear regression classifying the relationship of fit to work with risk classification, age group, gender and civil status

	Estimate	Standard error	P-value
Risk classification	5.49	1.47	**< 0.001**
Age	0.025	0.019	0.2327
Gender	–0.58	0.74	0.4538
Civil status	–0.58	0.44	0.1838

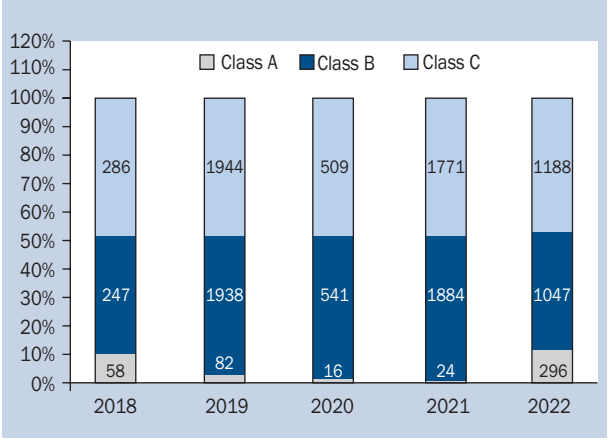

Figure 1. Risk classification from 2018–2022

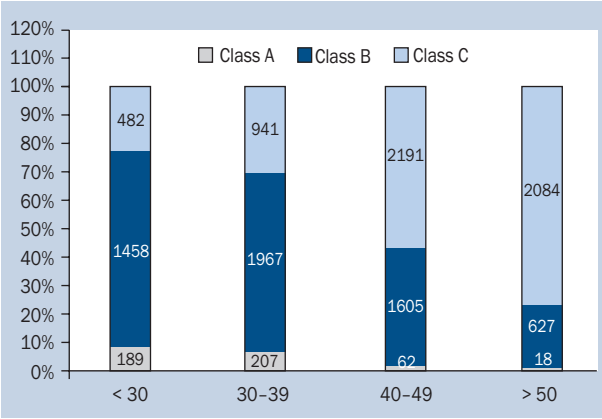

Figure 2. Risk classification according to age group

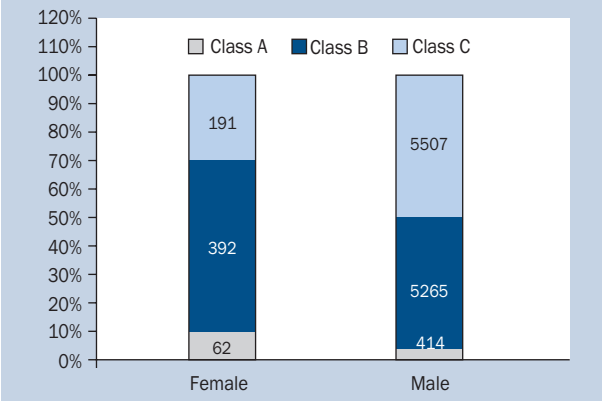

Figure 3. Risk classification according to sex

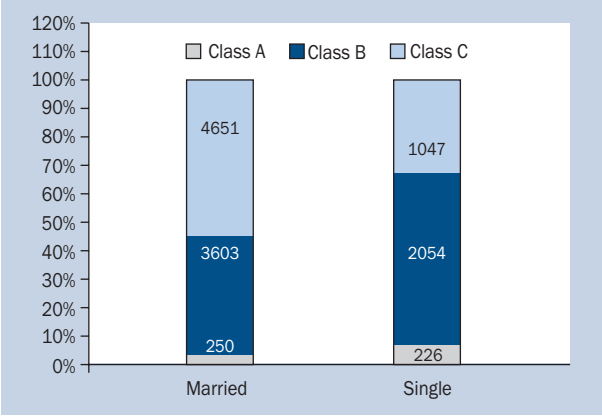

Figure 4. Risk classification according to civil status

a reversal of trends, with an increase in the proportion of risk class A seafarers and a decrease in the proportion of risk class B seafarers.

