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Letter from the Editor

Dear Readers,
Dear Authors,
Dear Colleagues,
Dear Friends,

On behalf of the whole Editorial Team I would like to share outstanding news with all of You.

Based on the Journal performance data for the year 2022 International Maritime Health has been granted 2.2 Impact Factor score.

First of all, I would like to thank the whole Editorial Team, Advisors and especially my Predecessors. Professor Bogdan Jaremin has introduced International Maritime Health to the arena of international scientific publishing. Doctor Maria Jeżewska for almost a decade has made a great effort to ensure high level and standards of published materials.

It is a great honour to continue their work.

I would also like to thank the reviewers for their expert input. Without high standards of peer review the scientific level of materials published in the International Maritime Health would not be possible.

The high score of International Maritime Health performance is certainly a great distinction. Above all, however, it should be a source of motivation for even greater commitment and work. I would like to invite all of you for cooperation and support in the reviewing and publishing process. It is a great opportunity for growth and broadening of our scientific impact in the future.

*Dr. Marta Grubman-Nowak
Editor-in-Chief*

COVID-19 on board a cruise ship: medical management

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ABSTRACT

Background: First, this analysis was conducted to study a coronavirus disease 2019 (COVID-19) cluster dynamic on a cruise ship in order to allow the ship physician to anticipate the duration and importance of the contaminations. Secondly, the author tries to find out if the closed environment on board allows specific conclusions about epidemic dynamics and preventative measures.

Materials and methods: From a personal epidemiological compendium done by himself on board the author analysed different epidemic curves identified on board other ships and compared them to the epidemiologic data from the different COVID-19 contamination waves in France since 2020. All crew members were submitted to polymerase chain reaction tests on D2, D5, D8 and D15 and symptomatic cases were tested on on-board devices in the meantime. An excel file called “Log Covid” allowed for daily reporting to the ship-owner on the epidemic dynamics and the prospects on the end of crises in order to anticipate the resumption of the business in the best conditions. The jobs on board, age and geographic origin of the contaminated people were analysed, as well as their vaccination status.

Results: Out of a total of 118 crew members, 61 (52%) sailors were contaminated in 8 days. The symptoms were benign (pharyngitis, headaches, feverish state); no serious form of illness were reported. The passengers were repatriated to France at the earliest stage. The epidemic phase occurred in a 15-day window. The first 8 days corresponded to the ascending phase, then a faster phase of epidemic decrease of 7 days. Similarities emerged between the epidemic dynamics of this virus and other contaminations on cruise ships and epidemic phases on land in spite of important differences in numbers.

Conclusions: This study can allow a ship’s doctor to better understand the viral dynamics in case of a COVID-19 cluster and to anticipate the exit of the crisis. Repeated tests during the active phase of the epidemic are necessary in case of a large cluster to know where to place oneself on a typical epidemic curve. Isolation and barrier measures advised by the ship’s doctor remain the only weapons that can limit its magnitude.

(Int Marit Health 2023; 74, 2: 83–88)

Key words: COVID-19, infection, maritime, boat

INTRODUCTION

Since March 2020, the coronavirus disease 2019 (COVID-19) epidemic has affected the entire planet with 9 epidemic waves identified by the end of December 2022. In marine

medicine, few ships have documented and published precisely the dynamics of the contaminations [1–4] since the first one described from the experience of the Diamond Princess immobilized in quarantine in Yokohama, Japan for 15 days [5, 6].

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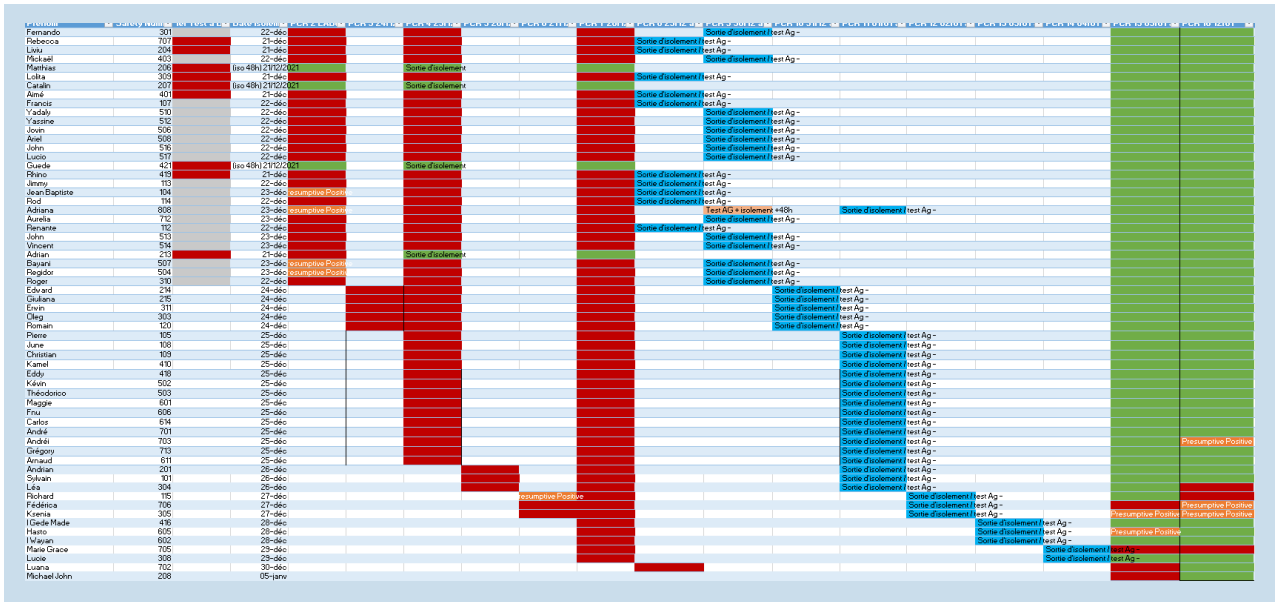


Figure 1. Log Covid filled by ship’s doctor and daily sent at the company

Shipowners tend not to communicate on these sensitive issues.

The Ponant Company, with 13 cruise ships, has set up internal medical reporting procedures for the doctors on board in order to report contaminations as soon as possible called the daily COVID report.

Having been confronted with an active COVID-19 cluster at the end of December 2021 on one of the company’s ships (Le Jacques Cartier) cruising in the Persian Gulf with 150 passengers on board, decisions had to be taken quickly in order to preserve the passengers, who were significantly older than the crew, from serious forms requiring hospitalisation.

The ship was then placed in quarantine, first alongside and then at anchor, and regular testing of the crew was carried out to monitor the epidemic dynamics and anticipate the end of the crisis.

Those decisions were discussed between the ship doctor and the captain.

MATERIALS AND METHODS

The Jacques Cartier’s headcount was 118 crew members and 150 passengers.

As the international maritime rules obligate a ship doctor is required up to 100 seamen or passengers on board and for cruising more of 3 days. The ship doctor’s duty is to take care of them and also to advise sanitary measures to the captain. In case of a viral epidemic the captain can order diversion of the ship, quarantine measures and all decisions about the safety of the ship that he considers available to decrease the health risks. He can also refer to the Telemedical Advisory Services [7].

This study is the report of the features of the cluster COVID-19 on board the Jacques Cartier with analyses of the epidemiologic data.

On board, the ship’s doctor had to diagnose the infection with nasal samples with the reverse transcription-polymerase chain reaction (RT-PCR) method with VITA PCR Credo Diagnostics from Biosynex laboratory. Then he advised the isolation of the infected crew members and the tracing of the contacts cases.

The ship’s doctor filled out an Excel spreadsheet Log Covid on a daily basis to report to the shipowner on the progress of the epidemic, and participated with the captain in conferences with the Dubaï Health Authority and the company headquarters in Marseille (Fig. 1).

RESULTS

At D1, several sailors came to the hospital with symptoms suggestive of COVID-19 and were tested on the Biosynex machine on board (VITA PCR Credo Diagnostics). Systematic tests were done on contact cases. In total 9 cases were positive out of 34 tests (26% of tests were positive).

The captain then took the decision to divert the ship to the nearest port to allow a global test of all the passengers and crew (Starmetropolis Dubai Laboratory) done at D2: 29 positive cases (i.e. 3.22 times compared to D1) among the crew members and only one positive passenger out of 150.

The company then decided to repatriate the healthy passengers (the only positive one was placed in a government isolation hotel). The Dubai Health Authority then confined us to quarantine on the ship under the supervision of the ship’s doctor.

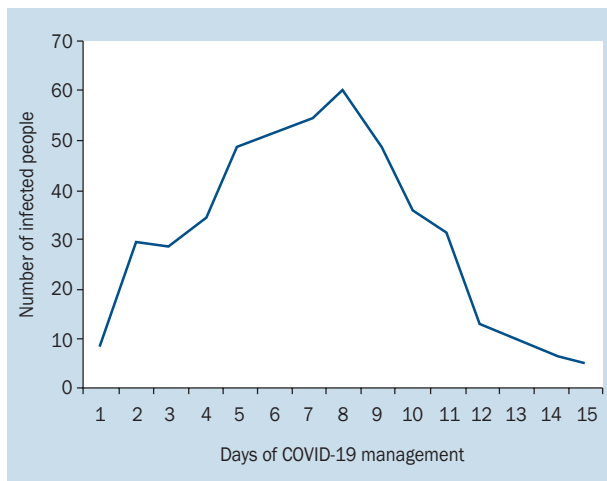


Figure 2. Epidemic curve on-board the Jacques Cartier

Systematic tests were done by the same laboratory at D5 and D8, and then the ship went to anchorage to continue the quarantine until the end of the epidemic at D15 (Fig. 2).

The resumption of cruises authorized by the Dubai Health Authority required an additional 10 days of quarantine after the last case, and a new global test at the end of these 10 days.

A total of 61 crew members were isolated in the cabin (the last contamination at D15), all of whom were released from isolation at D7 after a negative antigenic test (except for one positive who spent two more days in isolation).

The distribution of contaminated positions is unsurprising: the largest number of employees per sector are the most frequently affected (galley 27%, deck 20%, engine 16%) (Fig. 3).

The most frequent symptoms were like the ones ashore, pharyngeal pain (32%), followed by headache (25%) and flu-like symptoms (25%). It should be noted that 2/3 of the contaminated people were symptomatic and 1/3 asymptomatic detected by the tests of the whole crew (Fig. 4).

The extent of pharyngeal pain and headache and the complete absence of respiratory forms were in favour of an Omicron variant, which at that time was beginning to supplant the Delta variant, but it was not possible to perform viral sequencing in Dubai.

There was no predominance of infection by country of origin or by type of vaccine received (all crew members were vaccinated, those who received the Chinese vaccine, the Russian vaccine, or a dose of Janssen vaccine had all received a dose of RNA booster before the cluster).

The epidemic curve of the Jacques Cartier is comparable to the one from the Diamond Princess in March 2020 (712 cases out of 3711 passengers) and that of the Champlain in January 2022 (70 cases out of 113 crew members) (Figs. 5, 6).

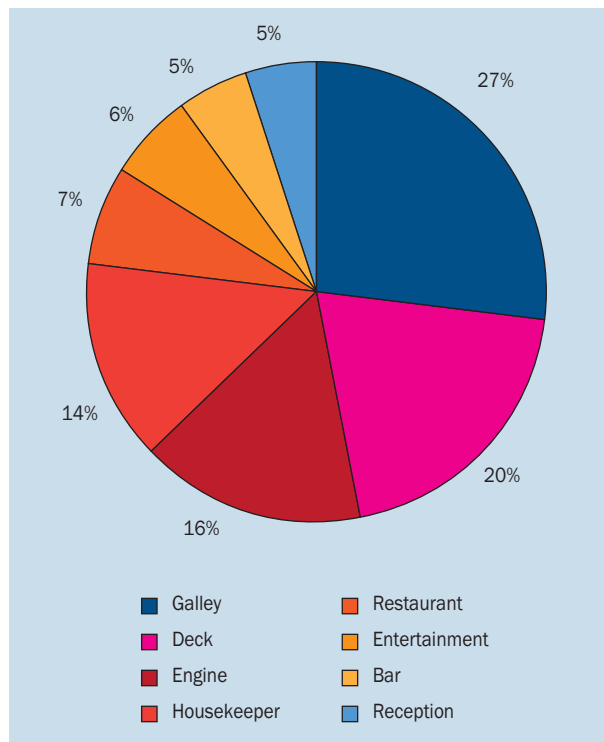


Figure 3. Work-places of the contaminated crew members on the Jacques Cartier

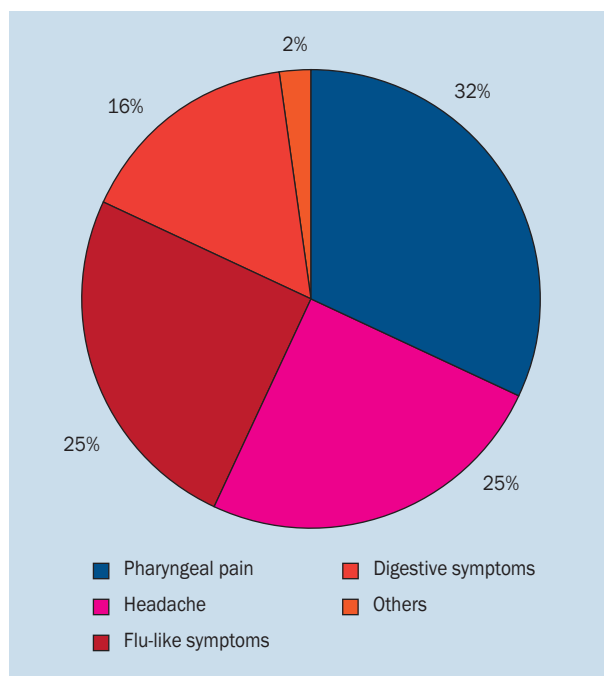


Figure 4. Symptoms of the contaminated crew members on the Jacques Cartier

The analysis of these curves shows:

- A duration of the active ascending phase of the epidemic of 14 days for the Diamond Princess and 8 days for the Jacques Cartier and Champlain. This longer duration

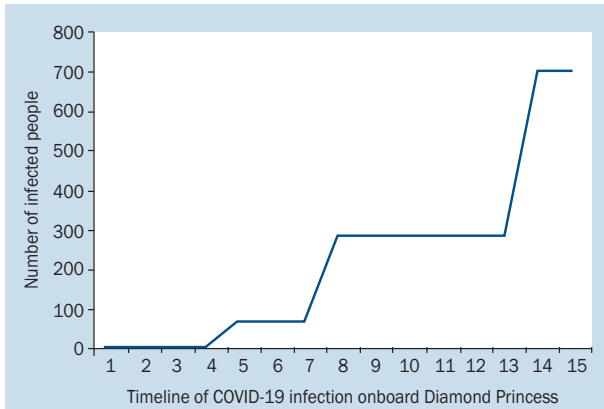


Figure 5. Curves of the Diamond Princess

is related to the larger number of participants, which delayed herd immunity;

- The duration of the descending phase was significantly shorter than the ascending phase (6 to 7 days);
- An initial phase lasting 3 to 4 days of slow viral replication followed by an exponential increase in the epidemic dynamics until herd immunity.

The epidemic plateau is brief, one can even speak of an epidemic peak.

If we compare these curves to the epidemic curves on land in France in 2020 and in Brittany in 2022, we find more or less the same dynamics with an initial phase of slow linear replication, then a brief plateau before the exponential phase, followed by a peak with rapid decay (Figs. 7, 8).

On land, the decrease in the dynamics is less clear-cut, either towards a high plateau (left-hand curve France 2020) or even with an active epidemic resumption (right-hand curve in Brittany 2022). This notable difference compared to the curves on board ships is certainly linked to the fact that the isolation of patients is less well respected than on board.

The amplitude of the curves on land is more marked due to the larger number of people.

DISCUSSION

Viral dynamics curves are typically exponentials of the type $y_2 = x^3 + x + 1$ [8].

The faster decay phase than the ascending phase and the sharp break at the epidemic peak have led to a preference for the term epidemic waves.

The ascending phase can be divided into two distinct parts separated by a short plateau: a linear phase and then an exponential phase, which can be explained by a weak diffusion of the virus at the very beginning of the cluster and then a more important contagiousness of the aerosols after a few days due to an increase of the viral replication [9].

It should be noted that on the Jacques Cartier this slow initial phase was absent probably due to a delay in consulting the first patients, especially Asians who were afraid of being disembarked.

The plateau phase or the epidemic peak is preceded by a slowing down of the epidemic dynamics which can be explained by the beneficial effect of the isolation of the patients.

