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Seafarers' health problems, emergencies, diseases and risk factors. A systematic review of the literature

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Abstract
Background/Aim: Currently, over 1.5 million seafarers, are employed in the global commercial fleet, which comprises of more than 50,000 ships. Traditionally, life at sea has been known to be of low quality and often complicated by various health issues. Despite the considerable number of seamen and the severity of their health issues, to date, no systematic overview of the relevant literature has been performed. Therefore, the aim of this paper is to perform a review of studies referring to health problems, emergencies, diseases and risk factors of seafarers.
Methods: A systematic review of peer-reviewed articles from January 1, 2012, to April 15, 2018 was performed. Included databases were: PubMed, Science Direct, Scopus, Cochrane Library and Google Scholar. Two independent researchers performed the study. From the 229 articles initially identified, 25 were selected, based on the inclusion criteria.
Results: The majority of studies were descriptive. The main health issues noted were: metabolic syndrome, obesity, cardiovascular/coronary heart disease, fatigue and stress, accidents and injuries. A high risk of bias was estimated due to the small sample size, study population selection, low response rate to questionnaires, lack of medical history and demographic data, and occasionally insufficient information regarding diagnosis or treatment.
Conclusion: Unhealthy lifestyle and work-related diseases are the main difficulties of seamen. However, despite the number of available studies, results are limited by small size, data collection, and sample selection. Therefore, more robust evidence is needed, in order to accurately identify health related issues and the means of improving occupational conditions among seafarers.

Keywords: seafarers, maritime, health, emergencies, disease, risk factors

1. Introduction

1.1 Background

More than 1,5 million seamen are employed by the worldwide fleet and around 55,000 commercial ships carry 90% of the world's supplies. Approximately 85% of the international fleet is comprised by oil tankers, bulk carriers, and container ships [1, 2].
Seafarers are burdened by long periods on board, away from regular life on shore. This specific occupational group has rudimentary features such as sex, age range, physical activity, body mass, nutrition, alcohol/tobacco overuse, and health issues. Due to these peculiarities of naval life, over the last decades, various actions have been implemented for all seafarers, irrespectively of nationality and ships' flag, in order to establish better living and working conditions [3, 4].
However, despite these improvements naval life remains burdened by various health related issues. Furthermore, limited scientific attention has been attributed to this problem, despite the considerable number of seamen and the severity of their health issues.

1.2 Aim

The aim of this study was the systematic identification and evaluation of scientific articles referring to health problems, emergencies, and diseases for seafarers. Furthermore, the identification of risk factors such as lifestyle, ship rank and demographic data.

2. Materials and Methods

A systematic review of scientific articles was performed based on the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. However, items for meta-analysis were not applicable in for our review and therefore not used [5]. A three-step approach was performed, firstly, related papers were initially identified in five international databases, PubMed, Science Direct, Scopus, Cochrane Library and Google Scholar using the relevant search words: "seafarers"; "maritime"; "health"; "emergencies"; "disease"; "risk factors". Flowingly, duplicate papers and articles not published in English were removed. Furthermore, book chapters, thesis, poster presentations, short communications, conference or workshop reports, letters to editor, editorials, case reports, historical articles, reviews or papers published before January 1, 2012, where excluded.
At the second step articles were evaluated by 2 independent reviewers in regards to relation of abstract to the subject and based on the following inclusion criteria: 1) seafarers, 2) registered in Maritime Authorities, 3) adults and 4) regardless of sex, nationality, position, rank or sector, 5) number of subjects more than n = 50 on a single study, 6) design as retrospective or prospective, 7) English language, 8) presence of abstract and full-text, and 9) published from January 1, 2012, to April 15, 2018.
Finally, full text reading of the selected studies was performed in order to confirm relevance and adhesion to inclusion criteria. In total 25 papers were selected.
Furthermore, the methodological quality of the included studies was evaluated. Two tools were used: 1) the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (QATOCCSS) [6] and 2) the Cochrane Collaboration's Tool for Assessing Risk of Bias (CCARB) [7]. The tools covered six fields of bias: selection, performance, detection, attrition, reporting, and others. The studies were characterized as low, high and unclear risk.