RISK CLASSIFICATION BY DEMOGRAPHIC CHARACTERISTICS

An uneven distribution of risk classifications was observed among different age groups (Fig. 2), with higher age groups exhibiting a greater proportion of risk class C seafarers, while lower age groups had a lower risk classification distribution. Among individuals younger than 30 years, risk class C accounted for only 22.64% of the cases, whereas among those aged 50 and older, it represented a significant majority of 76.36%. In contrast, risk class A and risk class B constituted 8.88% and 68.48%, respectively, among individuals below the age of 30, but these percentages decreased to 0.66% and 22.98% among individuals aged 50 and over.

When examining the distribution of risk classes based on sex, a similar uneven pattern emerges (Fig. 3). Male seafarers have a higher proportion of risk class C (49.23%) compared to female seafarers (29.61%). Furthermore, when considering civil status (Fig. 4), married individuals exhibit a higher proportion of risk class C (54.69%) compared to singles (31.47%).

RISK CLASSIFICATION BY OCCUPATIONAL CHARACTERISTICS

We investigated the distribution of risk classes among seafarers based on their occupation as seafarers. Figures 5 to 8 illustrate the risk class distribution among different departments, namely deck, engine, steward, and medic/administrative, while Figure 9 presents master mariner or the captain.

Our findings indicate that higher positions tend to have a greater proportion of higher-risk classifications. Notably, a significant percentage of master mariners (74.34%) fall into risk class C. Within the deck department, risk class C represents more than half of the second officers (52.38%), and chief officers (57.93%).

In the engine department, the second engineer and chief engineer have risk class C percentages of 58.89% and 68.93%, respectively. Similarly, positions such as mechanic or fitter show a notable proportion of seafarers classified as risk class C (62.08%). Within the steward's department, the chief steward and chief cook exhibit high percentages of risk class C seafarers, with 81.08% and 61.57% respectively.

Figure 10 displays the distribution of risk classifications among different types of vessels where seafarers are assigned. The percentage of risk class C across different types of vessels ranges from 35.00% to 70.21%. Risk class B has a proportion ranging from 27.66% to 65.00%, while risk class A ranges from 0% to 6.92%.

DISCUSSION

This study showed the health patterns among seafarers seen in Nordic Medical Clinic from year 2018 to 2022. The results revealed a high prevalence of high-risk classifications, with risk class C comprising the larg-