The epidemic peak typically corresponds to the collective immunity reached between 50 and 65% of infected persons

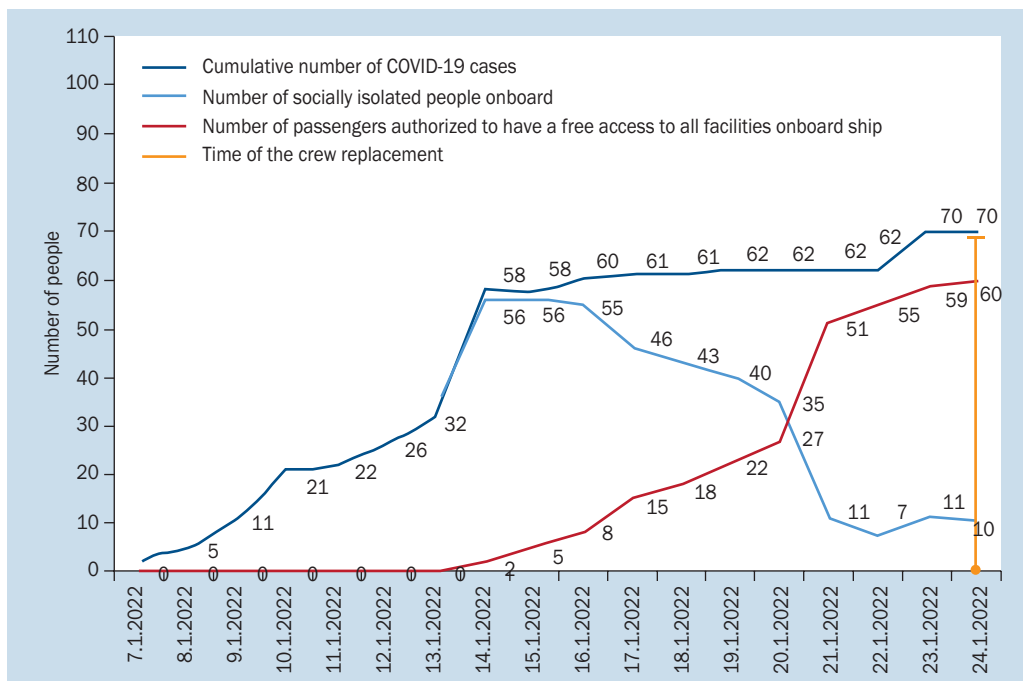


Figure 6. Curves of the Champlain

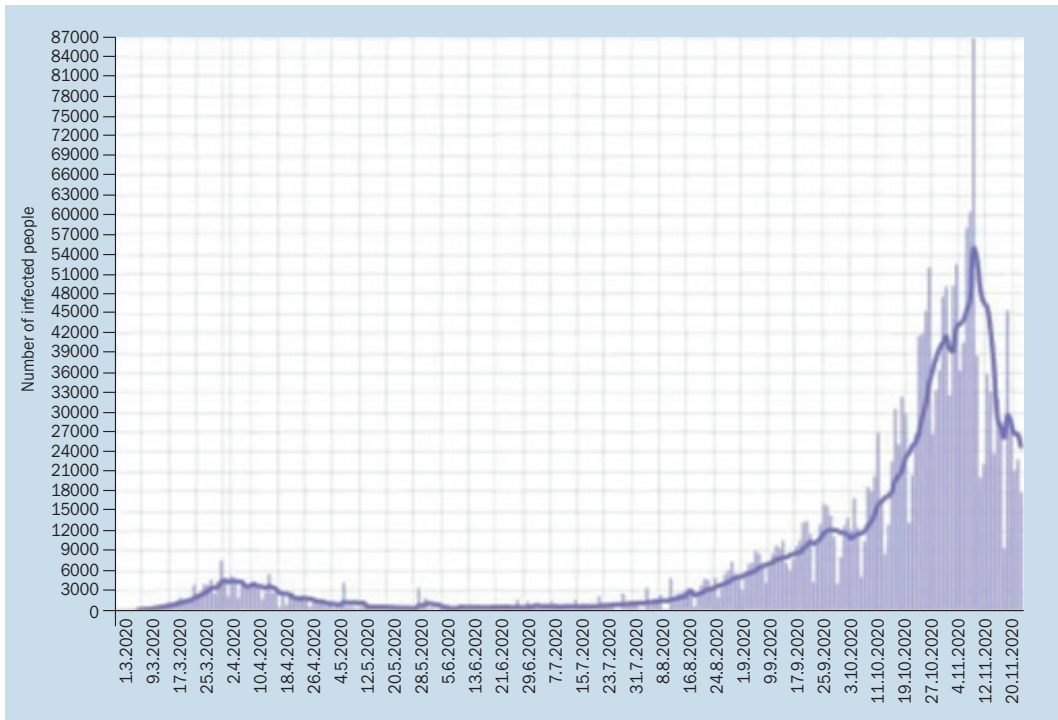


Figure 7. Incidence of COVID-19 cases in France

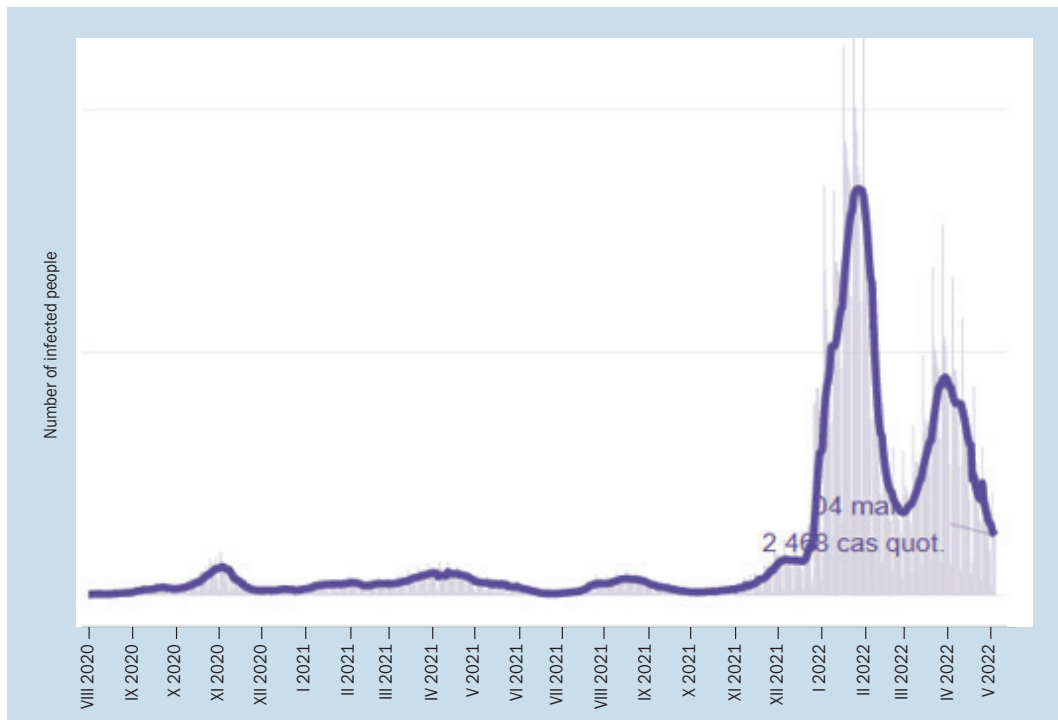


Figure 8. Incidence of COVID-19 cases in Brittany

in a stable workforce (no new entrants due to quarantine) [1–6].

The decay phase is rapid if the isolation of patients is respected. This is what made it possible to drastically limit the num-

ber of infected people during the SARS-COV1 and MERS-COV epidemics in 2002 and 2013 respectively, as well as during the influenza A pandemic in 2011, even though it was not a coronavirus but an influenza virus [9].

On board a ship, the isolation of patients remains the main weapon of the ship's doctor. It must be strict and as early as possible. Comfort facilities for the infected crew allow them to better tolerate this introspective phase (unlimited internet, internal telephone communications, use of a terrace or a reserved outdoor space) [10]. Psychological support and daily medical surveillance also help to cope with this phase. This is the role of the doctor or nurse on board, but also of the captain.

CONCLUSIONS

The role of the shipboard physician in the event of a COVID-19 cluster is paramount. Remote health care practice such as prescribed by a Telemedical Advisory Service cannot replace the effectiveness of a medical doctor practicing diagnosis, treatment and health survey on board.

The identification of the cluster must be done as early as possible in order for the isolation of the patients to be effective [1–6]. Repeated tests at an interval of 3 to 4 days maximum allow to know where to place oneself on a typical epidemic curve and to envisage the outcome of the epidemic phase.

The doctor must also provide his or her knowledge and forecasts to the shipowner and be absolutely transparent with the captain with whom important decisions are taken.

He or she must also relay sensitive information to the local health authorities, while taking care not to violate medical confidentiality.

Finally, he or she has an informative role and a psychological dimension of support for the crew, never forgetting that some of them have been on board and away from their families for many months.

Conflict of interest: None declared

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Lambliasis-associated Schönlein-Henoch purpura in an Italian traveller: first case report in Italy

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ABSTRACT

A unique report of Schönlein-Henoch purpura (SHP) associated with a recent *Giardia lamblia* enteric infection is described and discussed on the ground of the available literature. Tinidazole plus an appropriate probiotic therapy, including *Lactobacillus reuteri* and vitamin D, proved to be effective in the condition. SHP is an immunocomplex-mediated disorder characterised by a number of differently associated signs and symptoms, leading to the possible involvement of the skin, joints, abdomen and kidneys. Recent bacterial, viral, or protozoan infections may trigger the disease onset in patients of all ages. The paper describes the first case of SHP triggered by a giardiasis. Tinidazole plus an appropriate probiotic therapy, i.e. *L. reuteri* and vitamin D proved to be effective in this condition. To our knowledge, this is the first reported case of lambliasis-associated SHP described in an international traveller.

(Int Marit Health 2023; 74, 2: 89–91)

Key words: *Giardia lamblia*, giardiasis, Schönlein-Henoch purpura, travel medicine

A 34-year-old otherwise healthy immunocompetent woman, was seen 2 weeks after coming back from a 3-month stay in a small village located in Tanzania, where she participated in a volunteer humanitarian programme. The patient presented with watery, foul-smelling diarrhoea, associated with asthenia, dyspepsia, abdominal cramps/pain, mild arthralgia predominantly involving the upper and lower limbs, and a diffuse symmetric pompho-erythematopetechial cutaneous vasculitis-like rash initially localized on the buttocks and trunk, and later spreading to the upper and lower limbs, characterised by small non-itching but palpable papules (Fig. 1). After skin biopsy, histopathologic studies confirmed IgA vasculitis. The patient denied contact with water from uncontrolled sources; however, during her stay in Africa, the patient worked as a health care professional and had contact with paediatric patients. Also, the patient reported having unprotected sex while in Africa. Before leaving



Figure 1. Lambliasis-associated Schönlein-Henoch purpura

Italy for Africa, the patient had been immunised against hepatitis A, typhoid fever and yellow fever, and received antimalarial prophylaxis as well.

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Table 1. Reported cases of Henoch-Schönlein purpura and parasitic infections

References, year, country	Patient, age/sex	Parasitic infection	Kidney disease	Treatment	Clinical course
Janković et al., 2016, Serbia	A 14-year-old girl	<i>Strongyloides stercoralis</i> infection	HSP nephritis	Mebendazole; prednisone + azathioprine + enalapril	Recovery
Tutañç et al., 2013, Turkey	A 30-month-boy	<i>Blastocystis hominis</i>	Renal function tests remained normal	Systemic steroid + co-trimoxazole	Recovery
Thapa et al., 2010, India	A 9-year-old otherwise healthy boy	<i>Plasmodium falciparum</i> , cerebral malaria	Renal function tests remained normal	Parenteral artesunate. He was discharged with primaquine	Recovery
Hamidou et al., 1999, France	A 17-year-old boy	<i>Toxocara canis</i> infection	Renal function tests remained normal	No anthelmintic treatment	Recovery
Bellanger et al., 2011, Canada	A 28-year-old woman	<i>Toxocara canis</i> infection	HSP nephritis	An anthelmintic treatment with diethylcarbamazine together with the corticosteroid treatment	Recovery
Ergür et al., 1999, Turkey	35 cases of HSP (25 males, 10 females), aged between 2 and 15 years	<i>Giardia intestinalis</i> 14 cases, <i>Trichomonas hominis</i> 6 cases, <i>Entamoeba histolytica</i> 3 cases, <i>Ascaris lumbricoides</i> 2 cases	Renal involvement 8 cases	NR	NR
Kim et al., 2010, Korea	An 8-year-old girl	<i>Entamoeba histolytica</i>	Renal function tests remained normal	Empirical antibiotic (metronidazole), methylprednisolone/oral prednisolone	Recovery
Demiricin et al., 1998, Turkey	An 11-year-old boy	<i>Entamoeba histolytica</i>	HSP nephritis	Metronidazole, prednisolone	Recovery
Reitano, Fondacaro, 1950, Italy	Data not available	Ascarids	Data not available	Data not available	Data not available

HSP – Henoch-Schönlein purpura; NR – not reported

Laboratory examinations showed that a platelet count and coagulation tests results were within normal limits. The tests demonstrated mild leukocytosis and eosinophilia (12.000 and 900 cells/ μ L, respectively). Microhaematuria and mild albuminuria, together with mild serum aspartate aminotransferase (AST/GOT, 110 U/L, normal value: 5–50) and alanine aminotransferase (ALT/GPT, 160 U/L, normal value: 5–50) indicated limited but present kidney and liver involvement, respectively. Serum C2-C3 complement fraction consumption and moderately reduced serum IgA levels were fully consistent with the diagnosis of Schönlein-Henoch purpura (SHP). As for the microbiological tests results, all cultures for bacteria, mycobacteria and fungi tested negative, as well as all serological examinations for bacterial or viral diseases, malaria tests, and all parasite tests performed on blood/urine/stool specimens, when trying to detect *Giardia lamblia* by both direct methods and DNA immunoenzymatic assay on multiple consecutive stool specimens. The typical clinical and laboratory picture associated with parasitological findings confirmed the diagnosis. The administration of a full dose of oral tinidazole, and of an oral probiotic including *Lactobacillus reuteri* and vitamin D, plus supportive rehydration therapy

led to a complete resolution of signs and symptoms, with negative stool test results within 3 weeks of treatment. Follow-up tests performed 3 months and again 6 months post treatment revealed no abnormalities.

Schönlein-Henoch purpura is a form of vasculitis which is common in children, but is rare among adults. Typical manifestations include palpable purpura, abdominal pain, arthritis, and haematuria. It frequently occurs following an infectious trigger and involves IgA and C3 deposition in the walls of the small vessels. Many infectious agents were proposed as a potential trigger for SHP, particularly B-haemolytic *Streptococci*. Other bacterial agents that have been suggested as possible triggers of SHP include *Salmonella*, *Mycoplasma pneumonia*, *Staphylococcus aureus*, *Helicobacter pylori* and *Bartonella henselae* [1–11]. Many reports suggest that several viruses and vaccine inoculations should be included in the list of differentials responsible for triggering SHP. SHP, however, is rarely reported in association with parasitic infections [1–11]. Only 43 cases of SHP in association with parasites have been found in a MEDLINE search; they are summarised in Table 1 [1–11]. The analysis of the data retrieved suggests that, although it is an infrequent combination, clini-

cians should not underestimate this possibility. Parasitic diseases less frequently reported as triggers of SHP include intestinal giardiasis, amoebiasis, and toxocariasis. It was frequently responsible for the development of SHP nephritis in the cases described. Although representing an extremely rare condition, which was proved by our literature search [1–11], clinicians should be aware of the infrequent, but possible role of giardiasis in prompting SHP at any age and in the absence of underlying comorbidities.

Conflict of interest: None declared

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Hand hygiene knowledge and practices, and rates of respiratory tract infections between Hajj and Umrah pilgrims: a comparative study

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ABSTRACT

Background: Hajj and Umrah mass gatherings (MGs) in the Kingdom of Saudi Arabia amplify the risk of viral respiratory tract infections (RTIs), but there is a lack of comparative data from these two MGs. This study aims to compare pilgrims' hand hygiene knowledge, practices, and rates of RTIs during the peak periods of Umrah and Hajj in 2021.

Materials and methods: The datasets of this comparative study were obtained from two previously conducted studies that used similar study tools and identical syndromic definitions. The binary logistic regression was applied to compare the categorical variables and, a t-test was used to compare the continuous variables.

Results: A total of 510 Hajj pilgrims and 507 Umrah pilgrims were recruited. The majority of Hajj pilgrims (68%) were ≥ 40 years old, while most Umrah pilgrims (63%) were < 40 years old. The mean total knowledge scores of hand hygiene between the Hajj and Umrah pilgrims differed significantly (4.1 vs. 3.7, respectively, $p < 0.001$) so did their compliance with frequent use of alcohol-based hand rubs (53.0% vs. 36.3%, respectively, $p < 0.001$) and the rates of RTIs (4.7% vs. 2.2%, respectively, $p = 0.05$).

Conclusions: These differences could be attributable to the distinctive characteristics of Hajj and Umrah pilgrimages, and the unique differences in risks posed by those MGs.

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Key words: Hajj, Umrah, hand hygiene, mass gathering, pilgrim, respiratory tract infection

INTRODUCTION

The Kingdom of Saudi Arabia (KSA) hosts two major types of religious mass gatherings (MGs): Hajj and Umrah. Hajj is an annual Islamic pilgrimage that attracts up to

three million pilgrims between the 8th and the 13th of Dhul Hijjah, the last month of the Islamic calendar, while Umrah is a minor pilgrimage that can be completed within a short period of time at any time throughout the year,

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although the fasting month of Ramadan is the peak time for Umrah as it holds almost similar spiritual significance to the devotees as Hajj [1]. The common rituals of these pilgrimages include assembly at the Holy Mosque in Makkah City, where pilgrims make circumambulations around the monolith known as the “Kaaba” and march between two hillocks called Safa and Marwa, and Hajj pilgrimage has additional rituals, such as spending the designated Hajj days in tents on the outskirts of Makkah, including Arafat, Mina, and Muzdalifah [2].

During such MGs, the congregation of participants at particular sites for a specific period of rites poses a greater risk of acquiring and transmitting infectious diseases, mainly viral respiratory tract infections (RTIs) [3, 4]. In a survey conducted in 2010, approximately 50% of Hajj pilgrims from the capital city of KSA (Riyadh) developed RTIs [5]. Also, in a surveillance study conducted among returning Hajj and Umrah pilgrims from India in 2014 and 2015, about 11% reported symptoms of RTI [6]. Furthermore, the overall prevalence of influenza-like illnesses (ILI) among Hajj pilgrims is high. For instance, 30% of Egyptian pilgrims studied between 2012 and 2015 [7] and about 80% of French pilgrims studied between 2014 and 2017 had ILI [8].