3. Results

Two hundred ninety-seven papers were initially identified, 68 duplicates articles were removed, 229 papers were screened, and 62 articles were excluded on the absence of English language, abstract and full-text. One hundred sixty-seven papers assessed for eligibility while 142 papers excluded based on full-text reading, type of article and published date previously 1 January 2012. Twenty-five articles were included in the final review according to qualitative and quantitative methods (fig 1). From the selected papers, the majority were descriptive or cross-sectional surveys (68%) while 20% were follow-up or cohort studies.

Obesity, Metabolic Syndrome and Cardiovascular Disease

The main topics were obesity, Metabolic Syndrome (MS) and Cardiovascular Disease (CVD) related to seafarers' lifestyle in 9 articles. Various ethnic groups were studied, 3 papers referred to Danish seafarers [8-10], 2 papers referred to Iranians [12, 13], 1 to studied Spanish sailors [14], 1 referred to US officers [15] and 1 compared 2 different ethnic groups [16].

Moller Pedersen *et al.* collected data from 524 seamen, using Pre-Embarkation Medical Examinations (PEMEs) and questionnaires. MS was noted in 29,5% of men and 10,7% of women, 30,6% were smokers, while 18,6% consumed alcohol in excess [9]. Of this sample, 141 seafarers were re-examined after 2 years by Jepsen *et al*. MS identified in 26,5%, 37,7% were smokers and 19,6% were found to drink alcohol daily [10].

Similarly, Hjarnoe *et al.* studied 272 PEMEs and 360 questionnaires. Notably, 44% were daily smokers. There was no significant difference between physical activity on board versus onshore. Moreover, there was a significant difference between caloric diet and overeating at sea than at home. A normal Body Mass Index (BMI) was observed in 25%, whereas 51% presented MS [8]. In a follow-up study over 1-year period, these seamen were assessed by Hjarnoe *et al*, via PEMEs and questionnaires. An important increase in physical exercise, a decrease in caloric diet and a reduction of MS in 48% were noted [11].

Baygi *et al.* exanimated 234 males through PEMEs. MS prevalence was 14,9%. The reported risk factors were overweight (51,1%), obesity (38,5%) and smoking (27,8%). Also, age and BMI correlated with a rise in hypertension risk [12]. In a cohort study of 500 male seamen, PEMEs were gathered over a 4-year period. A significant increase of BMI and weight were observed [13].

Moreover, Romero-Paredes *et al.* investigated 334 PEMEs. Sixty-two percent of seamen were overweight or obese and were advised to follow appropriate nutrition and physical exercise until next PEMEs. Forty-seven subjects presented with reduction of BMI, and total cholesterol (CHOL) levels [14].

Scovill *et al*. examined 388 male mariners via PEMEs. Their past medical history included hypertension (12%), hyperlipidemia (12%), Heart Disease (HD) (4%) and Diabetes Mellitus (DM) (6%). High prevalence of smoking (41%), obesity (61%) and related cardio-metabolic risk factors were noted. These factors were low High-Density Lipoprotein-Cholesterol (HDL) (47%), high Triglycerides (42%), high blood pressure (BP) (42%) and high fasting blood plasma Glucose (GLU) (22%). Three or more factors of MS were identified in 39% of subjects [15].

Also, Westenhoefer *et al.* observed two different ethnic groups of male seafarers through measures and interviews on board. They noted that Kiribati mariners had higher BMI and eating disinhibition than Europeans [16].

Oral health

A descriptive survey involved 2,060 seamen using questionnaires. Tobacco was used by 56,11% while alcohol was consumed by 11,45%. Over the half of participants preferred an everyday carbohydrate diet (55,67%). Furthermore, Mahdi *et al.* confirmed that 74,07% brushed their teeth, and that 30,48% suffered from teeth diseases [17].

Emergencies, accidents, and injuries

Four surveys referred to emergencies, accidents and injuries of seamen (3 descriptive [18-20], and 1 retrospective [21]).