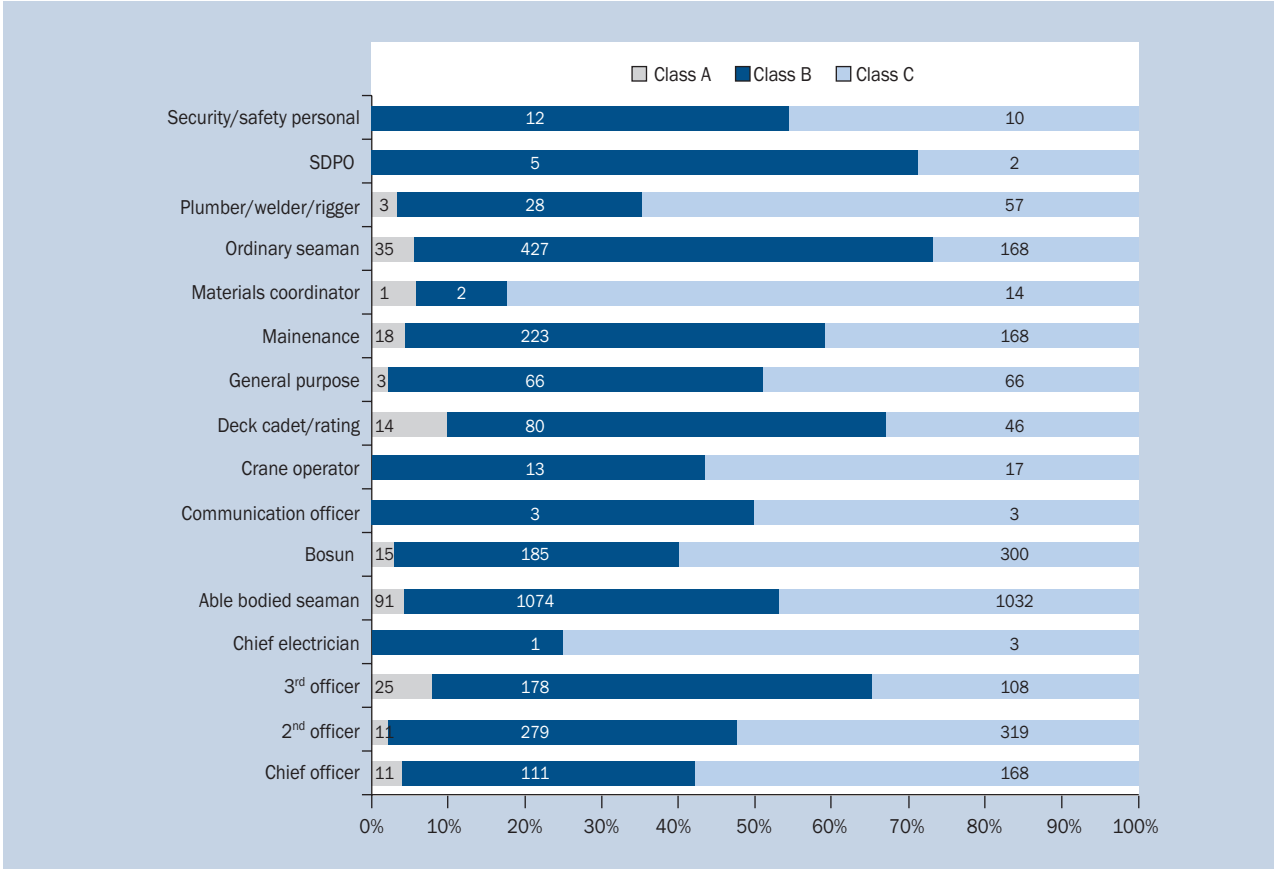

Figure 5. Risk classification of seafarers in deck department; SDPO – senior dynamic positioning operator