The practice of proper and frequent hand hygiene (HH), alongside other non-pharmacological interventions, is strongly recommended to control and prevent RTIs during MG events. In the recent Hajj and Umrah seasons, the government of KSA imposed a set of public health measures to prevent the spread of the coronavirus disease 2019 (COVID-19) in the midst of the global pandemic [9]. These measures included the mandatory use of face masks, advice on practising frequent HH, providing necessary hygienic products to pilgrims, and maintaining physical distance [10].

Limited studies have evaluated the knowledge and practices of HH measures among Hajj and Umrah pilgrims. A survey carried out by our researchers during Hajj in 2019 revealed that despite pilgrims' good HH knowledge and practices, only a minority utilised recommended HH products and the majority preferred handwashing with soap and water [11]. The majority of Umrah pilgrims (83%) who participated in a survey in 2019 at the departure lounge at King Abdul Aziz International Airport, Jeddah, KSA, reported cleaning their hands with soap and water or with sanitisers after coughing and sneezing [12].

Nevertheless, no focused study has compared participants' health behaviours and/or symptomatic RTI rates of these pilgrimages specifically amidst the COVID-19 pandemic. To this end, the primary objective of this study was to explore the differences in HH knowledge and practices along with the rates of syndromic RTIs among Hajj and Umrah pilgrims during the pandemic.

MATERIALS AND METHODS

The datasets for this comparative study were retrieved from two studies previously conducted by our team: one of the studies was a pilot randomised controlled trial (RCT) that was conducted among domestic Umrah pilgrims during the peak months of Umrah pilgrimage between 22 April and 8 July 2021 [13], and the other was a prospective cohort study conducted among domestic Hajj pilgrims during the peak week of Hajj festival from 19 to 23 July 2021 [14]. The detailed methodologies of these studies are published elsewhere [13, 14]. In brief, socio-demographic variables, medical and vaccination history, and knowledge about HH of Hajj and Umrah pilgrims were captured in a baseline questionnaire after they agreed to participate in the studies. Subsequently, the study participants were followed up for an equal period of 7 days after recruitment to record the occurrence of RTI symptoms and practices of HH through a follow-up questionnaire.

Similar assessment tools to evaluate knowledge and practice of HH and uniform definitions for RTIs were used in these studies. The level of HH knowledge was assessed based on the sum of the Likert scale of 0–6: ‘low level’ of knowledge was defined as a score of < 3, ‘moderate level’ as a score of 3–< 5, or ‘high level’ as ≥ 5 . HH practice was evaluated according to participants' daily use of soap and water as well as alcohol-based hand rubs (ABHR) to clean their hands during the study period: < 5 times/day indicating ‘less frequently’, or ≥ 5 times/day indicating ‘more frequently’. In order to estimate the rates of RTIs, we applied broad clinical criteria to define a case of RTI, in addition to syndromic definitions for ‘possible ILI’ and ‘possible COVID-19’ that were described and evaluated elsewhere [15, 16]. A case of RTI was defined as the development of at least one respiratory symptom, including cough, sore throat, rhinitis, dyspnoea, and smell or taste dysfunction.

The data recorded from both studies were exported to a single master Excel spreadsheet (Microsoft Office 356, version 2209, Redmond, WA, USA) for cleaning and assigning each line list of data to a code before being imported into Statistical Package for Social Sciences (SPSS) software (IBM SPSS Statistics for Windows, version 29.0, IBM Corp, Armonk, NY, USA) for analysis. The mean (or median with range) \pm standard deviation (SD) was used to report continuous variables, whilst frequencies and percentages were applied to summarise the categorical data. The binary logistic regression was used to test the difference between Hajj and Umrah pilgrims in terms of the reported HH practice and rates of RTIs, while the independent two-sample t-test was used to compare the means of overall HH knowledge score and other continuous variables between Hajj and Umrah pilgrims. A p value of ≤ 0.05 was considered statistically significant.

Table 1. Baseline characteristics by Hajj and Umrah pilgrims

Variable	Hajj pilgrims	Umrah pilgrims	P-value
Age [years]:			
Median (range)	50 (18–69)	34 (18–75)	
18–25	55 (10.8%)	119 (23.5%)	< 0.001*
26–39	109 (21.4%)	201 (39.6%)	< 0.001*
40–55	209 (41%)	153 (30.2%)	< 0.001*
≥ 56	137 (26.9%)	34 (6.7%)	< 0.001*
Male : Female	230 (45.1%) : 280 (54.9%)	231 (45.5%) : 276 (54.5%)	0.88
Nationality:			0.37
Saudi	437 (85.7%)	444 (87.6%)	
Non-Saudi	73 (14.3%)	63 (12.4%)	
Education:			
University-level and higher	390 (76.5%)	326 (64.3%)	< 0.001*
Diploma	27 (5.3%)	47 (9.3%)	0.016*
High school certificate	64 (12.5%)	103 (20.3%)	< 0.001*
Primary/elementary school certificate or no education	29 (5.7%)	31 (6.1%)	0.77
Presence of chronic medical conditions	167 (32.7%)	128 (25.2%)	0.009*
Received influenza vaccine	297 (58.2%)	117 (23.1%)	< 0.001*
Received at least one dose of COVID-19 vaccine	509 (99.8%)	456 (89.9%)	< 0.001*

*These values are statistically significant; COVID-19 – coronavirus disease 2019

Table 2. Comparison of hand hygiene knowledge and practices between Hajj and Umrah pilgrims

Variable	Hajj pilgrims	Umrah pilgrims	P-value
Mean ± SD total knowledge scores	4.1 ± 1.2	3.7 ± 1.3	< 0.001*
Frequency of using soap and water:			
Less frequently (< 5 times/day)	134 (30.1%)	147 (33%)	0.36
More frequently (≥ 5 times/day)	311 (69.9%)	299 (67%)	
Frequency of using ABHR:			
Less frequently (< 5 times/day)	209 (47.0%)	284 (63.7%)	< 0.001*
More frequently (≥ 5 times/day)	236 (53.0%)	162 (36.3%)	

*These values are statistically significant; SD – standard deviation; ABHR – alcohol-based hand rubs

RESULTS

A total of 510 Hajj pilgrims and 507 Umrah pilgrims were enrolled in the studies, of whom 445 participants in the Hajj study and 446 participants in the Umrah study completed the follow-up phase until the end. Table 1 summarises the baseline characteristics of Hajj and Umrah pilgrims and demonstrates significant differences between certain characteristics, including age, pre-existing medical conditions, and receipt of influenza and COVID-19 vaccinations.

Table 2 shows the differences between HH knowledge and practices among Hajj versus Umrah pilgrims. Hajj pilgrims had higher knowledge scores, and significantly more of them used ABHR to clean their hands more frequently compared to Umrah pilgrims. The logistic regression analysis found that there was a statistically significant difference between the rates of RTIs, with Hajj pilgrims having higher RTI rates than Umrah pilgrims; sore throat was the only symptom that significantly varied between participants of the two studies and affected Hajj pilgrims to a greater extent (Table 3).

Table 3. Comparison of respiratory tract infections (RTIs) rates between Hajj and Umrah pilgrims

Variable	Hajj pilgrims	Umrah pilgrims	P-value
Rate of RTI	21 (4.7%)	10 (2.2%)	0.05*
Rate of 'possible ILI'	5 (1.1%)	3 (0.7%)	0.48
Rate of 'possible COVID-19'	4 (0.9%)	2 (0.4%)	0.42
Reported respiratory symptoms:			
Sore throat	16 (3.6%)	6 (1.3%)	0.04*
Cough	9 (2%)	5 (1.1%)	0.29
Rhinitis	8 (1.8%)	5 (1.1%)	0.40
Smell/taste dysfunction	4 (0.9%)	1 (0.2%)	0.21
Shortness of breath (dyspnoea)	3 (0.7%)	1 (0.2%)	0.34

*These values are statistically significant; ILI – influenza-like illnesses; COVID-19 – coronavirus disease 2019

DISCUSSION

This is the first published study to compare health behaviours and rates of symptomatic RTIs among participants from the two largest annual religious MGs in KSA, and its findings indicated that although Hajj pilgrims demonstrated better knowledge and practices of HH than Umrah pilgrims, they reported a higher rate of symptomatic RTIs amidst the COVID-19 pandemic in 2021.

Our findings revealed that the pilgrims who participated in Hajj were significantly older and had more underlying health conditions compared to those who attended Umrah, with *p* values of < 0.001 and 0.009, respectively. The majority of Hajj pilgrims (68%) were ≥ 40 years old, whereas most Umrah pilgrims (63%) were younger than 40 years of age. Other studies also found most Hajj pilgrims to be middle-aged or older. For example, a study conducted in 2021 involving Hajj attendees found that approximately half of the pilgrims were aged between 51 and 60 years [17]. Many Hajj pilgrims are typically elderly as this is a serious commitment considered by most devotees as a once-in-a-lifetime performance and most pilgrims save for years to prepare for the journey [18].

Our study took place between April and July 2021, and the influenza vaccination campaign in KSA was launched in September of the preceding year (2020) [19]. We asked pilgrims if they had received the vaccine in the past 1 year; it is likely that most of the surveyed received the vaccine during the campaign, and some may have received it before the pilgrimages. Nonetheless, Hajj pilgrims showed a significantly higher influenza vaccination rate in comparison to Umrah pilgrims, with respectively 58.2% vs. 23.1% being vaccinated, *p* < 0.001. Similar to our findings, Alfelali et al. [20] reported a vaccination rate of 51.3% among Saudi Hajj pilgrims over 3 years (2013–2015), while Kandeel et al. [21] reported a lower vaccination rate of 26.8% among Egyptian

Umrah pilgrims in 2022. Possible reasons for this variation in vaccination coverage could be a more stringent recommendation for influenza immunisation for Hajj pilgrims, higher rates of pre-existing comorbidities among Hajjis, and thus being medically eligible for the vaccine irrespective of travel. We also observed that Hajj pilgrims had a significantly higher COVID-19 vaccination uptake than Umrah pilgrims, with respective vaccination rates of 99.8% vs. 89.9% (*p* < 0.001). Since Hajj follows Umrah, many more Hajj pilgrims may have been able to receive the mandatory vaccine, which was launched in KSA in phases and prioritised according to occupational category and risk conditions [22].

Overall, our findings indicated that participants in both studies had a moderate level of knowledge about HH, and all of them practised HH. Nevertheless, participants in the Hajj study had better knowledge, and more of them frequently used ABHR to clean their hands than those in the Umrah study, despite the fact that the Umrah study was an RCT to explore the effect of HH on RTIs and at least half of the participants received HH solution free of charge. This discrepancy may reflect the fact that more Hajj pilgrims had a tertiary-level education than their Umrah counterparts (76% vs. 64%, *p* < 0.001). Other studies showed that having a high level of education had a positive role in improving pilgrims' compliance with HH practices [17, 23].

Health education interventions have been demonstrated to improve pilgrims' awareness of and adherence to preventive measures against RTIs [24]. Turkestani et al. [25] demonstrated through a pre-and post-intervention survey conducted during the 2011 Hajj that direct health education to pilgrims is effective in increasing short-term health knowledge as well as the compliance rate of HH (from 79.1% to 95.5%). A cross-sectional study conducted among Australian Hajj pilgrims before and after Hajj to determine what factors influenced their compliance with preventive

measures indicated that pilgrims who sought pre-travel health advice were twice as likely to be vaccinated as those who did not [23]. Additionally, an RCT conducted by Abdin et al. [26] among Hajj pilgrims from Riyadh in 2004 found that in the control group, 33.6% of pilgrims used a face mask during the pilgrimage; among the health education alone group, 51.7% used a face mask (odds ratio [OR] = 2.1; 95% confidence interval [CI] = 1.56–2.86); and among the health education with free face mask group, 81.3% used a face mask (OR = 8.6; 95% CI = 5.93–12.44) [26].

In contrast to Umrah pilgrimage, Hajj is more rite-intensive, takes a longer period to conclude, and entails prolonged exposure to larger crowds, particularly during pilgrims' stays in the tents of Mina and in the plain of Arafat, which in turn poses a higher risk of RTIs; thus, this may have contributed to the higher rates of RTIs observed among Hajj pilgrims in our study. The overall rate of RTIs in both studies was lower than in the pre-pandemic studies that established diagnosis by reverse-transcription polymerase chain reaction (RT-PCR) tests. For instance, approximately one-third of nasopharyngeal and throat samples collected from 300 Indian pilgrims returning from Hajj and Umrah with respiratory infections between 2014 and 2015 were positive for a virus [27]. Although there was no significant difference in the rate of 'possible COVID-19' between Hajj and Umrah studies, the overall rate in this study was lower than that in the general Saudi population and that among attendees of other MGs [10]. A retrospective surveillance study conducted at Hajj in 2021 showed that out of 58,428 pilgrims, 41 tested positive for COVID-19 by RT-PCR conducted before, during and after Hajj [17]. From 11 July to 7 August, the adjusted incidence rate of COVID-19 in KSA ranged from 19 to 24 per 100,000 residents, while the incidence rate among Hajj pilgrims ranged from 3 to 7 per 100,000 pilgrims [17]. Moreover, a low incidence of COVID-19 and influenza was identified in a surveillance study conducted at Cairo airport using RT-PCR on nasopharyngeal swabs among Egyptian pilgrims who returned from Umrah during Ramadan of the year 2022: 67 (6.7%) of the 1003 participants tested positive for COVID-19, and 7 (0.7%) tested positive for influenza [21].

The strength of the current study is that it is the first study to compare the health behaviours and symptomatic RTIs of Hajj and Umrah pilgrims. Also, the comparison was carried out between populations from the same country in the same year amidst the pandemic. Nevertheless, the study has some limitations. We investigated only domestic pilgrims during the COVID-19 pandemic; hence, this may limit the generalisability of our findings beyond the specified population and time frame. A further limitation is the use of distinct research designs; though both studies used similar questionnaires and syndromic criteria to define

ILI and COVID-19 cases, there were differences in methodologies. Lastly, the syndromic RTIs in this study were not confirmed by laboratory tests; therefore, we considered ILI and COVID-19 cases as 'possible' rather than 'confirmed'.

Notably, there are persistent gaps in the health knowledge and behaviours of pilgrims; thus, the application of effective health education programmes and stringent recommendations prior to and during MGs should be sustained, with special consideration for Umrah pilgrims. Using smartphone applications and social media platforms (such as Twitter™, WhatsApp™, Facebook™, etc.) is an ideal medium for communicating health-related messages to a larger audience of Hajj and Umrah pilgrims. Moreover, virtual meeting platforms, such as Zoom, Webex, and Google Meet, have become a significant part of the global education system, particularly so with the unfortunate arrival of COVID-19, and can therefore be utilised by healthcare professionals and health educators to promote health messages and preventive interventions and increase awareness about the potential health risks among attendees of MGs.

CONCLUSIONS

In this comparative study, we sought to describe the differences between Hajj and Umrah pilgrims concerning their HH knowledge and practices in addition to the rates of syndromic RTIs amidst the COVID-19 pandemic. Our findings revealed that Hajj pilgrims had better knowledge about preventive measures and complied more with public health interventions yet had a higher risk of RTIs. These discrepancies could be attributable to the distinctive characteristics of Hajj and Umrah pilgrimages, and the unique differences in risks posed by those MGs.

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Biosafety of marine vessels: current trends and prospects

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ABSTRACT

Background: The global aggravation of the political situation in the world against the background of catastrophic changes in the Earth's ecology is inexorably growing. Despite the fact that most ships are equipped with Waste Water Treatment Plants (WWTP), pollution of the World Ocean remains a serious problem. One of the main reasons contributing to the pollution of the sea by ships is the lack of the ship's environmental protection equipment necessary for the work. Thus, the adoption of measures to prevent the discharge of raw sewage from ships and improve the quality of their treatment is of paramount importance.

Materials and methods: The data of comprehensive surveys of ship WWTP operation in the ports of Ukraine for 2009–2010 are analysed – the most intensive period of navigation in the last 20 years. To assess the quality of wastewater treatment, samples were taken for laboratory studies in accordance with the requirements of the “State Sanitary Rules and Norms for Discharge of Waste, Oily, Ballast Water and Garbage from Ships into Water Bodies”, No. 199, 09/07/1997.

Results: The results of laboratory studies of wastewater after treatment on shipboard WWTP, conducted in the Black Sea ports of Ukraine in 2009–2010, show the unsatisfactory quality of their treatment according to the main regulated national and international indicators.

Conclusions: Taking into account the results of surveys of foreign ships conducted in 2009–2010, the studied literature, we consider our study worthy of serious reflection in order to understand the current situation on ships equipped with WWTP installations, determine priority areas for ensuring their efficient operation and preventing pollution of water bodies by untreated waste carrying the threat of contamination of residents of coastal areas with pathogens of dangerous infectious diseases transmitted by water, toxic substances that are detrimental to the flora and fauna of the oceans.

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Key words: wastewater treatment plants, ships, pathogens, microorganisms, pollutants, toxicity of sea water

INTRODUCTION

Pollution of the oceans in recent decades has caused great concern to mankind. Household waste, sewage, oil products significantly limit the use of water bodies for commercial, recreational purposes by the population of coastal cities [1, 2].

A significant amount of pollutants enters coastal sea waters from ships. The main pollutants of ship wastewater are organic nitrogenous substances, which are a substrate for the development of microorganisms [3, 4].

Raw wastewater contains 5 main groups of pollutants:
– a huge number of bacteria, viruses, parasites;

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- organic and inorganic substances dissolved in water with a high biochemical oxygen demand;
- solid organic and inorganic particles settling to the bottom of reservoirs;
- floating organic and inorganic particles lingering on the surface, which makes it difficult to use the water of marine reservoirs;
- a large number of biogenic elements, leading to oversaturation and eutrophication of water bodies.