Oldenburg *et al.* evaluated the emergencies among 465 officers by interview over a 6-year period. Almost 28,6% of mariners reported at least one severe medical case aboard. They complained about injuries (37,9%), CVD (18,2%), gastrointestinal (15,9%), skin or respiratory infections (9,8%), neurological (9,1%) or urological (4,5%) diseases and burns (4,5%) [18].

Moreover, Adam *et al.* collected data of work-related accidents in the Danish fleet through a 2-year period via the Danish Maritime Authority and Radio Medical Denmark documents. A significant number (n=1,274) of cases of seafarers of various nationalities were recorded. Western Europeans had a significantly higher incident of accidents than other ethnic groups. Additionally, a high injury rate of back and eye were noticed by Western Europeans and South East Asians, respectively [19].

Forsell *et al.* identified the risk of accidents among 1,936 mariners using web-questionnaires. Sixty-seven percent of the deck, 77% of the engine and 64% of service personnel reported occupational accidents [20]. Hansen *et al.* studied 146 fatal accidents in the Danish fleet during a 10-years period. The mortality risk was three times higher on small than large ships [21].

Fatigue and stress

Fatigue and stress factors related to work environment were the major areas of interest within 5 studies (3 cross-sectional [22-24], 1 descriptive [25] and 1 pilot [26]).

Oldenburg *et al.* assessed burnout syndrome of 251 mariners via Emotional Exhaustion Score (EES) questionnaire. EES was higher in 10,8%, including 10,7% officers, 4,5% lower ranting and 25% galley personnel. The main observed related factors were long-lasting voyages, sleep quality, and social problems as family separation [22].

Hystad *et al.* evaluated fatigue and sleep quality according to occupational stress, voyage duration and psychological capital (PsyCap) by 742 questionnaires. The authors defined PsyCap as a personal concept of optimism and confidence. A statistically significant association between PsyCap, fatigue and sleep quality was noted. Particularly, it was related to voyage duration and high fatigue level and was significantly higher in cargo and passenger ships mariners [23].

Kim *et al.* investigated occupational stress, satisfaction and mental health using Symptom Checklist-90-Revision (SCL-90-R) questionnaire in 149 Korean, male, officers. Job stress score was more severe among first mates. However, job satisfaction score was higher in seamen up and around 60 years old. Common psychological symptoms were obsessive-compulsive behavior followed by depression, anxiety, interpersonal sensitivity, and somatization [24].

Moreover, Carotenuto *et al.* estimated stress by the Psychological General Well-Being Index (PGWBI) questionnaire in 162 male mariners. Engine officers had higher anxiety and fatigue than deck personnel as well as lower employee satisfaction. Higher levels of depression and less self-control were observed in deck crew [25].
Stannard *et al.* studied 595 questionnaires. Main complaints were anxiety, depression or stress, approximately in 56% of the 51-60 years old women officers age group [26].

Musculoskeletal Disorders
Two studies (1 descriptive [21] and 1 pilot [26]) reviewed work-related Musculoskeletal Disorders (MSD) among mariners.
Stannard *et al.* gathered 595 questionnaires among women seafarers. MSD, with focus on joint and back pain, was mentioned as the chief complaint by approximately 50% of subjects. Particularly, 56% of non-officers and 40% of officers complained about MSD. Furthermore, 44% of middle age mariners selected MSD as the second important health issue [26].
Also, Forsell *et al.* estimated 1,963 wed-questionnaire of seamen registered in Swedish Authorities. Hand/Arm Vibrations (HAV), from handheld pulsating tools related to hand or arm pain, was identified in 24%. Fifty-five percent of non-officers, 19% of officers and 75% of engine ratings suffered from HAV. Notably, tension on the neck, back or arm, and heavy lifting were mostly reported by the engine (88%) and service (85%) personnel [20].

Skin diseases
An essential subject of two 2 studies was the evaluation of skin diseases among mariners (1 cohort [27] and 1 descriptive [20]).
Kaerlev *et al.* presented a Danish population-based cohort study. A higher Standardized Hospital Contact Ratio (SHCR) for skin diseases among non-officers was observed. The main issues were dermatitis and eczema with only a few cases of allergic or toxic reactions [27].
Similarly, Forsell *et al.* researched 1,963 mariners in the Swedish fleet. Thirty-three percent had contact with oils on the skin. Moreover, 70% of engine crew considered skin chemical exposures as an important health topic [20].