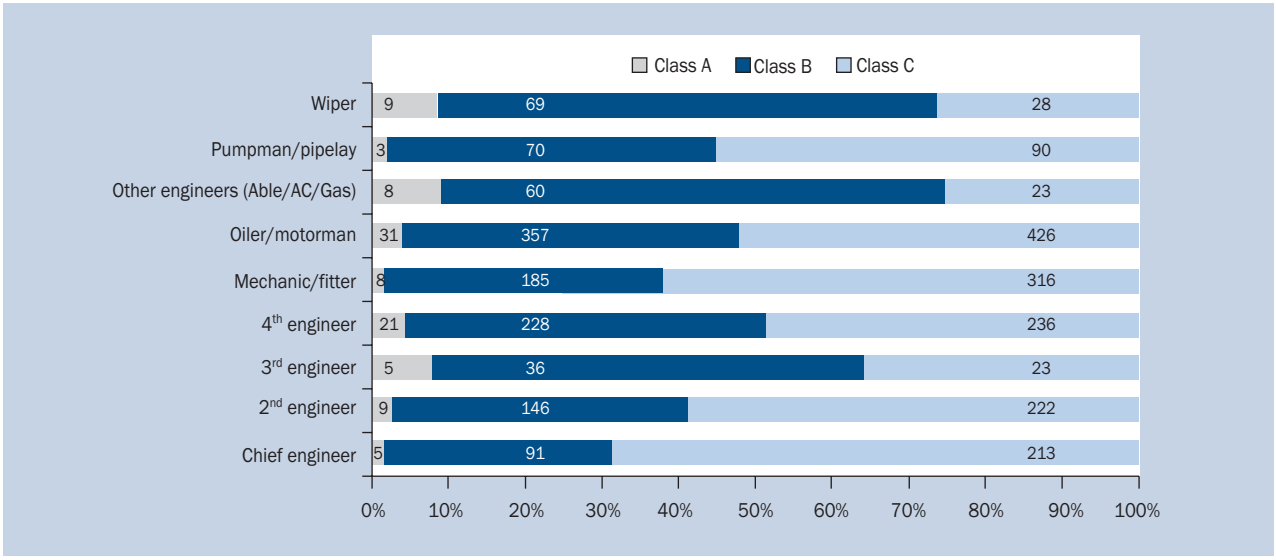

Figure 6. Risk classification of seafarers in engine department

est proportion (48.16%) among all risk categories. Fit-to-work duration was significantly associated with risk classification, with lower-risk classes having shorter fit-to-work times and higher-risk classes requiring longer fit-to-work durations. Older age, male gender, married status, and higher ranks exhibited higher proportion of risk class C.

The high proportion of risk classification C that is revealed in the study reflect the poor health of the seafarers. The findings indicate that a significant proportion needs