The ingress of these pollutants into water bodies leads to the rapid development of algae, disruption of the natural self-purification process, the appearance of cyanobacteria in the water that produce toxins that cause poisoning of people and animals, oxygen deficiency, and the death of fish and animals [5].

In addition, untreated sewage contains millions of pathogens that cause human infections such as gastroenteritis, cholera, hepatitis, salmonellosis, giardiasis, cryptosporidiosis, rotavirus infections, escherichiosis, leptospirosis etc. Specific diseases associated with exposure to sea water are also ear, eye, and skin diseases [6, 7].

A large group of cholerae-like vibrios to which the gram-negative bacteria *Vibrio parahaemolyticus*, *V. mimicus*, *V. alginolyticus*, *V. hollisae* and *V. vulnificus* belong, may cause diarrhoea, wound infection, or septicaemia. *V. parahaemolyticus* infections commonly occur in Japan and coastal areas of the United States.

The causative agents of these diseases can persist in sea water for an average of 2 to 20 days. This is quite enough for direct or indirect infection of a person [8].

Back in 1975–1976 in 23 states of the United States and Puerto Rico, 95 outbreaks of diseases were registered, the causative agents of which infected a person while swimming in the sea. However, there are still no accurate data on the frequency of infection among swimmers in world medical practice. Despite the fact that various diseases are constantly confirmed by the laboratory analysis of cases in coastal regions, it is impossible to establish a direct causal relationship with sea water. To date, there is not enough information on the underlying characteristics or disease levels of bathers to understand whether other factors are at play [9–11].

It is believed that people who bathe in sea water are almost twice as likely to get sick.

Vibrio vulnificus is one of the dangerous pathogens for humans. It may cause necrotising fasciitis, acute gastroenteritis, and septic shock. *Vibrio vulnificus* grows and reproduces in sea water at water temperatures above 20 °C. Human infection occurs when a pathogen enters an open wound from sea water or by eating insufficiently thermally processed seafood (oysters, shrimp, crabs). The largest number of cases of *V. vulnificus* infection was registered

in the United States of America, Cuba, India, Brazil, Thailand, China, Japan, France, Spain, and Australia. In the United States, about 100 cases of infection are recorded annually, mainly on the coast of the Gulf of Mexico, of which an average of 35 cases end in the death of the patient [12–14].

In recent decades, cases of intoxication of people due to the consumption of fish, shellfish and other seafood from reservoirs polluted by sewage have become more frequent. The mechanisms of occurrence of toxicity of sea water underlying nonspecific syndromes have been studied [15].

The aquatic environment also plays a significant role in the spread of viral diseases. Viral and bacterial hepatitis of water origin are registered, the pathogens of which are highly resistant in the water of sea and river reservoirs, in other environmental objects [16].

A large group of parasites that cause a number of diseases dangerous to humans deserves special attention [17].

Maritime states, including Ukraine, have adopted a number of Laws and Resolutions at the international and national levels aimed at protecting the sea from pollution, formulated regulatory requirements and recommendations for wastewater treatment [18–20].

There are quite a few wastewater treatment methods, and a lot of experience has been gained in their application. All of them have certain advantages and disadvantages [21].

Currently, sea vessels are equipped with small-sized wastewater treatment plants from the world's leading manufacturers, whose operation is based on the biochemical principle of operation (about 90%). The essence of the wastewater treatment process in various modifications of installations remains unchanged, regardless of the design features: a complex of microorganisms, their metabolic products, organic and inorganic substrates form the so-called "activated sludge", in which continuous biochemical processes occur in a closed cycle [22, 23].

The operating conditions of Waste Water Treatment Plants (WWTP) on ships are significantly different from those onshore. This is due to the specific conditions on the ships: constant rolling, limited equipment dimensions, uneven flow of effluents, changes in the salinity of sea water used for discharge, contamination of the active components of the treatment plant with chemicals, fluctuations in water temperature, etc.

Under certain circumstances, the balance in the system "waste water – activated sludge" may be disturbed. Such failures lead to the exit of ship WWTPs from the passport regime and pollution of water bodies with untreated sewage. Recovery after such failures takes 20–30 days. Given the limited time that vessels spend in ports, such time delays are unacceptable. As a result, ship treatment facilities continue to operate in violation of the operating regime and discharge untreated sewage overboard [24, 25].

To date, there are various ways to intensify the process of wastewater treatment. The use of technical oxygen, oxygen-enriched air, biological oxidizers, biofilters, aeration accelerators, chemical mediators, etc. is effective. Increasing the dose of activated sludge, adding activated carbon to the mixture of activated sludge and wastewater also improves the performance of WWTP [26–28].

To clean wastewater from viruses, microbes and helminth eggs, methods are used based on a combination of coagulants and natural sorbents, lowering the pH of the water to 3.5–5.8, followed by ultraviolet irradiation, ozone treatment, and the use of various disinfectants. The use of ozone has a number of advantages over other reagents due to the ability to destroy pathogenic microorganisms, spore bacteria and viruses, deodorize and bleach wastewater [29, 30].

MATERIALS AND METHODS

MATERIALS

The authors studied numerous literature sources on the problem of morbidity among residents of coastal areas, vacationers, associated with pollution of marine and freshwater reservoirs by untreated sewage, various toxic substances, industrial discharges, pesticides and other pollutants.

The literature on the problem of protecting the World Ocean from Global pollution has been studied in terms of preserving human health, preventing the spread of dangerous human diseases through sea water when swimming, eating contaminated marine products, as well as the ongoing disappearance of many species of marine flora and fauna.

The authors studied the materials of the sanitary and epidemiological survey of 2,171 foreign ships with a crew of 44,380 people who visited the Black Sea ports of Ukraine in 2009–2010. On these ships, the WWTP ship installations were surveyed for compliance with their operational characteristics.

The results of laboratory studies of wastewater after treatment for compliance with the requirements of the “State Sanitary Rules and Norms for Discharge of Waste, Oily, Ballast Water and Garbage from Ships into Water Bodies”, No. 199, 09/07/1997, MARPOL 73/78, were studied.

METHODS

All wastewater samples after treatment on ship WWTPs were taken in the presence of a chief engineer in accordance with the requirements of the “State Sanitary Rules and Norms for Discharge of Waste, Oily, Ballast Water and Garbage from Ships into Water Bodies” No. 199, 07/09/1997. The control sample of each sample was sealed in the presence of the chief engineer, sealed by

the employee who conducted the sampling and the chief engineer, sealed with the ship’s seal. Sampling certificates (in 2 copies) were signed by the chief engineer, the captain of the ship and, together with the control sample, remained on the ship for an independent laboratory study in case of disputes.

All samples were taken using the same methods and tested in the laboratory in accordance with the regulatory documents.

Wastewater samples taken after treatment at ship WWTPs were examined in the laboratory by bacteriological and chemical methods in accordance with the current regulatory documents governing these studies.

In accordance with the regulatory requirements for wastewater after treatment on ship WWTP, studies were carried out for indicators regulated “State Sanitary Rules and Norms for Discharge of Waste, Oily, Ballast Water and Garbage from Ships into Water Bodies”, No. 199, 09/07/1997 and MARPOL 73/78: suspended substances, biological oxygen demand for 5 days, residual active chlorine (when treated with chlorine), coli-index.

There were no comments, disagreements, doubts with the results of laboratory studies, re-examination of control samples by the captains of the ships.

The results of the laboratory study of wastewater with recommendations for correcting the shortcomings were transferred to the ship’s captain, chief engineer. Upon receipt of laboratory test results that did not meet the requirements of regulatory documents, penalties were applied. In the case of a short stay in the port of Ukraine, information about the results of laboratory tests was transmitted to the ship through the Maritime Agency, which was in charge of this ship.

RESULTS

Out of 2,171 foreign ships calling at the Black Sea ports of Ukraine in 2009–2010, 1,576 were equipped with WWTP (72.6 ± 0.1%), 595 were equipped with tanks for collecting raw sewage (27.4 ± 0.1%).

The sewage collection tanks had flanges for connection to onshore reception facilities. On some ships, ballast and other tanks were used to collect sewage. The use of such non-regulated tanks prevents pollution of the port water area during the stay, but leads to the discharge of sewage into the sea, at best, outside the sanitary zone. Such actions allow the ship to avoid penalties from the port authorities, but do not prevent pollution of water bodies with untreated sewage and create a threat of the spread of pathogens of infectious diseases by water, infection of residents of coastal areas, and poisoning of sea water bodies with toxic substances.

Foreign ships calling at the Black Sea ports of Ukraine in 2009–2010 were equipped with biochemical WWTP units

Table 1. Results of a laboratory study of wastewater after treatment at ship Waste Water Treatment Plants (WWTP) in the Black Sea ports of Ukraine in 2009–2010, which do not meet the requirements of “State Sanitary Rules and Norms for Discharge Waste, Oily, Ballast Water and Garbage from Ships into Water Bodies”, No. 199, 09/07/1997

Laboratory study	2009			2010		
	Vessels surveyed	No. of non-standard samples	Per cent ratio	Vessels surveyed	No. of non-standard samples	Per cent ratio
Bacteriological	682	125	18.3	894	172	19.2
Chemical	682	131	19.2	894	205	22.9
Bacteriological and chemical	682	74	10.9	894	143	16.0

of various types from the respective manufacturers of environmental protection equipment. However, despite the presence of WWTP, the quality of wastewater treatment on them did not provide the final regulated result. And one of the main reasons is the human factor in the difficult operating conditions of ship's environmental protection equipment.

Sampling of wastewater after ship WWTP and laboratory studies were carried out in accordance with the unified regulatory requirements of the “State Sanitary Rules and Norms for Discharge of Waste, Oily, Ballast Water and Garbage from Ships into Water Bodies” No. 199, 09/07/1997 in accordance with the annual plan laboratory studies, taking into account the presence of ships under cargo operations in the ports of the Black Sea of Ukraine and the presence of treatment facilities on board.

Of the total number of wastewater samples taken on 1,576 foreign vessels equipped with WWTP, 414 samples did not meet the regulatory requirements ($26.3 \pm 0.1\%$). The results of a laboratory study of wastewater after ship WWTP, which do not meet the requirements of the “State Sanitary Rules and Norms for Discharge of Waste, Oily, Ballast Water and Garbage from Ships into Water Bodies” No. 199, 09/07/1997 for 2009–2010 are presented in Table 1. Of the results obtained for 2009, 125 (18.3%) samples did not meet the regulatory requirements for bacteriological indicators, 131 (19.2%) samples – for chemical indicators, 74 samples did not meet the regulatory requirements for both bacteriological and chemical indicators. Accordingly, in 2010, 172 (19.2%) samples did not meet the regulatory requirements for bacteriological indicators, 205 (22.9%) samples – for chemical indicators, 143 (16.0%) samples – for bacteriological and chemical indicators. On some ships, the samples did not meet the regulatory requirements only in terms of bacteriological indicators, on others – only in terms of chemical indicators, and on some ships – wastewater samples did not meet the regulatory requirements both in terms of bacteriological and chemical indicators at the same time. Thus, the total amount of samples that do not meet the standards includes the number of non-standard samples on some vessels only

for bacteriological indicators, on others – only for chemical indicators, and on some vessels both for bacteriological and chemical indicators at the same time. As a result, the total ratio of the number of wastewater samples that do not meet regulatory requirements to the total number of samples for the period 2009–2010 amounted to 26.3%.

The results of the study were processed by the methods of correlation-regression analysis [31].

DISCUSSION

Many years of practical experience of working with sea vessels in the Black Sea ports of Ukraine, experience of working on sea vessels in voyage conditions, a large fruitful experience of interaction with ship administration, ship mechanics served as a concept for a series of studies that allow us to look at the problem of pollution of the World Ocean by discharges from ships through the eyes of specialists – physicians, epidemiologists, parasitologists, hygienists, to create the ground for interaction and cooperation with researchers on the problem of the incidence of dangerous human diseases transmitted through polluted sea water among residents of coastal regions of maritime states, the creation of algorithms for the efficient and uninterrupted operation of WWTP ship installations.

The period from 2009 to 2010 was chosen for study as the period of the most intensive shipping over the past 20 years and is no exception to the general unfavourable trend for the Ecology and Biology of the World Ocean and Humanity. The results of laboratory studies of wastewater after ship WWTP have remained at an unsatisfactory level over the past 20 years with fluctuations within $10 \pm 2\%$ of laboratory indicators that do not meet the requirements of regulatory documents and similar indicators in terms of the number of wastewater samples taken depending on the number of ships entering to the Black Sea ports of Ukraine.

Unfortunately, due to the short-term stay of ships in the ports of Ukraine under cargo operations, it is often not possible to apply penalties based on the results of a laboratory study of wastewater after treatment on shipboard

WWTP. So, for a complete laboratory study of wastewater after treatment, at least 5 days are required (for example, according to such a regulated indicator as biological oxygen demand for 5 days). As a result, one has to limit oneself to informing the captains and shipowners about certain violations on the ship through the ship's agents.

And even if other states provide for tougher sanctions for violation of environmental legislation than in Ukraine, according to the results of a laboratory study of wastewater after WWTP, which do not meet regulatory requirements, they cannot in any way compensate for the harm caused to human health by untreated wastewater, the biology of the Seas and Oceans.

CONCLUSIONS

The work of WWTP on 1,576 foreign vessels, out of 2,171 vessels that called at the Black Sea ports of Ukraine in 2009–2010, was analysed according to the main regulated indicators.

The sanitary and hygienic efficiency of various technologies of environmental protection equipment based on the combined treatment of ship wastewater has been studied.

The modes of operation of shipboard WWTPs were studied during the voyage (according to the information of senior mechanics), when moored at ports of call in order to ensure the protection of sea water bodies from biological and toxic pollution, to prevent the introduction and spread of dangerous human diseases of infectious toxic genesis, as well as the harmful effects of biological and chemical pollutants on the flora and fauna of the sea.

Analysis, hygienic assessment of the results of laboratory studies of wastewater after treatment on ships that called at the Black Sea ports of Ukraine, the study and systematisation of violations in the operation of ship WWTP confirm the need for an urgent solution to the identified problems.

The results of laboratory studies of wastewater after treatment on ship WWTP for the specified period indicate the unsatisfactory quality of wastewater treatment and the potential epidemiological, environmental and biological hazard of such ships.

Forecasting the prospects for the use of world water resources shows that while maintaining the quality of wastewater treatment at the current level, sooner or later they will be completely depleted due to the use of seawater as a diluent for discharged wastewater.

Thus, in order to prevent pollution of water bodies by untreated sewage after shipborne WWTP, which creates a constant threat of infection of the population living in coastal areas with pathogens of dangerous infectious diseases transmitted by water, poisoning of water bodies with toxic substances generated during the transformation of waste entering sea water and causing, ultimately, irreparable

harm to human health, ecology and biology of the sea, it is necessary to ensure that the following initial preventive measures are implemented:

- carry out further research to improve the quality of shipboard WWTP treatment, search for more efficient methods of wastewater treatment, including the use of new biological treatment activators;
- ensure control over the timing of commissioning, the frequency of replacement of components (including preparations of microorganisms) and the uninterrupted operation of WWTP on ships;
- keep a permanent record of the regime characteristics of ship WWTP, constantly record the results of express tests of the quality of wastewater treatment in the voyage period, the results of laboratory studies of port services in ports of call;
- register all malfunctions in the WWTP operation with an analysis of the causes of violations and proposals for their elimination;
- toughen sanctions for violation of the operation of shipboard WWTPs based on the results of laboratory tests, with the accrual of damages for pollution of water bodies.

Thus, the study conducted by the authors testifies to the versatility of the problem of ship WWTP management and the difficulties that arise in their solution by the port authorities of Ukraine and other maritime states.

Measures aimed at strengthening supervision over the work of shipboard WWTPs, the search for new practical solutions to improve the quality of their work, will contribute to the prevention of water pollution during shipping, the biological improvement of not only the Black Sea basin of Ukraine, but also other areas of the World Ocean. And as a result, the measures taken will help reduce the incidence of people living and vacationing in coastal areas, dangerous infectious diseases of bacterial and viral origin, various intoxications associated with both the transformation of insufficiently treated ship effluents and disturbed biology of the flora and fauna of the seas and oceans.

Further improvement of the processes of effective treatment of ship wastewater, the search for new means of their disinfection remain relevant for hygienists, ecologists, physicians and technologists to the present.

The authors plan to further study the problem of protecting the health of residents of coastal areas of maritime states, vacationers, swimming in sea water, eating seafood contaminated with various toxic substances, pathogens of diseases dangerous to humans transmitted through sea water. Also, it is planned to prepare recommendations for residents of coastal areas, tourists bathing on the prevention of infection with dangerous diseases transmitted by water, toxic damage to the human body in areas of water use.

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Prevalence of dental caries, oral hygiene status and treatment needs among seafarers and trainee sailors in the state of Goa, India: a descriptive cross-sectional study

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ABSTRACT

Background: The fixed regimen and strict dietary habits of seafarers and trainee sailors, make them susceptible to several oral diseases. The aim of the study was to assess prevalence of dental caries, oral hygiene status and treatment needs among seafarers and trainee sailors in the state of Goa.

Materials and methods: This descriptive, cross-sectional study was carried out from January 2023 to March 2023. After a pilot study, convenience sampling technique was employed to recruit 261 participants. The investigators were standardized and calibrated to record World Health Organization Oral Health Assessment Form (1997) and Oral Hygiene Index-Simplified (OHI-S) which were instrumented in the study. Intra-examiner and inter-examiner reliability scores were recorded using kappa statistics (0.81, 0.83) and (0.83, 0.85), respectively. The data was analysed using descriptive analysis, chi-square test, Mann-Whitney U test and multivariate linear regression analysis at statistical significance ($p \leq 0.05$).