Infectious diseases
Kaerlev at al investigated the SHCR for infectious diseases of the Danish mariners. A significantly higher SHCR for infectious diseases, on cargo ships, was noted. Especially, the SHRC for Human Immunodeficiency Virus (HIV) and hepatitis was high over a 5-year period [27].

Vibration and noise: sleep, cognitive and hearing effects
The effects of vibration and noise in mariners have been researched in 3 surveys (1 cohort [20], and 2 descriptive [27, 29]).
Forsell *et al.* evaluated 1,963 web-questionnaires in the Swedish fleet. Noise exposure had significant correlation with tinnitus or hearing impairment (HI) of engine (83%), service (71%) and deck (70%). Also, vibrations from the hull was the most frequent cause of sleep disorders in 63% of engineers [20].
The other 2 studies referred to the Royal Norwegian Navy. Sunde *et al.* observed in 24,9% of 68 participants, that sleep disorders were triggered by exposure to noise, caffeine or tobacco [28]. Also, Irgens-Hansen *et al.* studied 87 seamen. The response time in a cognitive test was significantly increased among participants if they had been exposed to noise greater than 77,1 dB(A) at least 4 hours earlier than the test [29].

Mortality rates
Three articles studied mortality rates (2 descriptive [30, 31], and 1 cohort [32] studies).
Grappasonni *et al.* investigated 344 mortalities cases by records of Centro Internazionale Radio Medico during a 25-years period. Main causes were: CVD, accidents, infectious diseases, psychoactive factors, and respiratory diseases. Mean age of death (MAD) was 44,89±10,53 years. Specifically, mortality rate appeared higher between males in the deck, in passenger ships followed by tanker and cargo. It should be noted though, that injury related deaths decreased by age and conversely CVD related deaths increased [31].
Furthermore, Oldenburg *et al.* investigated 68 fatalities cases in German-flagged ships during 1998-2008. The cause of death was in 66% unidentified, 20,8% suicides, and 47% occupational accidents. The MAD was 48,5±12,7 years [32].
Apostolatos *et al.* evaluated 551 cases with CVD symptomatology which were reported over a year through telemedical services. Almost 8% of the total cases were established as CVD cases. However, in most of them, the chest pain was due to MSD or respiratory diseases. Notably, stress and anxiety were amplifiers of the severity of CVD presentation [30].

Risk of bias
In general, 68% of the studies were descriptive or cross-sectional and almost 4% were retrospective. One-third of them included small samples with selection bias of population. In most of the surveys, data collected via questionnaires presented validation weakness. Furthermore, low response rate (5,4 to 35%) was noticed. Also, the main problem was the lack of information by maritime or telemedical documents, and the un-reported employment or lifestyle data. There was no discrimination of the confounders to the outcomes. Additionally, there was a difficulty in the establishment of causality. Particularly, a generalization of the results was noted. Therefore, these studies are characterized by a high risk of bias.
Moreover, 20% of surveys were follow-up or cohort studies and were performed during months to more than five years. The samples consisted of 68 to 25,919 subjects, with a low participating rate in follow-up and considerable population selection bias. However, data via official documents had has undoubtedly considerable validation strength.
Also, 1 pilot survey had no reported study's limitations and had an unclear risk of bias. In contrast, 1 clinical trial identified bias due to a small sample size and a single referred Health Unit. This study had a very low risk of bias.

4. Discussion
In eighteen of the 25 selected articles, Obesity, MS, CVD, work-related emergencies, accidents or injuries, fatigue, and stress were the main topics noted.
According to the World Health Organization (WHO), obesity have affected more than 650 million adults globally [34]. Furthermore, the MS prevalence is estimated to be 25% of the world population [35]. However, in the current study, the rates of obesity and MS were higher among seamen possible due to their unhealthy lifestyle both on board and on shore.
There was exceptional agreement between the incidence of

CVD among seafarers and the general population. In 2015, 422.7 million cases of CVD and 17.92 million CVD deaths were identified worldwide [36]. Triggering CVD were the tobacco and alcohol use, unhealthy diet and physical inactivity. These facts were supported by Hinton *et al.* in an English cross-sectional study of 1 275 174 participants using medical documents. A CVD diagnosis was recorded in more than one in five adults [37]. It is interesting to note that in our review smoking, alcohol intake, caloric meals as well as reduced exercise were preferred from the majority of seafarers. Moreover, CVD presented as the main health complaint and the leading cause of death among mariners.