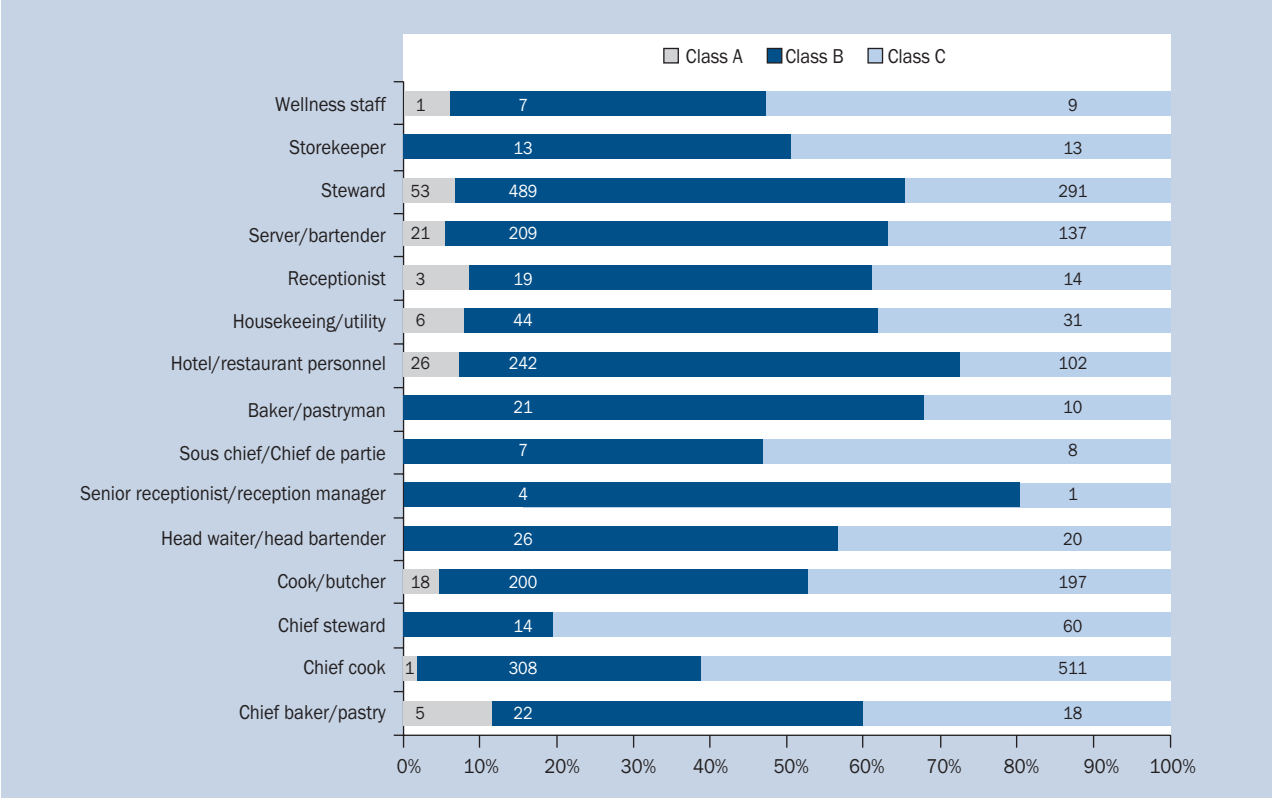

Figure 7. Risk classification of seafarers in steward's department

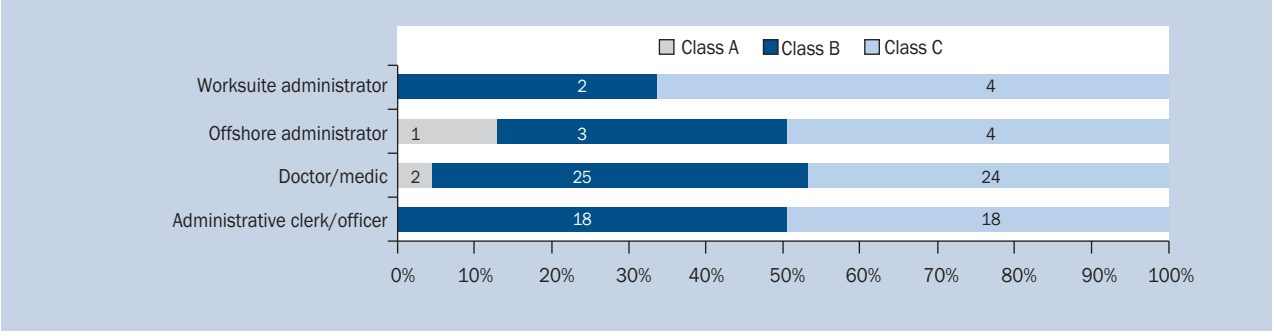

Figure 8. Risk classification of seafarers in medic/administrative department

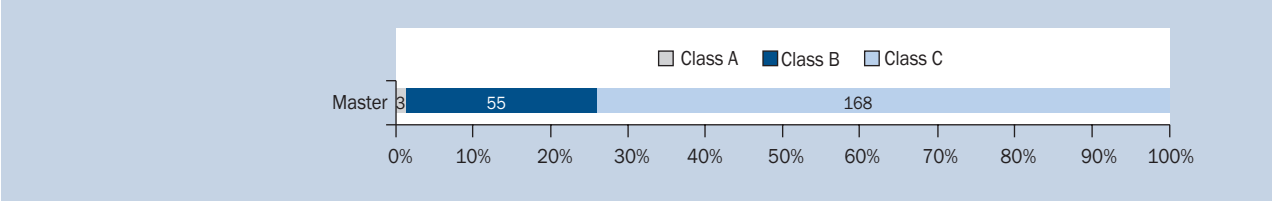

Figure 9. Risk classification of master mariners

a medical attention or intervention for them to be fit to work. Seafarers are exposed to uncomfortable living conditions while aboard ship, and may have limited opportunities for exercise and limited access to food with quality nutrition [1, 3, 5]. There is a need for effective health intervention to minimise health risks that seafarers experience. Comprehensive health screening packages and policy interventions from different stakeholders in the maritime industry are