Results: The mean ages of seafarers ($n = 133$) and trainee sailors ($n = 128$) were 36.41 ± 6.40 , and 25.36 ± 7.39 , respectively. The prevalence of dental caries among seafarers and trainee sailors was determined to be 59% and 78%, respectively ($p = 0.01$). The mean OHI-S score of seafarers (1.31 ± 0.68) and trainee sailors (1.53 ± 0.82) was statistically significant ($p = 0.015$).

Conclusions: Seafarers and trainee sailors demonstrated high caries prevalence and poor oral hygiene status due to their distinctive lifestyle, representing a vulnerable community in terms of oral health.

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Key words: dental caries, maritime dentistry, occupational health, oral health, oral hygiene, seafarers, trainee sailors

INTRODUCTION

India is often regarded as a dependable and significant supplier of marine labour. Ship board jobs for Indian seafarers increased by 42.3% in the last 4 years (2013–2017)

[1, 2]. As a labour-intensive country, India has historically offered quality sailors for both domestic and international shipping. The number of sailors operating aboard ships around the world climbed from 108,446 in 2013 to

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154,349 in 2017 [2]. India today contributes 9.35% of global seafarers and ranks third among significant seafarer supplying nations to the global maritime industry [2, 3]. An individual who steers waterborne vessels or serves as a crewmember in their operation and maintenance in all types of weather is known as a sailor, seaman, mariner, or seafarer [1]. Seafaring was the world's first globally integrated industry [3].

Poor oral health among sailors has been linked to pain and suffering for individuals as well as logistical issues for shipping corporations during trips. Excessive snacking is one of the most common problem found among sailors due to their unusual working hours and lifestyle [3]. Seafarers are known to overlook dental hygiene on long journeys, due to work stress, irregular duty hours and solitude; in addition, fruits and vegetables are scarce in their diet, and meals are consumed at irregular intervals [4]. A trainee seaman or sailor is an inexperienced sailor who comes onboard and participates in shipboard chores (typically in a limited capacity) [5]. Cadets are the ship's lowest-ranking sailors [4, 5]. Due to their fixed regimen and strict dietary habits, they may lack adequate nutrients, hence they are susceptible to several oral diseases. Oral disorders are extremely common, affecting more than one-third of the world's population, or 3.5 billion people [6]. Oral health is a multifaceted notion that represents an individual's oral as well as general health state at any given moment. Numerous variables impact it, including current pathology, dental disorders, tooth loss, prosthesis use, and age, as well as extra cultural, psychological, social, educational, nutritional, and socioeconomic concerns [7]. Dental caries left untreated; the condition can progress to more serious consequences. Severe untreated caries has also been linked to general health and well-being. The interaction of many aetiological and predisposing variables with varied capacities determines oral health status [8].

The current epoch of dental caries care has quietly progressed from “extension for prevention” to “prevention of extension” paradigm. Dental caries is a worldwide health problem, yet progress towards a remedy is still visible. The combined effects of excessive consumption of alcohol, tobacco, refined carbohydrates (sweets/dairy products), and a lack of oral hygiene awareness are manifested in the majority of seafarers' poor oral hygiene status [3, 9]. Due to poor oral hygiene and inadequate dietary habits, seafarers and trainee sailors are at a risk of developing numerous oral problems [10]. It is critical that sailors get thorough knowledge on oral hygiene regimens and the benefits of maintaining a healthy mouth [3, 11]. However, little research has been done to identify the conditions that may lead to an assessment of seafarer dental health and comprehensive oral health services. The scarcity in the literature prompted to take up the present study with aim to

assess prevalence of dental caries, oral hygiene status and treatment needs among seafarers and trainee sailors in the state of Goa.

MATERIALS AND METHODS

STUDY SETTING

This descriptive, cross-sectional study was conducted among seafarers and trainee sailors in the National Union of Seafarers of India (NUSI) Maritime Academy, situated in South Goa district in India from January 2023 to March 2023. The NUSI established the NUSI/ITF Trust for Indian seafarers and their families in collaboration with the International Transport Workers Federation (ITF). This study had been carried out in compliance with the STROBE guidelines for reporting.

PERMISSION, ETHICAL CONSIDERATIONS AND INFORMED CONSENT

Ethical clearance was obtained from the Institutional Research and Ethics Committee (EC/NEW/2021/2435/1549). This study followed the ethical standards of human experimentation and the Helsinki Declaration of 1975, amended in 2000. An official permission was obtained from the Secretary-General, International Maritime Organization (IMO). The method of data collection, confidentiality of personal information and aim of the study was described to the study participants and a written informed consent was acquired.

TRAINING AND CALIBRATION OF INVESTIGATORS

Prior to the commencement of the study, the investigators were standardized and calibrated to enable consistent examination by a panel of experts to ensure similar interpretations of the codes and criteria to be recorded for World Health Organization Oral Health Assessment Form (1997) [12], and Oral Hygiene Index Simplified (OHIS) [13], which was supervised by subject experts. Intra-examiner (0.81, 0.83) and inter-examiner reliability (0.83, 0.85) were recorded by using kappa statistics, indicating a high degree of agreement.

SELECTION CRITERIA

The participants comprised those who were present on the day of the study and willing to provide informed consent. Whereas, participants who had shown disinterest in oral examination and those who were absent on the day of examination were excluded from the study.

SAMPLE SIZE ESTIMATION AND SAMPLING TECHNIQUE

A pilot study was conducted among 30 participants to determine the feasibility of the study. The sample size was estimated to be 241 with type I (α) error = 0.05 and Power ($1-\beta$) = 0.95 using G*Power statistical software (Ver. 3.1.9.4.), considering 10% attrition, total sample size was

Table 1. Distribution of study population by designation and educational qualification

Qualification	Designation	
	Seafarers (n = 133)	Trainee sailors (n = 128)
Higher secondary	4 (3%)	32 (25%)
Diploma	53 (39.85%)	89 (69.53%)
Graduation	36 (27.07%)	3 (2.34%)
Specialization	40 (30.07%)	4 (3.12%)

All values are expressed as frequency with percentages (in parentheses)

estimated to be 261. The participants were selected by convenience sampling technique.

DATA COLLECTION

A survey proforma consisted of three sections: (1) Demographic data including name, age and education; (2) Oral hygiene practices; (3) Clinical parameters assessed were the dentition status, OHI-S [14] and treatment needs. On pre-determined dates the examiners visited the NUSI Maritime Academy situated in South-Goa where 133 seafarers and 128 trainee sailors were examined. The examiners performed a type III examination in natural light, taking approximately 15 minutes for each participant.

STATISTICAL ANALYSIS

The data was imported into Microsoft Excel 2019 and analysed with IBM SPSS® Statistics Version 21 (IBM, USA). Descriptive statistics were generated, which included percentages, means and standard deviations. The Shapiro-Wilk test was used to evaluate the normality of the data distribution. Chi-square test was performed to check for the association between the study variables among the participants. Mann-Whitney U test was performed to check for any significant differences in the study parameters. The association with the demographic details was analysed by multivariate linear regression analysis. For all the tests, confidence level and level of significance were set at 95% and 5%, respectively.

RESULTS

A total of 261 participants [133 seafarers (51%) and 128 trainee sailors (49%)] were examined. The mean ages of seafarers and trainee sailors were 36.41 ± 6.40, and 25.36 ± 7.39, respectively. Majority of the participants had qualified diploma education. The distribution of study participants is presented in Table 1.

The prevalence of dental caries among seafarers and trainee sailors was found to be 59% and 78%, respectively (Fig. 1) and their mean Decayed, Missing and Filled Teeth (DMFT) index score was 6.22 ± 2.55 and 7.35 ± 3.92,

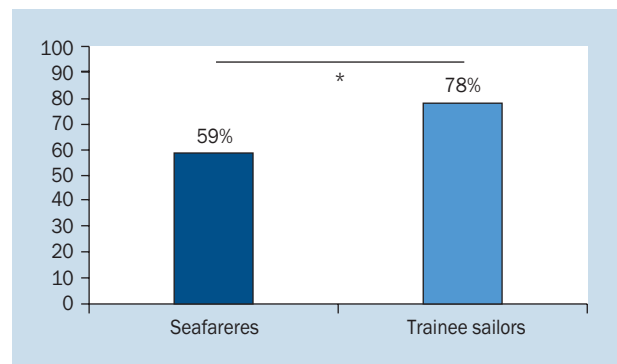


Figure 1. Comparison of caries prevalence (%) in seafarers and trainee sailors. Statistical test used: Mann-Whitney U test; *statistically significant, p = 0.01

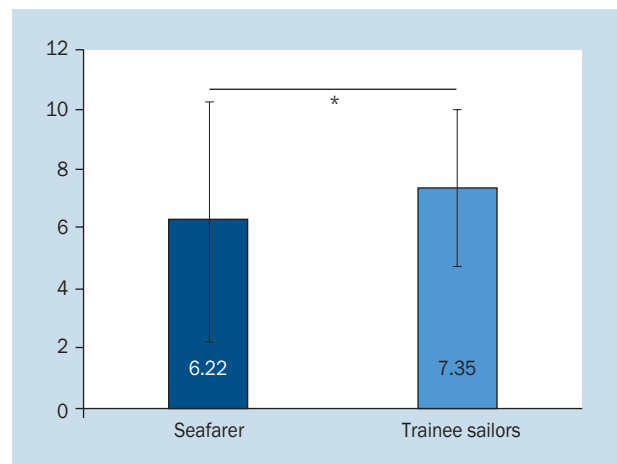


Figure 2. Comparison of Decayed, Missing and Filled Teeth (DMFT) scores (mean ± standard deviation) in seafarers and trainee sailors. Statistical test used: Mann-Whitney U test; *statistically significant, p = 0.047

respectively (Fig. 2). Mann-Whitney U test depicted that there were statistically significant differences in caries prevalence (p = 0.01) and DMFT index score (p = 0.047) among the participants. Most participants – 96.99% of seafarers and 96.09% of trainee sailors – were using a toothbrush and toothpaste as their oral hygiene aid. There was no statistically significant

Table 2. Oral hygiene aids and status of the seafarers and trainee sailors

Parameters	Seafarers	Trainee sailors	P
Oral hygiene aid			0.156
Toothbrush and toothpaste	129 (96.99%)	123 (96.09%)	
Finger and toothpaste	4 (3%)	2 (1.56%)	
Finger, charcoal and toothpowder/salt	0	3 (2.34%)	
OHI-S score			0.050*
Good	107 (80.45%)	86 (67.19%)	
Fair	10 (7.52%)	15 (11.72%)	
Poor	16 (12.03%)	27 (21.09%)	

All values are expressed as frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered statistically significant; OHI-S – Oral Hygiene Index-Simplified

Table 3. Treatment needs of the population

Treatment needs	Seafarer	Trainee sailors	P
One surface filling	56 (42.1%)	24 (18.75%)	
Two or more surface filling	27 (20.30%)	39 (30.47%)	
Pulp care	17 (12.78%)	21 (16.41%)	
Extraction	30 (22.56%)	42 (32.81%)	≤ 0.001*
Crown	3 (2.25%)	2 (1.56%)	
Total	133	128	

All values are expressed as frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.001 is considered statistically significant association

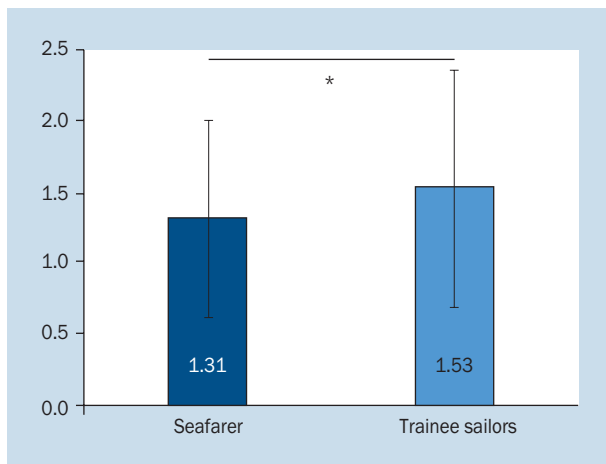


Figure 3. Comparison of Oral Hygiene Index-Simplified (OHI-S) scores (mean ± standard deviation) in seafarers and trainee sailors. Statistical test used: Mann-Whitney U test; *statistically significant, p = 0.015

difference between the participants with regards to oral hygiene aid (p = 0.156). Among seafarers, 80% had good oral hygiene; in contrast to 21% trainee sailors with poor oral hygiene which was statistically significant (p = 0.050) (Table 2).

Figure 3 depicts mean OHI-S score of seafarers (1.31 ± 0.68) and trainee sailors (1.53 ± 0.82) which was statistically significant (p = 0.015). In trainee sailors, extraction (32.81%) was the highest treatment need whereas in seafarers it was one surface filling (42.1%) (Table 3).

The categorisation of the variables obtained a significant relation between caries prevalence and OHI-S score with the designation (p < 0.001) using multivariate linear regression analysis. Whereas there was no significant relationship with education (p > 0.05) and oral hygiene practices (p > 0.05). The dependence of caries prevalence and OHI-S score were found to be 33% and 14%, respectively on designation, education and oral hygiene practices (Table 4).

DISCUSSION

This descriptive, cross-sectional study was conducted among 261 seafarers and trainee sailors in the NUSI Maritime Academy, situated in South Goa district in India. Each disease has a distinct natural history that may not be the same in all patients. A complicated interplay between a person, an agent, and the environment leads to disease. One such hazardous occupation is sailing, which involves pernicious habit, stress, and an unbalanced diet. The oral

Table 4. Association between caries prevalence and Oral Hygiene Index-Simplified (OHI-S) with designation, education qualification and oral hygiene aids

	Unstandardized coefficients		Standardized coefficients Beta	t	95.0% confidence interval for B		P	Adjusted R2
	B	SE			Lower bound	Upper bound		
Dependent variable: caries prevalence								0.33
(Constant)	0.509	1.071		0.476	-1.599	2.618	0.635	
Designation	1.089	0.351	0.227	3.105	0.398	1.779	0.002*	
Education	0.113	0.192	0.043	0.587	-0.265	0.49	0.557	
OHP	0.254	0.57	0.027	0.447	-0.867	1.376	0.655	
Dependent variable: OHI-S score								0.14
(Constant)	0.889	0.341		2.609	0.218	1.561	0.01	
Designation	0.282	0.112	0.186	2.527	0.062	0.502	0.012*	
Education	0.058	0.061	0.07	0.948	-0.062	0.178	0.344	
OHP	-0.02	0.181	-0.007	-0.108	-0.377	0.338	0.914	

The statistical analysis used: multivariate linear regression; level of significance: *p ≤ 0.05 is considered statistically significant; CI – confidence interval; SE – standard error; OHP – oral hygiene practices

and overall health of sailors may be impacted by their lower socioeconomic level, poor oral hygiene, and lack of literacy. World Health Organization Oral Health Assessment Form (1997) was utilised in the current study to assess the oral health status of seafarers and trainee sailors. We integrated the findings of the present study with those of other working populations due to the dearth of literature on sailors.

In the present study the prevalence of dental caries among seafarers and trainee sailors was found to be 59% and 78%, respectively which was in congruence to a similar study conducted to assess the oral hygiene status among fishermen in Kerala whereby the caries prevalence of dental caries was (47%) high among the fishermen due to higher sweet intake (70.9%), poor brushing habits (11.3%) and lower frequency of dental visits (28.5%) [4]. Singh et al. [14] also reported the prevalence of poor oral health among Malaysian Fishermen in Teluk Bahang, Penang to be relatively higher (47.5%). They may have a higher prevalence of dental caries since their 24-hour operations necessitate working in shifts. This affects dietary habits leading to frequent eating and caffeine use as stimulants, especially at night. The use of excessive amounts of snacks is another factor contributing to the common mouth diseases seen in sailors which contain fermentable sugars and carbohydrates, which are major risk factors for dental caries and related dental disorders. Long work hours promote unhealthy habits, inactivity, and social isolation, while placing a low focus on dental health [15].

The majority of seafarers (96.99%) and trainee sailors (96.09%) were using a toothbrush and toothpaste as their

oral hygiene aid, which contrasted with a study conducted among Seafarers in Mundra port, Kutch where majority of them (59.2%) chewed sea weeds to maintain their oral hygiene as compared to only 18.9% participants who used toothpaste plus toothbrush to clean their teeth [1]. The mean OHI-S score of seafarers was 1.31 ± 0.68 and trainee sailors was 1.53 ± 0.82, which was similar to mean OHI-S score among fishermen in South Goa (2.11 ± 1.25). Among seafarers, 80% had good oral hygiene; in contrast to 21% trainee sailors with poor oral hygiene. The trainee sailors are subjected to dietary constraints, rigid schedules, and a lack of sufficient nutrients. In such cases, oral hygiene when on board for extended periods of time may be completely neglected, and self-reported tooth-brushing habits may become less frequent than those on land. The fact that the training sailors had poorer oral hygiene is another evidence of the group’s continued lack of oral hygiene education and motivation. Due to low family income or relocation from one location to another, this may also be related to the trainee sailors’ lower educational levels when compared to seafarers [16, 17].