In the field of work-related emergencies, there are similarities between the results of this study and those described by Abaya *et al.* in a retrospective analysis. The study population included 388,963 Filipinos seafarers who were occupied in 2,256 vessels of 174 different shipping companies. Official agencies' documents during 2010-2014 were gathered and 6,759 medically repatriated cases for a 5-year period were confirmed. Distribution of the causes using ICD-10 classification was performed. The authors reported as major causes: trauma (21.4%), MSD (19.4%), gastrointestinal (17.3%), genitourinary (8.9%) or and CVD disorders (8.1%), skin (5.6%) and infectious diseases (3.6%) [38]. As Filipinos represent 25-30% of the whole seafaring population these findings provide a profile of the important health issues among seamen.

Furthermore, the European Maritime Agency (EMA) in a summary overview, during 2011-2015, evaluated that around one-third of all marine casualties and incidents were occupational accidents. "Stumbling and fall of persons" was the most common cause in 39%, followed by "loss of control" (19%) and "body movement without physical stress" (18%). Overall 1,098 occupational accidents, 115 fatalities, and 976 injured seamen were noted [39]. Our review findings match those reported by EMA.

Dohrmann and Leppin analyzed the determinants of seafarers' fatigue, in a systematic review. Work schedule, tour length, occupational tasks and demands, exposure to noise, chemical agents and vibration or lack of sleep were correlated with fatigue and stress. Important fatiguing and stressful factors were sleep disorders, night shifts and short-term trips [40]. Moreover, in a survey by the Mental Health Foundation, 38% of 4,619 adults reported being stressed about work [41]. In contrast to these results, however, the rate of occupational fatigue and stress were significantly higher among seamen than in the general population. A possible explanation for this might be that seafarers are working and living in an isolated environment on board.

Limitations of review

The majority of studies were descriptive or cross-sectional and had a high risk of bias, while 1 pilot study with no reported limitations had an unclear risk of bias. Data was gathered via questionnaires in almost 12 studies, official documents in 7 surveys, and PEMEs in 8 reviews. The sample size varied from 68 participants, in a descriptive study to 25,919 subjects, in a cohort survey.

The most frequently represented seafarer was male, nearby forty years old, non-officer, registered mostly in the Danish, German or Norwegian maritime authorities. However, this is not descriptive of the majority of seafarers, who are indeed male, but younger and non-European.