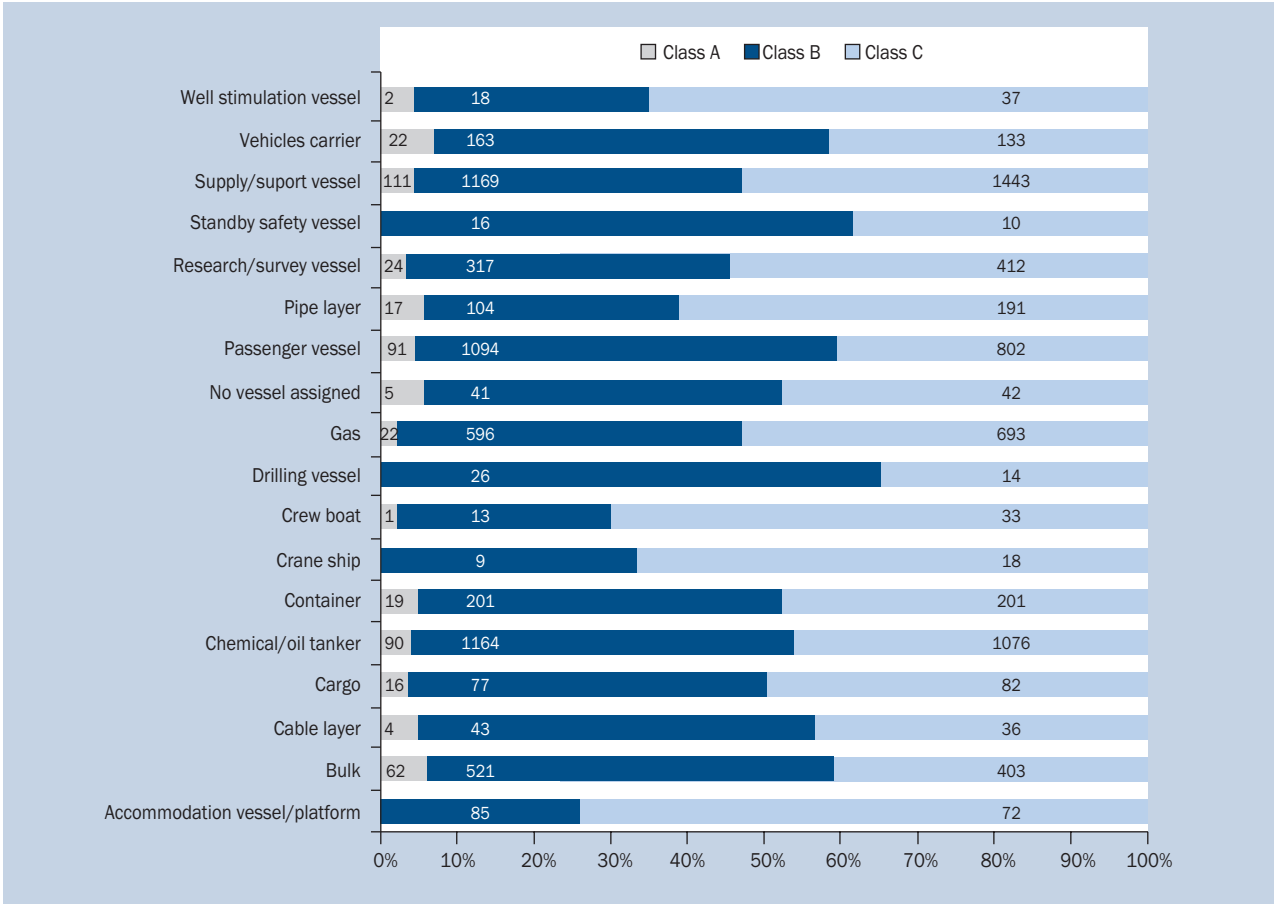

Figure 10. Risk classification according to vessels

essential to ensure the safety and well-being of seafarers. Shorter work contract duration and deployment in near coastal waters could present as an option for seafarers with a pre-existing but controlled medical condition, especially when they have a unique set of skills that is difficult to find among a small pool of specialised maritime workers.

Our results showed that risk classification is disproportionately distributed in certain demographic and occupational characteristics. These findings suggest that certain subgroups of seafarers may be more susceptible to health risks and require targeted interventions and support. Understanding these demographic and occupational patterns can inform the development of tailored health promotion strategies and occupational health programs for seafarers.

The higher prevalence of risk class C among older seafarers indicates the need for increased medical surveillance and interventions targeting age-related health conditions. As seafarers advance in age, they may experience a higher burden of chronic diseases that can affect their fitness for work [1, 15, 16]. Implementing more frequent health screenings and preventive measures specific to age-related conditions can help mitigate the impact of these health issues and ensure the continued well-being of older seafarers [17]. Gender disparity is also observed in the distribution of risk classes, with higher proportion of males in higher risk class. This finding agrees with the observation that males have higher risk for several diseases including cardiovascular and metabolic diseases [18, 19].