The mean DMFT index score among seafarers and trainee sailors was 6.22 ± 2.55 and 7.35 ± 3.92, respectively. A study conducted by Saravanan et al. [4] comparing the oral health status and treatment needs among fishermen and non-fishermen in Tamil Nadu also concluded that the mean DMFT was 3.61 among fishermen group whereas in non-fishermen group it was 2.88. This lack of dental hygiene among ship dwellers may be related to their low educational level, physically demanding jobs, stress, psy-

chological problems, and poverty. Despite the enormous numbers of crew members, dentists are typically not on board. Dental assistants and a small number of dentists have occasionally been used. Usually, these departments lack the necessary resources to offer either general or urgent dental care. The obstacles faced by ship operators include the lack of available space aboard, the expensive cost of high-quality dental supplies and equipment, and the difficulty in finding qualified dentists. It can be difficult to keep a seaman on board healthy. The percentage of dental-related consultations for civilian seafarers who lack dental services on board can reach 66.9%. A study reported that the frequency of consultations for oral health problems in foreign ports on commercial cargo ships might be as high as 67% and just 19 nations provide full oral health facilities for seafarers [15].

Teledentistry may be a means of offering seafarers a respectable degree of oral help given their oral health, their isolation on board, and their restricted access to health and dental care. Teledentistry may become a new tool for treating people with poor oral/dental conditions on board seagoing vessels. It has the potential to enhance access to oral health care while lowering treatment costs. It might be linked to electronic health records and employ digital imaging to provide teleconsultations with dental professionals [16].

LIMITATIONS OF THE STUDY

The limitation of the study is its inability to determine temporal relationships between lifestyle factors and oral health status. Furthermore, because our study was cross-sectional in design, it was challenging to delve deeper into respondents' attitudes towards their dental health. An analytical study could be carried out to identify the risk factors that contribute to the development of oral disease among them.

FURTHER RECOMMENDATIONS

The baseline data from this study will serve as the foundation for the implementation of interventions to promote oral health. Given the lack of fundamental dental care guidelines, a concise strategy should be created to raise this population's dental awareness and oral health including national programmes for preventing oral diseases; effective systems for screening oral health; dental care provided as a part of their primary health care; and delivery systems for those services. It is evident from the discussion above that greater oral hygiene education and supervision are necessary for sailors in order to help them better take care of their dental health. Because of the stress that comes with living at sea in difficult conditions, it is crucial that seafarers are fully informed about proper dental and oral hygiene practises.

CONCLUSIONS

Seafarers and trainee sailors demonstrated high caries prevalence and poor oral hygiene status due to their distinctive lifestyle, representing a vulnerable community in terms of oral health. Therefore, further research is needed on dental hygiene habits of sailors to broaden our present understanding of the challenges this community faces in maintaining its oral health, which has direct repercussions on their systemic health.

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Conflict of interest: None declared

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Linkage of job ranks and personality traits with augmented stress: a study on Indian marine engineers in the context of the COVID-19 pandemic

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ABSTRACT

Background: Marine engineering is a profession that affects a high level of physical and psychological stress. Such a high level of stress was further aggravated during the coronavirus disease 2019 (COVID-19) pandemic. On the other hand, personality traits and perceived stress are linked with each other, while job ranks also influence stress levels among employees. However, very few clinical studies are available on this mechanism in seafarers. This study explores the hidden area through the collection of cross-sectional data.

Materials and methods: Big Five personality traits instrument, along with a stress augmentation questionnaire, were administered among 280 Indian marine engineers across job ranks who have sailed prior to and during the COVID-19 pandemic. The collected data were analysed using Kruskal-Wallis test and structural equation modelling.

Results and Conclusions: The analysis reveals significant differences among Indian marine engineers across their job ranks towards their perception of augmented stress levels. It also indicates that, except for extraversion, personality traits have linkages with levels of augmented stress among Indian marine engineers during the pandemic.

(Int Marit Health 2023; 74, 2: 112–121)

Key words: allostasis load, Big Five personality traits, structural equation modelling, Cronbach's alpha, heterotrait-monotrait ratio of correlations

INTRODUCTION

Psychological stress is part and parcel of human life. Development in different aspects of human society has made human lives easier and more comfortable while impacting mental health. In today's world, stress is an inevitable aspect of human life. While too little stress may not result in the desired outcome, too high stress may lead towards various complications, including a negative impact on the physical and mental health of the human being and may interact with one another [1]. Stressful life events often lead to depression [2, 3].

The 'human function curve', as shown in Figure 1, can reveal stress's impact on a human's physical and mental

health. The arousal of stress to the desired level improves the performance of the individual. The performance would keep improving while an individual experiences 'Good stress' or 'Eustress,' i.e. till the stress reaches such a level that the individual would face an inability to cope and thereby feel fatigued. Further increase in stress would result in 'Distress' and would only worsen the performance and lead towards exertion, health implications and many adverse impacts to the individual.

JOB STRESS AS A MATTER OF CONCERN

Human beings are engaged in different professions to earn livelihoods, which often become sources of stressful

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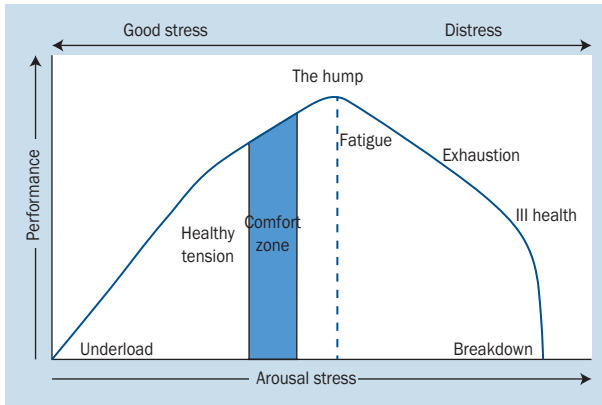


Figure 1. Human function curve. Source: Adapted from Nixon (1982)

situations. A good number of individuals suffer stressful conditions at workplaces where they spend a major portion of their lives. Job stress is generally an outcome due to a mismatch between job demand and available resources, skills, knowledge, etc. Technological advancements, competitive business environments, etc. lead to changing working patterns among employees, giving rise to higher levels of job demands, job insecurity, layoff, lower control, etc. [4].

McEwen (2005) [5] propounded the Allostasis Load Model of Stress and introduced a new terminology called allostasis refers to the adaptive bodily responses to stress. He propounded that an adaptive response to demands would occur if the allostasis load is within limits. However, allostasis “overload” may lead to negative effects on human health physically as well as psychologically.

Past studies indicate that crises adversely affect individuals’ psychological well-being [6–8]. Epidemiological evidence indicates that job stress is rapidly emerging as the single greatest cause of work-related disease and injury [9]. Stressful working condition is more likely to lead to workplace accidents [10]. According to Bartlett [11], it’s not only stress which is an important element of health psychology but knowledge of stress, health, work and well-being are closely linked.

Apart from day-to-day job-related stress, the coronavirus disease 2019 (COVID-19) pandemic creates a sense of panic and fear among people, including a high level of stress resulting in disturbances in mental well-being [12]. A recent study shows that the pandemic has increased mental health problems and chronic fatigue among seafarers [13].

PERSONALITY AND STRESS

The impact of personality on stress has been an area of interest for researchers for a long time. According to Carroll [14], people differ a lot depending on how differently their bodies react to certain challenging situations. These

individual differences also have implications on their health and behaviour [15, 16]. A low score in the general factor of personality exhibits less engagement with socially adaptive stress coping strategies, leading to maladaptive behaviour [17]. The Big Five factor model of personality, developed by Goldberg in 1993, is the widely used personality test in recent years which indicates five personality traits, viz. Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness. According to Hengartner et al. [18], fear, panic, distress, etc., are specifically related to neuroticism. A person higher on neuroticism frequently feels negative emotions and, therefore, is more prone to experience role stress in the workplace [19]. The five-factor model is also widely used to assess stress vulnerability [20]. Personality has also been linked with the likelihood of experiencing stressful situations [21]. On the other hand, evaluating stressful situations is also linked to personality [22]. These five factors are also used to assess how people cope with stress [23]. Similarly, adequate pieces of evidence are available, which indicates that there is a close link between ‘personality’ and ‘stress’. Some population-based studies indicate that people’s personality and temperament predict their perception of job strain and effort-reward imbalance [24–26]. Another study by Sutin and Costa [27] shows that the direction of association runs from personality to stress but not the other way.

SEAFARING AND STRESS

The shipping industry bears a huge toll due to the consequences of stress [28]. According to Parker et al. [29], seafarers reported a higher level of stress in comparison to the reference group. Compared to galley staff, the officers on board are more stressed due to their higher level of responsibility and changing nature of job demands [30, 31].

Though the concept and levels of psychological stress differ from person to person, some commonly identified stressors at sea include excessive or insufficient work responsibilities, shift work, and extended family separation [28]. Separation from home and family is being identified as a dominant stressor among seafarers [30, 32–37]. Factors like job content and inadequate organizational communication may lead to distress among seafarers [1]. Seafarers’ physical efforts in accomplishing tasks and factors associated with such accomplishments are responsible for a high level of stress [38]. According to Leszczyńska et al. [39], stress among seafarers is associated with the physical and psychological conditions of working onboard. He also identified specific stressors like monotony, loss of attention, biorhythmic disorders, excessive or inadequate job responsibility, being away from the family, continuous change of environment, conflict and responsibility towards the safety of personnel and decisions making.

SEAFARERS PLIGHT DURING COVID-19 PANDEMIC

Throughout the pandemic, the world's 1.9 million seafarers have played a vital role in keeping ships moving and ensuring critical goods such as food, medical equipment and vaccines are delivered [40]. Studies conducted in recent times have identified that in the work and life onboard, there have been several changes in recent years due to the COVID-19 pandemic [41–44]. These include maintenance of cleaner surroundings, disinfecting surfaces, more paper works concerning port calls and at the same time, necessary arrangements for maintenance of physical distance. On the other hand, due to restrictions on shore-based services supply of necessary items, medical facilities, as well as the supply of contractors onboard for maintenance and repair jobs, got adversely affected [13].

During the COVID-19 pandemic, due to lockdown, travel restrictions, etc., the changing of ship crew members was delayed for a reasonable time, resulting in the extension of contracts even for several months. Four United Nations organizations issued a joint statement on 28.02.2022 that at times during the COVID-19 pandemic has left more than 4,00,000 seafarers stranded at sea [40]. Even due to the pandemic, the seafarers were not allowed shore leave. Ana Sliskovic [43] mentioned that physical, mental, and social well-being are seriously threatened due to the restrictions imposed to prevent the spread of COVID-19. According to International Labour Organization, COVID-19 is responsible for adverse impacts on seafarers' and their family member's mental and physical health [45]. As per Erdem and Tutar [46], the COVID-19 pandemic increases stress levels among seafarers. In brief, the pandemic has augmented seafarers' stress levels.

On 22.02.2021, the International Seafarers' Welfare and Assistance Network (ISWAN) reported that the number of suicide and seafarers calling ISWAN about suicidal thoughts had "roughly doubled" from about 12 in a normal year to 25 since March 2020 [47]. The Seafarers Happiness Index shows that the happiness level for a year (2021–2022) is lowest during the first quarter of 2022 (Fig. 2).

A high level of stress among seafarers is an already established fact through various studies. Coupled with the COVID-19 pandemic, its restrictions, etc., the stress level among seafarers increases further, resulting in an augmented stress level among them.

RESEARCH GAPS AND INTERVENTION

On review of relevant literature, the research gaps are identified, i.e. the existing research studies on seafarers' stress during the COVID-19 pandemic are based on seafarers as a whole and not specific to particular job, rank or nationality. At this juncture, this study is an intervention which addresses the Indian marine engineers across

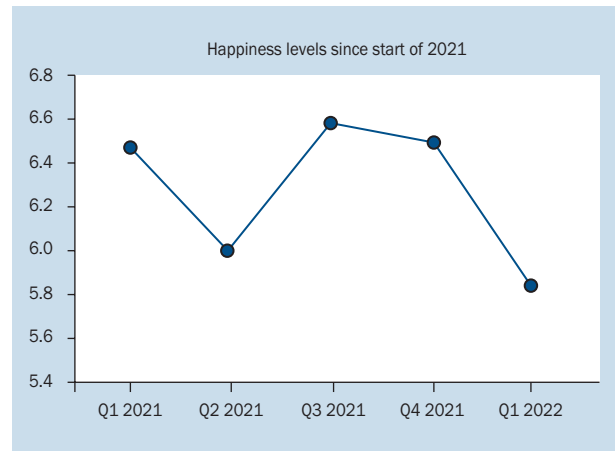


Figure 2. Seafarers happiness index. Source: Seafarers Happiness Index, Quarter 1 2022

ranks from chief engineers to fourth engineers who sailed during the pandemic. The existing studies do not focus on the personality of seafarers and its linkage with augmented stress levels during the pandemic, which is being addressed in the present study.

RESEARCH QUESTIONS

The following research questions are formed with reference to the period of the COVID-19 pandemic:

- RQ₁: During the COVID-19 pandemic, do Indian marine engineers differ significantly with reference to augmented stress levels?
- RQ₂: Based on different personality traits, do Indian marine engineers' perceptions of augmented stress levels differ significantly during the COVID-19 pandemic?

MATERIALS AND METHODS

SAMPLING AND DATA COLLECTION

As the profession, marine engineering is highly specialised, and the professionals are scattered throughout the world, the researcher used the snowball sampling technique. An online survey was conducted from January–April, 2022 and data were collected from 280 Indian marine engineers who served different types of vessels and sailed for a considerable period before as well as during the COVID-19 pandemic. Seventy responses were collected from each rank, i.e. 'Chief engineer', 'Second engineer', 'Third engineer' and 'Fourth engineer'. The respondents completed the survey voluntarily.

TOOLS USED FOR ASSESSMENT

Data was collected through a battery consisting of the following instruments:

- socio-demographic variables: a structured questionnaire on socio-demographic aspects to collect data on age,

- sex, marital status, job experience, etc., was used; such collected data were analysed using descriptive statistics;
- Big Five Inventory (44 items) is a five-point Likert scale (1 = “strongly disagree” to 5 = “strongly agree”). The theory holds that the ways people think, feel, and interact with others are attributable to individual differences in five personality dimensions. Accordingly, the instrument was developed by Goldberg (1992), which captures an individual’s personality using five dimensions, viz. (i) Extraversion, i.e. qualities like assertiveness, sociability, etc. On the contrary, people who lack extraversion tend to be reserved; (ii) Agreeableness, i.e. friendly behaviour, flexibility in dealing, etc. People with less agreeableness tend to be rigid while dealing with others; (iii) Conscientiousness, i.e. people with high conscientiousness show qualities like orderliness, responsible, dependability, etc.; (iv) Neuroticism refers to emotional stability, i.e. the degree to which people experience stress, anxiety, anger, depression, etc.; (v) Openness, i.e. people with high openness acceptance new ideas, curious, imaginative, etc. The Big Five factors are also increasingly being used to help researchers understand the dimensions of psychological disorders such as anxiety and depression [48];
 - A stress augmentation scale was developed to collect data on augmented stress levels during the pandemic. The instrument consists of 24 items that address stress factors like (i) the job itself; (ii) planning activities; (iii) company rules, policies, etc.; (iv) situations like being away from family, friends, etc.; (v) lack of socialisation opportunities due to the pandemic.

QUESTIONNAIRE: INTERNAL CONSISTENCY AND VALIDITY

The reliability and validity of the instruments were also tested and items that failed to be valid were excluded from the final questionnaire. The final questionnaire includes questions/statements on (i) Socio-demographic variables (5 questions); (ii) the Big Five Inventory (35 items) and (iv) the Stress augmentation scale (24 items). The confirmatory factor analysis was carried out, and the factor loadings are shown in Table 1. Items with a factor loading of 0.50 and above are considered and included in this instrument, except item 6 in the Big Five personality traits instrument and item 7 in the stress augmentation scale, as the factor loadings were very near to 0.50. The reliability and validity scores of validated instruments are shown in the following Tables 2A and 2B.

The Cronbach’s alpha of all variables are above 0.70, ensuring both instruments’ internal consistency. According to Fornell and Larcker [49], the convergent validity is still adequate even if the average variance explained (AVE) is

Table 1. Factor loads of two instruments

Big Five personality factors		Stress augmentation scale	
Item no.	Factor load	Item no.	Factor load
1	0.213	1	0.469
2	0.535	2	0.617
3	0.504	3	0.642
4	0.670	4	0.444
5	0.709	5	0.719
6	0.493	6	0.627
7	0.565	7	0.492
8	0.627	8	0.612
9	0.673	9	0.524
10	0.305	10	0.442
11	0.777	11	0.522
12	0.535	12	0.745
13	0.636	13	0.742
14	0.621	14	0.710
15	0.333	15	0.437
16	0.703	16	0.457
17	0.506	17	0.686
18	0.718	18	0.801
19	0.577	19	0.895
20	0.662	20	0.932
21	0.302	21	0.840
22	0.558	22	0.865
23	0.554	23	-0.164
24	0.647	24	0.785
25	0.828	25	0.773
26	0.587	26	0.927
27	0.308	27	0.919
28	0.511	28	0.576
29	0.630	29	0.713
30	0.668	30	0.847
31	0.425		
32	0.603		
33	0.728		
34	0.648		
35	-0.431		
36	0.881		
37	0.728		
38	0.549		
39	0.698		
40	0.591		
41	-0.258		
42	0.648		
43	0.671		
44	0.316		

Table 2A. Test of reliability and validity of Big Five personality questionnaire

Variables	Cronbach's alpha	AVE	CR	HTMT				
				Extrovert	Agreeableness	Conscientiousness	Neuroticism	Openness
Extrovert	0.741	0.41	0.82					
Agreeableness	0.806	0.35	0.81	0.64				
Conscientiousness	0.833	0.38	0.84	0.77	0.69			
Neuroticism	0.849	0.48	0.85	-0.60	-0.59	-0.62		
Openness	0.776	0.48	0.82	0.69	0.51	0.50	-0.50	

AVE – average variance explained; CR – composite reliability; HTMT – heterotrait-monotrait ratio of correlations

Table 2B. Test of reliability and validity of stress augmentation scale

Variables	Cronbach's alpha	AVE	CR	HTMT				
				Job content and environment	Company policy	Planning	Away from family	Lack of socialisation
Job content and environment	0.781	0.39	0.79					
Company policy	0.934	0.71	0.93	0.29				
Planning	0.780	0.43	0.79	0.62	0.23			
Away from family	0.910	0.73	0.91	0.51	0.15	0.62		
Lack of socialisation	0.730	0.52	0.76	0.48	0.14	0.53	0.50	

AVE – average variance explained; CR – composite reliability; HTMT – heterotrait-monotrait ratio of correlations

Table 3. Demographic profile of the respondents

Age [years]									Job experience [years]							
21–25	26–30	31–35	36–40	41–45	46–50	51–55	56–60	60+	01–05	06–10	11–15	16–20	21–25	26+		
1	55	110	67	18	19	6	2	2	33	88	88	43	18	10		
Job rank									Marital status							
Chief engineer		2 nd engineer		3 rd engineer		4 th engineer			Married		Unmarried		Divorced		Live-in relation	
70		70		70		70			231		47		1		1	

less than 0.50 but the composite reliability (CR) is more than 0.60. The scores of CR, AVE and heterotrait-monotrait ratio of correlations (HTMT) indicate adequate discriminant and convergent validity.