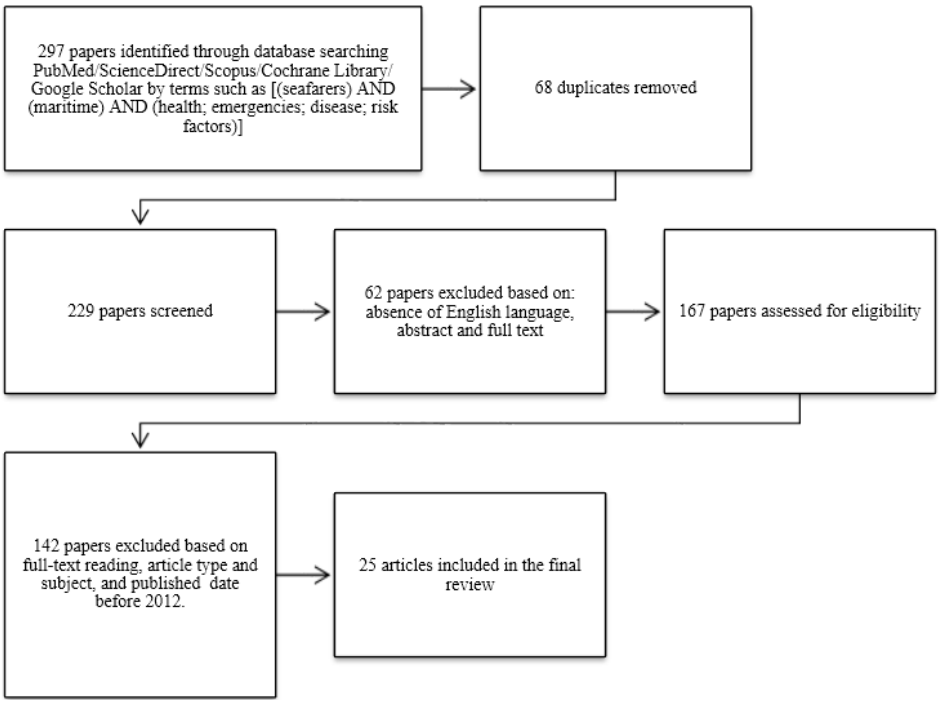

Fig 1: Flow diagram systematic review

European Union
European Regional Development Fund
HELLENIC REPUBLIC
MINISTRY OF ECONOMY & DEVELOPMENT
SPECIAL SECRETARY FOR ERDF & CF
MANAGING AUTHORITY OF EPAnEK
EPAnEK 2014-2020
OPERATIONAL PROGRAMME
COMPETITIVENESS
ENTREPRENEURSHIP
INNOVATION
ΕΣΠΑ 2014-2020
ανάπτυξη - εργασία - αλληλεγγύη
Partnership Agreement 2014 - 2020

Fig 2: Co-financed by Greece and the European Union

5. Conclusion

The outcomes of this review suggest that the unhealthy lifestyle and work-related diseases are the main health related difficulties of seamen. However, the majority of studies was limited by size, data, and sample selection. The combination of findings and limitations provides some support for further study. A longitudinal population survey is required to identify health related issues and the means of improving occupational conditions among seafarers.

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Statement on conflicts of interest

There are no conflicts of interest to declare.