Furthermore, certain seafarer positions exhibit a higher proportion of risk class C. Specifically, higher-ranking officials tend to have a higher prevalence of this specific risk class. Multiple factors may contribute to this observation. One factor is that older seafarers tend to be employed in higher-ranking positions, and age itself may contribute to an increased risk of health issues. Additionally, specific stressors associated with occupational positions may also contribute to the poorer risk class [20]. Because these positions require several years of training and experience working at sea, there are less of these seafarers continuing their study to further their career. Hence, shipowners and maritime employers place more value in older, highly-skilled and loyal employees. Employers would be obliged to consider decreasing the duration of work contract and assign these specific seafarers near coastal waters where

medical assistance is more readily available in exchange for a highly-skilled and more experienced seafarer. Similarly, given an understanding of the medical risk classification, a vessel-specific, work location-specific or role-specific medical class could be applied analogous to the pilot class standards. Further exploration of these factors is necessary to effectively address the unique health needs of seafarers in these positions.

Other employment sectors such as the military has similar standards in the medical examination prior to enlistment [21]. The surgeon general outlined medical fitness standards for the army, ensuring that soldiers have fitness level to perform their duty. Soldiers have to complete the army combat fitness test at the minimum level of fitness, the occupational physical assessment test and the deployability based on individual medical readiness requirements and standards. Medical readiness in the army is classified into four risk classifications ranging from medically ready/deployable to not medically ready (Suppl. Table 1 — see journal website) [22]. Using this standard, medical requirements are based on deployment, mobilisation, and is assignment-specific. For instance, soldiers with dental conditions that can possibly result in dental emergencies cannot be assigned to the territories of American Samoa, Guam, the Northern Mariana islands, Puerto Rico, the U.S. Virgin Islands, and the District of Columbia [21].

In the airline industry on the other hand, the medical classification is based on the type of aircraft to be flown by the pilot (Suppl. Table 2 — see journal website). The airline transport requires the most stringent criteria (first class), commercial aircraft requires second class medical classification, and private aircraft requires third class [23]. The vessel type based risk classification in the airline industry may be applied in seafarers, as our results showed differing risk classification on each vessel types.

CONCLUSIONS

The findings of this study provide valuable insights into the health risk classification patterns among seafarers who underwent physical and medical examinations at the Nordic Medical Clinic. It is evident that a significant proportion of seafarers in this population fall into higher risk classifications, with risk class C being the most prevalent. The analysis also revealed a strong association between risk classification and pre-employment medical exam to fit-to-work durations, with higher-risk classes requiring longer durations to be fit to work. Demographic and occupational characteristics such as age, gender, marital status, and position have differential distribution of risk classifications among seafarers.

These findings emphasize the importance of comprehensive risk assessment and management strategies in the maritime industry. It is crucial to prioritize the health and well-being of seafarers by implementing proactive measures to mitigate health risks and promote timely medical interventions. This may involve targeted health promotion programs, regular health screenings, and appropriate medical support systems onboard vessels. Furthermore, the implementation of guidelines and accurate risk classification assessment can aid in ensuring the safety and productivity of seafarers.

Given the results of the study, the following recommendations are proposed:

- there is a need for further studies on the standards on proper pre-boarding medical screening of seafarers that is holistic and tailor-fit for the nature of the specific role at sea, type of vessel and voyage, length of contract and location of work at sea;
- given an understanding of the medical risk classification, a vessel-specific, work location-specific or role-specific medical class could be applied similar to the pilot medical certificate class;
- shorter work contract duration and deployment in near coastal waters could present as an option for seafarers with a pre-existing but controlled medical condition, especially when they have a unique set of skills that is difficult to find among a small pool of specialized maritime workers;
- implementing more frequent health screenings and preventive measures specific to age-related conditions can help mitigate the impact of these health issues and ensure the continued well-being of older seafarers;
- tailored health promotion strategies and occupational health programmes for seafarers are necessary preventive approaches to health and safety at sea.

Conflict of interest: None declared

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