ANALYSIS OF DATA USING ‘R’

R’ is a programming language used in the present study. As the data is not normally distributed, to answer the research question RQ₁, the Kruskal-Wallis test was performed through ‘R’. On the other hand, for RQ₂, structural equation modelling (SEM) is used through ‘R’ to identify the impact of different personality traits on augmented stress levels among Indian marine engineers. As the data is ordinal in nature, the method of estimation followed was unweighted least squares. According to Bentler and Chou [50], SEM

is a statistical method which takes a hypothesis-testing approach to analyse a structural theory bearing on some phenomenon. SEM conveys two aspects, viz. (i) that a series of regression equations represent the causal processes under study and (ii) these structural equations can be modelled pictorially to enable a clearer conceptualisation of the theory under study. The developed model is tested, and if the goodness of fit is found adequate, the model indicates reasonable relations among the variables [51].

RESULTS

DEMOGRAPHIC PROFILE OF THE RESPONDENTS

The demographic profile of the participants is in Table 3. All 280 respondents were male only.

Table 4. Mean scores of augmented stress

Chief engineer	Second engineer	Third engineer	Fourth engineer
84.17	83.21	79.31	80.14

Table 5. Kruskal-Wallis test output of augmented stress based on job rank

Kruskal-Wallis rank sum test
Data: Augmented_Stress by Job_Rank
Kruskal-Wallis chi-squared = 10.704, df = 3, p-value = 0.01344

The COVID-19 pandemic brought a number of challenges to seafarers. The present study aimed to examine if factors responsible for increased stress levels are perceived similarly by Indian marine engineers across their job ranks.

COMPARISON OF STRESS LEVELS ACROSS JOB RANKS

RQ₁: During the COVID-19 pandemic, do Indian marine engineers differ significantly with reference to augmented stress levels?

The answer to the above question can be obtained by job rank wise mean augmented stress levels and using the Kruskal-Wallis test, carried out using 'R'; the output is shown in Tables 4 and 5.

Table 4 above shows average scores of augmented stress across job ranks. The Kruskal-Wallis test with a p-value of 0.01 indicates that across job ranks, there is a significant difference in perceived augmented stress levels among Indian marine engineers.

While answering RQ₂, the present study considers five different personality traits and studies how respondents perceived augmented stress levels.

RQ₂: Based on different personality traits, do Indian marine engineers' perceptions of augmented stress levels differ significantly during the COVID-19 pandemic?

Structural equation modelling was carried out using the 'R' language, and the outputs are shown in Figure 3 and Table 6.

The Figure 3 and Table 6 above indicate that, except for extraversion, marine engineers of all other traits are significantly impacted by augmented stress levels during the pandemic. While for agreeableness, the effect is negative; for openness, conscientiousness and neuroticism, significant positive impacts are seen. It resembles higher levels of openness, conscientiousness and neuroticism are responsible for a higher stress level during the pandemic; in contrast, higher agreeableness lowers stress levels.

DISCUSSION

The present study is probably the first of its kind, revealing a linkage between personality traits and perceived stress levels during the pandemic among Indian marine engineers. This outcome is in line with past studies on populations other than seafarers. Several past studies have revealed that personality and stress are linked with each other, and higher levels of certain personality traits result in higher stress levels.

Though apart from extraversion, all other personality traits have shown significant linkages; conscientiousness has been found to have a very high positive impact on augmented stress levels with a standardised regression coefficient of 0.538. Such a finding contradicts some of the previous studies, viz. Murphy et al. [52], which state that a higher level of conscientiousness may protect from exposure to certain stress factors. According to Schlatter et al. [53], higher conscientiousness has been found to be associated with lower psychological stress levels. Conscientiousness has been considered a type of personal resource that may help individuals protect themselves from the harmful effects of stress [54, 55]. According to Ikizer et al. [56], lower levels of conscientiousness perceived higher levels of stress during the pandemic. Conscientiousness has been found to be negatively associated with COVID-19 anxiety [57]. However, the present study's finding aligns with Getzmann et al. [58], which found conscientiousness to have a significant positive correlation with stress among individuals during the COVID-19 pandemic.

The present study found a significant positive impact of the openness trait on augmented stress levels among Indian marine engineers during the pandemic, which contradicts existing literature. According to Roesch et al. [59], highly open individuals can cope with stressful situations more effectively than others. However, the finding of this study complements a cross-sectional study by Xu et al. [60], carried out among nursing students during the COVID-19 pandemic. Another study reveals a positive link between openness and the COVID-19 anxiety syndrome [57]. A similar finding is that individuals with a higher level of openness perceived a higher stress level during the COVID-19 pandemic [56].

Agreeableness is seen to have a significant negative linkage with augmented stress levels among Indian marine engineers during the pandemic. Such finding is at par with some of the earlier studies. Agreeable-

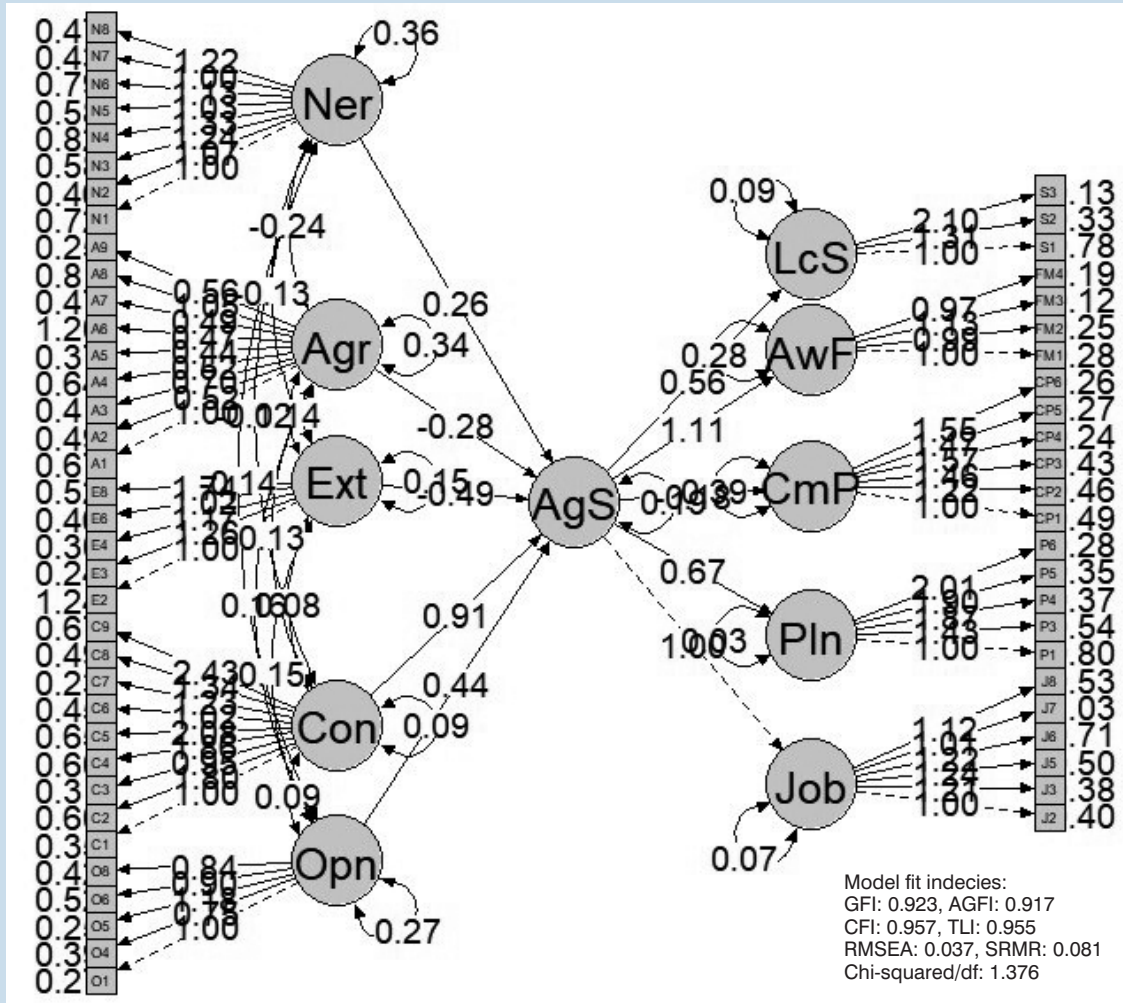


Figure 3. Impact of personality traits on augmented stress among Indian marine engineers; Opn – openness; Con – conscientiousness; Ext – extraversion; Agr – agreeableness; Ner – neuroticism; AgS – augmented stress level; Job – job; Pln – planning activities; CmP – company policies; AwF – away from family; LcS – lack of socialisation

Table 6. Regression coefficients of personality traits (independent variables) and augmented stress (dependent variable)

Augmented Stress ~	Estimate	SE	z-value	P(> z)	SLV	SOLV
Openness	0.440	0.144	3.056	0.002	0.459	0.459
Conscientiousness	0.908	0.320	2.837	0.005	0.538	0.538
Extraversion	-0.491	0.256	-1.918	0.055	-0.380	-0.380
Agreeableness	-0.278	0.135	-2.055	0.040	-0.323	-0.323
Neuroticism	0.263	0.065	4.059	0.000	0.314	0.314

SE – standard error; SLV – standardised latent variables; SOLV – standardised observed and latent variables

ness has been found to have a significant negative relationship with stress [58]. According to Ebstrup et al. [24], agreeableness significantly negatively affects perceived stress. Agreeableness has been identified to have negatively and directly associated with anxiety

during the pandemic [57]. According to another study [60], agreeableness negatively impacts anxiety during the COVID-19 pandemic among nursing students.

The finding of this present study on the linkage between neuroticism and augmented stress complements existing

pieces of literature, i.e. a higher level of neuroticism reflects an augmented stress level. Some recent studies have encompassed the COVID-19 pandemic, and the findings are similar, i.e. a higher level of neuroticism reflects a higher level of stress [56–58, 60].

LIMITATIONS OF THE PRESENT STUDY

Though this study on marine engineers, especially during the COVID-19 pandemic, provides valuable insights; it is also important to acknowledge the limitations. Firstly, the study may have limited generalisability due to the small sample size, and the sample size may not represent the larger population of Indian marine engineers. Further, the study uses primary data from the respondents, which may be subject to biases such as social desirability or memory bias. This could potentially affect the accuracy of the results obtained. Also, the study collects data for a very limited period and not over time, limiting the ability to examine changes in stress levels and personality traits over time.

CONCLUSIONS

This study captures data from Indian marine engineers concerning their sailing experience during the COVID-19 pandemic, which is uniquely stressful. The study aims to understand if, during the pandemic, the level of augmented stress differs among Indian marine engineers across job ranks. It also attempts to shed some light on the impact of personality traits on augmented stress levels among Indian marine engineers during the COVID-19 pandemic. Thereby, this study enlightens on developing cross-sectional strategies to assist Indian marine engineers in coping with stress levels. The same is expected to benefit marine engineers, shipping companies, and policymakers in formulating policies and rules regarding stress mitigation strategies for seafarers, especially during periods of uncertainty.

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The psychosocial burden and stress coping strategies among seafarers

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ABSTRACT

Background: The seafarers' professional group is one of the most numerous in the world. According to the statistics of the European Maritime Safety Agency (2020), there are approximately 280,000 people employed at sea in the European Union. The specific work environment on the ship (climatic, physical, chemical, psychological factors, etc.) is related to experiencing long-term stress. The World Health Organization considers work-related stressors to be very important determinants of health and disease. One of the basic psychological resources related to adaptation to demanding working conditions are strategies for coping with stress. The aim of the study is to assess the occurrence of harmful psychosocial factors in the work of seafarers and the stress coping strategies and their relationship with somatic diseases.

Materials and methods: One hundred and fifteen seafarers who received a maritime health certificate participated in the study at the Occupational Medicine Clinic. The study was part of a larger project looking at the prevalence of cardiovascular risk factors among seafarers. The study used the Coping Questionnaire in Stressful Situations (CISS) (Endler and Parker) and a general questionnaire created for the purposes of the study.

Results: Thirty six per cent respondents were exposed to traumatic event and to having nightmares, 13% had been discriminated at least once in the workplace. A positive correlation was found between discrimination and depression, nightmares and trauma. In addition, people who admitted having experienced trauma slept shorter (also while at home) and experienced nightmares more often. The most common style of coping was task oriented (29; 28.5%), and avoidance oriented (15%). The study also found a positive correlation between depression and the style of emotion-oriented coping and avoidance-oriented coping.

Conclusions: The specific working conditions and exposure to traumatic events have a negative impact on the health of seafarers by increasing the risk of depression and cardiovascular diseases. The coping styles with stress depend on the position in the ship hierarchy.

(Int Marit Health 2023; 74, 2: 122–128)

Key words: psychosocial risk factors, stress coping styles, work-related stress, work environment

INTRODUCTION

According to the latest statistics of the European Maritime Safety Agency (EMSA), published in June 2020, there are approximately 280,000 professionally active seafarers in the European Union, from which around 36,000 are of Polish nationality [1]. Seafarers on sea-going ships are

exposed to multiple harmful factors related to changing climatic conditions, physical and chemical factors on board, specific work mode and high level of mental strain [2–4]. Seafarers are particularly exposed to the climatic conditions occurring onboard such as work both in low and very high temperatures, as well as exposure to wind, rainfall and other

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atmospheric phenomena [3]. When it comes to physical factors, one should mention exposure to vibrations, electromagnetic field, high noise level, high temperatures and poor ventilation [2–5]. Accordingly chemical agents on ships include asbestos [6], polycyclic aromatic hydrocarbons, soot, as well as benzene and engine exhaust [2–4]. Moreover, harmful psychosocial factors such as long working hours, shift work, exposure to stress and traumatic events, as well as long separation from the family and constant stay in a closed environment are commonly found in the work environment of seafarers [4, 7, 8]. According to the research carried out by Oldenburg et al. [9], the high level of stress and the large number of night watches during the stay on board particularly concerned the officers employed on the bridge. In addition, most of the crews are made up of seafarers of different nationalities, speaking different languages, often from culturally distant countries. Those aspects may increase the level of stress, as well as induce a feeling of isolation and contribute to a greater risk of depression, especially at the beginning of a cruise [10].

In opposite to other professions, seafarers are exposed to the detrimental impact of harmful factors, also during their free time/during the entire stay on board.

In the context of work in the marine environment, the notion of mental stress as well as the participation and role of psychosocial factors as its source plays a particularly important role [11–13]. Exposure to harmful physical and psychosocial factors occurs simultaneously. In this approach, we deal with at least two processes – the direct mechanism of somatic disorders and the psychological effects of stress.

People vary greatly in their responses to stress. An event that triggers anxiety and flight responses in one person can be inspiring and energizing to another [14]. Resources related to coping may result from the actual external possibilities of coping with the problem (access to money, social support) or can be related to the personal internal predispositions [14].

Coping concerns the individual's efforts to regulate a stressful situation [15]. The coping styles are often used as mediators of prior stressful events and their consequences such as: anxiety, depression; mental discomfort and somatic complaints [16–18].

One of the most popular concepts of stress coping strategies is the differentiation made by Endler and Parker [see 9]. Based on the research, three styles of coping with difficult situations were described (1) the task-oriented style, (2) the emotion-oriented style and (3) the avoidance-oriented style. Coping styles can be diagnosed with the Coping Inventory for Stressful Situations (CISS) [19]

The health consequences of stress and coping with it are diverse – they include both subjective and objective aspects. Indicators of health effects, as the likely effects

of occupational stress, can be divided into at least five groups, depending on the level of objectivity [20]:

1. “Objective” level indicators, such as the number and type of symptoms – i.e. body mass index and self-assessment health;
2. Declaration level – “subjective” indicators – i.e. assessment of mental and physical well-being, general perception of health;
3. Behavioural level – behaviour that may be stress-related (not necessarily conscious): smoking, eating habits (different at work than at home), absence from work;
4. Psychological well-being – an aspect of manifested mood, and generally perceived stress at work and at home;
5. Physiological consequences of stress, as well as based on behavioural indicators such as trouble falling asleep and waking up etc.

In the current research we analysed all five aspects of health indicators at the seafarers work. The aim of the presented study is to assess the occurrence of harmful psychosocial factors in the work of seafarers as well as the strategies of coping with stress and their possible relationship with somatic diseases.