7. References

1. Shipping Industry: 8 interesting facts [Internet]. Ocean Insights. 2018 [cited 8 September 2018]. Available from: https://www.ocean-insights.com/business-news/8-facts-about-the-shipping-industry/
2. [Internet]. Bimco.org. 2018 [cited 8 September 2018]. Available from: https://www.bimco. org/-/media/BIMCO/News-and-trends/News/Crew-support/2016/Manpower_Report_2015_Executive_Summary_Final.ashx
3. [Internet]. Unctad.org. 2018 [cited 8 September 2018]. Available from: http://unctad.org/en/ Publications Library/rmt2017_en.pdf
4. Maritime Labour Convention. [Internet]. Ilo.org. 2018 [cited 8 September 2018]. Available from, 2006, http:// www.ilo.org/global/standards/maritime-labour-convention/lang--en/index.htm
5. Moher D, Liberati A, Tetzlaff J, Altman D. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. BMJ. 2009; 339 (jul21 1): b2535. doi: 10.1136/bmj.b2535.
6. Study Quality Assessment Tools | National Heart, Lung, and Blood Institute (NHLBI) [Internet]. Nhlbi.nih.gov. 2018 [cited 8 September 2018]. Available from: http://www.nhlbi.nih.gov/health-pro/guidelines/in-develop/cardiovascular-risk-reduction/tools/cohort
7. Higgins J, Altman D, Gotzsche P, Jüni P, Moher D, Oxman AD, *et al.* The Cochrane Collaboration's tool for assessing risk of bias in randomized trials. BMJ. 2011; 343(oct18 2): d5928. doi: 10.1136/bmj.d5928.
8. Hjarnoe L, Leppin A. A risky occupation? (Un) healthy lifestyle behaviors among Danish seafarers. Health Promotion International. 2013; 29:720-729. doi: 10. 1093/heapro/dat024.
9. Møller Pedersen S, Jepsen J. The metabolic syndrome among Danish seafarers. International Maritime Health. 2013; 64: 183-190. doi: 10.5603/IMH.2013.0002.
10. Jepsen J, Rasmussen H. The metabolic syndrome among Danish seafarers: a follow-up study. International Maritime Health. 2016; 67: 129-136. doi: 10.5603/IMH.2016.0025.
11. Hjarnoe L, Leppin A. Health promotion in the Danish maritime setting: challenges and possibilities for changing lifestyle behavior and health among seafarers. BMC Public Health. 2013; 13:1. doi: 10.1186/1471-2458-13-1165.
12. Baygi F, Jensen O, Qorbani M, Farshad A, Salehi SA, Mohammadi-Nasrabadi F, *et al*. Prevalence and associated factors of cardio-metabolic risk factors in Iranian seafarers. International Maritime Health. 2016; 67: 59-65. doi: 10.5603/IMH.2016.0013.
13. Baygi F, Jensen O, Qorbani M, Farshad A, Salehi SA, Mohammadi-Nasrabadi F, *et al*. Pattern of some risk factors of cardiovascular diseases and liver enzymes among Iranian seafarers. Medical Journal of the Islamic Republic of Iran. 2017; 31: 130-135. doi: 10.18869/mjiri.31.23.
14. Romero-Paredes M, Reinoso-Barbero L, González-Gómez M, Bandrés-Moya F. Improving cardiovascular health in Spanish seafarers. International Maritime Health. 2016; 67: 3-8. doi: 10.5603/IMH.2016.0002.
15. Scovill S, Roberts T, McCarty D. Health characteristics of inland waterway merchant marine captains and pilots. Occupational Medicine. 2012; 62: 638-641. doi: 10.1093/occmed/kqs156.
16. Westenhoefer J, von Katzler R, Jensen H, Zyriax BC, Jagemann B, Harth V, *et al*. Cultural differences in food and shape related attitudes and eating behavior are associated with differences of Body Mass Index in the same food environment: cross-sectional results from the Seafarer Nutrition Study of Kiribati and European seafarers on merchant ships. BMC Obesity. 2018; 5(1). doi: 10.1186/s40608-018-0180-x.
17. Mahdi S, Sibilio F, Amenta F. Dental hygiene habits and oral health status of seafarers. International Maritime Health. 2016; 67: 9-13. doi: 10.5603/IMH.2016.0003.
18. Oldenburg M, Rieger J, Sevenich C, Harth V. Nautical officers at sea: emergency experience and need for medical training. Journal of Occupational Medicine and Toxicology. 2014; 9:19. doi: 10.1186/1745-6673-9-19.
19. Ádám B, Rasmussen H, Pedersen R, Jepsen JR. Occupational accidents in the Danish merchant fleet and the nationality of seafarers. Journal of Occupational Medicine and Toxicology. 2014; 9(1). doi: 10.1186/s12995-014-0035-4.
20. Forsell K, Eriksson H, Järvholm B, Lundh M, Andersson E, Nilsson R. Work environment and safety climate in the Swedish merchant fleet. International Archives of Occupational and Environmental Health. 2016; 90:161-168. doi: 10.1007/s00420-016-1180-0.
21. Hansen H, Jepsen J, Hermansen K. Factors influencing survival in case of shipwreck and other maritime disasters in the Danish merchant fleet since 1970. Safety Science. 2012; 50: 1589-1593. doi: 10.1016/j.ssci.2012.03.016.
22. Oldenburg M, Jensen H, Wegner R. Burnout syndrome in seafarers in the merchant marine service. International Archives of Occupational and Environmental Health. 2012; 86: 407-416. doi: 10.1007/s00420-012-0771-7.
23. Hystad S, Eid J. Sleep and Fatigue among Seafarers: The Role of Environmental Stressors, Duration at Sea and Psychological Capital. Safety and Health at Work. 2016; 7: 363-371. doi: 10.1016/j.shaw.2016.05.006.
24. Kim J, Jang S. The Relationship between Job Stress, Job Satisfaction, and the Symptom Checklist-90-Revision (SCL-90-R) in Marine Officers on Board. Journal of Preventive Medicine and Public Health. 2016; 49: 376-385. doi: 10.3961/jpmph.16.046.

25. Carotenuto A, Fasanaro A, Molino I, Sibilio F, Saturnino A, Traini E, *et al*. The Psychological General Well-Being Index (PGWBI) for assessing stress of seafarers on board merchant ships. International Maritime Health. 2013; 64: 215-220. doi: 10.5603/IMH.2013.0007.
26. Stannard S, Vaughan C, Swift O, Robinson G, Altaf SA, McGarry. Women seafarers' health and welfare survey. International Maritime Health. 2015; 66: 123-138. doi: 10.5603/IMH.2015.0027.
27. Kaerlev L, Jensen A, Hannerz H. Surveillance of Hospital Contacts among Danish Seafarers and Fishermen with Focus on Skin and Infectious Diseases—A Population-Based Cohort Study. International Journal of Environmental Research and Public Health. 2014; 11: 11931-11949. doi: 10.3390/ijerph111111931.
28. Sunde E, Bratveit M, Pallesen S, Moen BE. Noise and sleep on board vessels in the Royal Norwegian Navy. Noise and Health. 2016; 18(81): 85. doi: 10.4103/1463-1741.178481.
29. Irgens-Hansen K, Gundersen H, Sunde E, Baste V, Harris A, Bråtveit M, *et al*. Noise exposure and cognitive performance: A study on personnel on board Royal Norwegian Navy vessels. Noise and Health. 2015; 17(78): 320. doi: 10.4103/1463-1741.165057.
30. Apostolatos C, Andria V, LIcari J. Overall comparative analysis of management and outcomes of cardiac cases reported on board merchant ships. International Maritime Health. 2017; 68: 190-195. doi: 10.5603/IMH.2017.0036.
31. Grappasonni I, Petrelli F, Amenta F. Deaths on board ships assisted by the Centro Internazionale Radio Medico in the last 25 years. Travel Medicine and Infectious Disease. 2012; 10: 186-191. doi: 10.1016/j.tmaid.2012.06.006.
32. Oldenburg M, Herzog J, Harth V. Seafarer deaths at sea: a German mortality study. Occupational Medicine. 2015; 66:135-137. doi: 10.1093/occmed/kqv153.
33. [Internet]. Obesity and overweight. WHO. 2019 [cited 18 January 2019]. Available from: https:// www. who. int/news-room/fact-sheets/detail/obesity-and-overweight
34. Saklayen MG. The Global Epidemic of the Metabolic Syndrome. Current Hypertension Reports. 2018; 20: pp12. doi: 10.1007/s11906-018-0812-z.
35. Roth GA, Johnson C, Abajobir A, Abd-Allah F, Abera SF, Abyu G, *et al*. Global, Regional, and National Burden of Cardiovascular Diseases for 10 Causes, 1990 to 2015. Journal of the American College of Cardiology. 2017; 70: 1-25. doi: 10.1016/j.jacc.2017.04.052.
36. Hinton W, McGovern A, Coyle R, Han TS, Sharma P, Correa A, *et al*. Incidence and prevalence of cardiovascular disease in English primary care: a cross-sectional and follow-up study of the Royal College of General Practitioners (RCGP) Research and Surveillance Centre (RSC). BMJ Open. 2018; 8:e020282. doi:10.1136/bmjopen-2017-020282.
37. Abaya AR, Roldan S, Ongchangco JC, Ronquillo-Sarmiento RM, Sarmiento RF. Repatriation rates in Filipino seafarers: a five-year study of 6,759 cases. International Maritime Health. 2015; 66:189-95. doi: 10.5603/IMH.2015.0038.
38. [Internet]. Summary Overview of Marine Casualties and Incidents 2011-2015. [cited 18 January 2019]. Available from: http://www.emsa.europa.eu/news-a-press-centre/external-news/item/3011-summary-overview-of-marine-casualties-and-incidents-2011-2015.html
39. Dohrmann SB, Leppin A. Determinants of seafarers' fatigue: a systematic review and quality assessment. Inter Arch Occup Environ Health. 2017; 90:13-37. doi: 10.1007/s00420-016-1174-y.
40. Mental Health Foundation. Stress: Are we coping? London: Mental Health Foundation, 2018, 34.