MATERIALS AND METHODS

The study included a statistical analysis of the data obtained from the questionnaire created for the purpose of this project and the CISS [19]. The study was conducted in the period from February 2018 to February 2019 at the Outgoing Occupational Medicine Clinic after obtaining the consent of the Independent Bioethics Committee for Scientific Research. Inclusion criteria for the study were: age > 18 years and informed consent to participate in the study.

CHARACTERISTICS OF THE STUDY GROUP

The study involved 115 seamen of Polish nationality who reported periodic examinations at the Clinic of Occupational Medicine. About 17% of seafarers refused to take part in the survey (20 out of 135). All people who agreed to participate in the study received a marine health certificate. Seafarers aged 21 to 68 (mean age 42.3, median 42) participated in the study; 97.19% of the respondents were male, which, according to data provided by EMSA [1], corresponds to the gender ratio of the European seafarers' population. In the study population, 60 seafarers were in the 20–40 age group, 45 in the 41–60 age group; and 10 respondents were over 60 years old

In the study group, three subgroups were distinguished depending on the workplace/department on the ship – deck crew, engine room crew and the so-called hotel crew (cooks, stewards), which can also be included in the deck crew. People who described their job as a fitter were included in the machinery department. The above division into three groups is con-

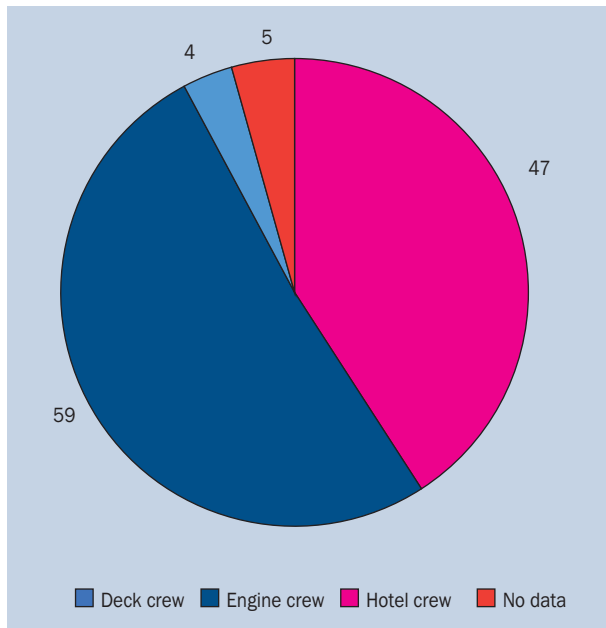


Figure 1. Division of the study group according to the place of work on the ship

sistent with the division introduced by the International Convention on Standards of Training, Certification and Watch-keeping for Seafarers [20], which regulates the organization of work on ships. Figure 1 shows the division of respondents according to the place of work. Another division, which was applied due to possible differences in exposure to harmful factors and partly different job characteristics, is the division into a group of officers and non-officers. In the studied group, about 51% were non-officers (58 people) and about 45% (52 people) were officers (no data for 5 people).

METHODS

General questionnaire created for the purpose of the study

The survey was a detailed interview including questions on following data.

Chronic diseases

The questionnaire asked about occurrence of such disease as: cardiovascular diseases (CVD), depression, schizophrenia, rheumatic diseases, as well as obstructive sleep apnoea and hypothyroidism.

Lifestyle

Smoking cigarettes. The respondents were asked whether they had ever smoked cigarettes (and if so, whether they still smoke), the duration of smoking (in years) and the average number of cigarettes smoked during the day.

Diet. The survey asked whether the respondents consumed at least 4–5 meals a day and how many portions

of vegetables/fruit, meat, dairy and sweets they consumed during the day.

Exercise. The questionnaire asked whether the respondents performed physical exercise (non-work-related effort) in an amount corresponding to at least 30 minutes a day for 5 days a week.

Sleep. Respondents had to determine how many hours they sleep on average per night while at work, and how many while at home. The respondents had to choose one of 4 intervals (1.9 h).

Characteristics of the work

The questionnaire included questions about type of work they perform, as well as the number of working hours during the week and night work. People who admitted to shift work were asked to clarify how many years they had been working at night. In the last question concerning the specificity of the work performed, the respondents were to estimate the average income per person in the family (the respondents could choose from 7 ranges, PLN 3,000).

Psychosocial factors

The surveyed seafarers also answered questions about whether they had ever experienced discrimination in the workplace on the basis of sex, age or race, and whether they had been exposed to a traumatic event, and whether they had nightmares or intrusive thoughts.

The Coping Inventory for Stressful Situations (CISS)

The CISS [17, 19] is a tool validated and adapted for use in Poland to assess the style of coping with stress. The CISS questionnaire contains 48 statements concerning different behaviours in stressful situations. The person's scale is to determine the frequency with which he/she takes a given action (or feels a given state or emotion) on a scale of 1–5, where 1 means never, and 5 – very often. The CISS questionnaire allows you to assess the levels of specific styles of coping with stress – task-oriented coping (TOC), emotion-oriented coping (EOC) and avoidance-oriented coping (AOC). In terms of the style focused on avoidance, two subscales can be distinguished: distractions (D) and seeking social diversion (SD).

RESULTS

GENERAL QUESTIONNAIRE

Psychosocial factors

One hundred and six seafarers answered questions about discrimination, trauma, nightmares and intrusive thoughts. 13% of respondents (15 people) stated that they felt discriminated at least once in the workplace due to age, gender or race. 42 (36%) seafarers admitted to having been exposed to a traumatic event in the past. Also 42 (36%) people from

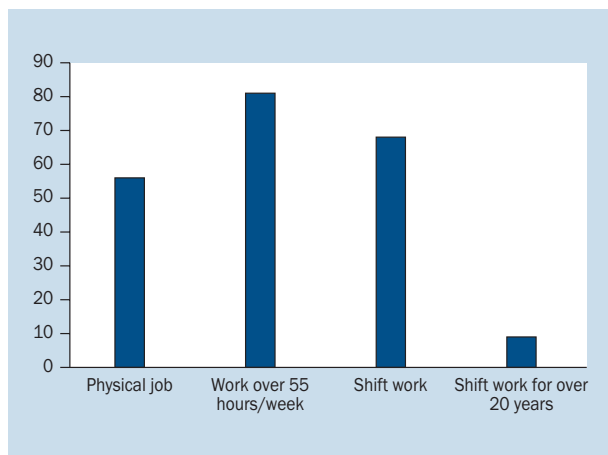


Figure 2. Work characteristics of the studied group

the study group admitted to having nightmares or intrusive thoughts. We found a weak positive correlation between an affirmative answer to the question about discrimination and depression in the interview ($r = 0.240$; $p = 0.013$) and a moderate positive correlation between discrimination and trauma ($r = 0.309$; $p = 0.001$); as well as between discrimination and nightmares ($r = 0.312$; $p = 0.001$). Additionally, a moderate positive correlation was found between the experience of trauma and nightmares ($r = 0.431$; $p = 0.043$).

Work-related factors

The work characteristics are presented in Figure 2. As many as 70% of the surveyed seafarers work more than 55 hours a week, and over 60% work in shifts (9 people have worked in shifts for more than 20 years). Shift work is more often performed by people working on board ($M = 0.77$; $SD = 0.42$; $t = 2.13$; $p = 0.36$) in comparison with people employed in the engine room ($M = 0.57$; $SD = 0.49$; $p = 0.61$). At the same time, officers ($M = 0.79$; $SD = 0.41$) performed

shift work more often ($t = 2.861$; $p = 0.005$) compared to non-officers ($M = 0.53$; $SD = 0.5$). On the other hand, manual labour is the domain of employees in the engine room ($M = 0.69$; $SD = 0.47$); who work significantly more physically – $t(96) = 3.32$; $p = 0.001$ from deck workers ($M = 0.36$, $SD = 0.49$). At the same time, there were significant differences between officers and non-officers – officers ($M = 0.32$; $SD = 0.47$) performed physical work less frequently ($t = 4.228$; $p = 0.013$).

Chronic diseases

There were no people in the study group who had experienced a heart attack or arterial revascularization coronary heart disease, stroke or transient ischaemic attack.

Two (1.7%) respondents admitted to being depressed in the study group. Both respondents who admitted depression were cooks, and therefore members of the hotel staff. There was a weak positive correlation between the exposure to discrimination in the history and the occurrence of depression. Weakly/moderately positive correlation occurred simultaneously between depression and the AOC styles of coping ($r = 0.249$; $p = 0.012$) and EOC ($r = 0.397$; $p = 0.000$). In response to the question about schizophrenia, none of the respondents chose an affirmative answer.

In the study group, 3 (2.6%) suffered from obstructive sleep apnoea, and 4 (3.5%) suffered from hypothyroidism.

STRESS COPING STYLES

Among the respondents, 102 completed the CISS questionnaire assessing the styles of coping with stress. The most common style of coping with stress was TOC (29; 28.5%). AOC, which is associated with an increased risk of CVD, was presented by 14 (13.7%) respondents. Figure 3 presents the division of the respondents according to the dominant

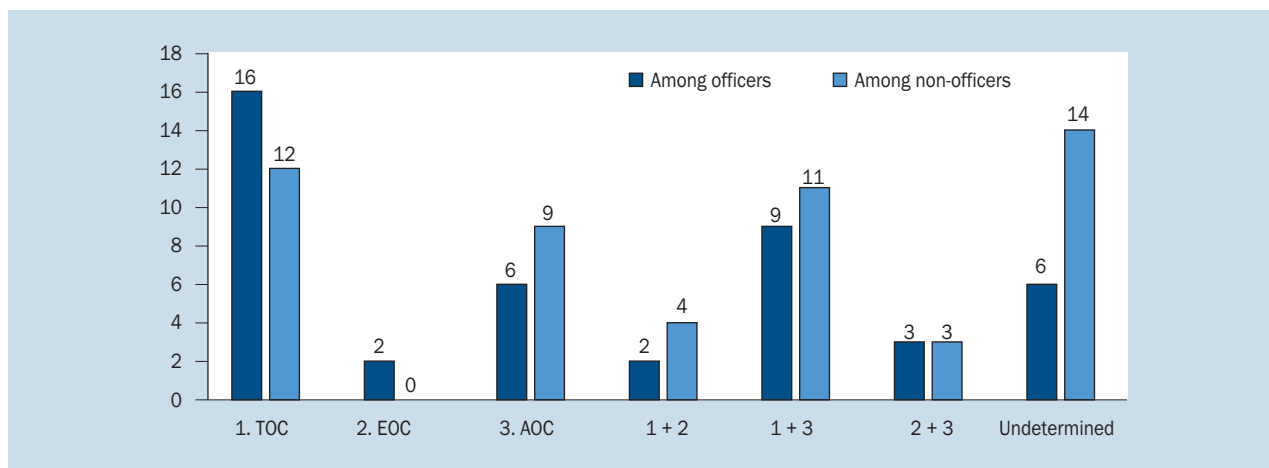


Figure 3. The comparison of the dominant coping styles among seafarers with division into officers and non-officers; TOC – task-oriented style; EOC – emotions-oriented style; AOC – avoidance-oriented style

CISS style. In some respondents, two styles were dominant or it was impossible to define the dominant style in accordance with the applicable norms. There is a significant difference in the TOC between officers ($M = 6.4$; $SD = 1.9$) and non-officers ($M = 95.5$; $SD = 91.6$). Officers have a significantly higher TOC index ($TOC = 2.564$; $p = 0.012$).

A positive correlation was found between EOC and a positive history of CVD in men in a family ($r = 0.199$; $p = 0.056$) and the frequency of consuming sweets during the week ($r = 0.272$; $p = 0.01$). There was also a weak positive correlation between avoidant style (the avoidant style has two dimensions: distraction and social diversion) and eating at least 5 meals a day ($r = 0.245$; $p = 0.05$) and consumption of red meat ($r = 0.220$; $p = 0.029$). The study also found a positive correlation between depression and EOC ($r = 0.399$; $p = 0.000$) and AOC ($r = 0.249$; $p = 0.01$).

Lifestyle

Smoking cigarettes. In the study group, 58 (50.5%) sailors have ever smoked cigarettes in their lives, of whom 41 (35% of respondents) were still smoking at the time of the study. The average number of cigarettes smoked by smokers in the study group was 8.80/day ($SD = 15.10$), and 5 people smoked more than 20 cigarettes a day. The average length of cigarette smoking was 8.9 years ($SD = 11.68$); and most of the respondents smoked for a maximum of 5 years – only 15 seafarers (13% of the respondents) smoked for over 5 years. There is a significant difference in the number of cigarettes smoked during the day between officers ($M = 6.1$; $SD = 7.3$) and not officers ($M = 9.3$; $SD = 9.3$) – officers smoke significantly less cigarettes during the day ($t = 1.964$; $p = 0.05$) than non-officers. A positive correlation was found between the duration of cigarette smoking and body mass index ($r = 0.222$; $p = 0.025$).

Diet and exercise. One hundred and eight of the respondents answered questions about physical exercise and diet (no data for 7, i.e. 6% of the study group). Among 108 respondents, less than half (48 respondents) perform physical exercises in the amount recommended by the European Society of Cardiology guidelines [21], i.e. on average 5 times a week for a minimum of 30 minutes. A moderate positive correlation was found between the recommended amount of physical exercise and shift work ($r = 0.337$; $p = 0.000$). Moreover, people who exercised smoked less cigarettes during the day ($r = -0.240$; $p = 0.012$) and were more satisfied with their health condition ($r = 0.256$; $p = 0.008$). In the case of diet 49.5% (57) and 52% (62) of the respondents, respectively, do not consume the recommended portion of fish and dairy products during the week; and 48.7% or 56 of respondents eat less than the recommended 5 meals a day. Moreover, 54% of the surveyed people (62 people) eat more than 300 g of red meat a week, and as many as

69% (75 respondents) eat sweets more than twice a week. Officers ($M = 0.75$; $SD = 0.44$) ate vegetables significantly more often ($t = 2.133$; $p = 0.035$) than non-officers ($M = 0.55$; $SD = 0.5$). There was a positive relationship between the level of income and the consumption of the recommended portion of vegetables ($r = 0.20$; $p = 0.035$) and between the consumption of the recommended portion of vegetables and the consumption of the recommended amount of dairy ($r = 0.243$; $p = 0.011$) and fish ($r = 0.304$; $p = 0.05$).

Sleep. The optimal length of sleep (7–9 hours) per day while staying at home was declared by 76% of the respondents. While on board, this percentage drops to 55%. Almost half of the respondents (45%) sleep less than 7 hours while working at sea (only 1/5 of the respondents (20%) sleep at home for less than 7 hours a day. Ten respondents sleep less than 6 hours at work and at home. On the other hand, the study found a weak negative correlation between the duration of sleep at home and the exposure to a traumatic event in the history of non-officers ($r = -0.240$; $p = 0.015$).

DISCUSSION

Working at sea is associated with a heavy physical and mental burden, and work on ships is one of the most dangerous jobs in the world. All harmful and hazardous factors onboard affect seafarers both during their work and in their spare time throughout the voyage.

Also the presence of harmful psychosocial factors such as stress and fatigue is inherent in working on a ship [22]. The reflection of a significant psychological burden among seafarers may be indirect due to the fact that, according to some reports available in the literature, suicides are one of the most frequent causes of death in this professional group (especially considering the underestimation of the number of suicides, for example in the case of disappearances at sea) [10, 22–24].

Moreover, significant fatigue related to working at sea may pose a direct threat to the health and life of the seafarer himself or other crew members, increasing the risk of an accident. According to the literature, especially long working hours and night work are associated with a higher risk of an accident [25]. In the presented study, as many as 70% of seafarers admitted to work over 55 hours a week, and as many as 60% of seafarers to working at night – shift work was more often performed by deck workers and officers. Similarly, a significant shift workload among officers was found in a Danish study on occupational burnout among seafarers [9]. Psychosocial burdens found in seagoing work include discrimination, sleep disturbances, depression, and post-traumatic stress disorder (PTSD) [22, 24]. Currently, most of the crews of seagoing ships are composed of representatives of different nationalities and religions, which may generate conflicts, increase the level of stress

and be a source of discrimination [26]. In the survey, approximately 13% of respondents stated that they felt discriminated against in the workplace at least once. Exposure to a traumatic event (36%) and nightmares (36%) were reported much more often, as many as 1/3 of the respondents. Moreover, a positive relationship was found between exposure to a traumatic event and nightmares and intrusive thoughts, as well as between shorter sleep at home and exposure to a traumatic event in the history. Both nightmares, intrusive thoughts and sleep disturbances are symptoms of PTSD [27]. Post-traumatic stress disorder was also diagnosed in 5 out of 15 Polish survivors of the Nefryt ship after group poisoning with phosphate (PH₃), which resulted in the death of 2 young officers [28, 29]. Similar statistics on exposure to traumatic incidents among seafarers can be found in a survey of German seafarers – out of 323 surveyed seafarers, 116 (35.9%) experienced ship damage/serious accidents and 55 (17.0%) piracy on board [30]. Moreover, in the case of such dramatic events as kidnapping of crew members by pirates, PTSD may affect up to 1/4 of seafarers who have experienced kidnapping [31], and the detrimental effect of trauma often affects family members of kidnapping victims [32].

However, the sleep at work of seafarers is mainly influenced by the shift work system. In the current study, about half of the respondents admitted that sleeps less than 7 hours while at sea; and only one in 5 seafarers admitted sleeping for less than 7 hours while at home. The frequent sleep deficit among seafarers is confirmed by earlier studies – in a German study conducted in 2019 on a group of over 300 seafarers working on the deck of a container ship [33] it was found that the average length of sleep for a sailor was 5 hours a day, and the sleep deficit was common, especially among officers (67%). Among the respondents, the task-oriented style (TOC) was dominant, which is associated with a lower CVD risk, and the prevalence of the TOC style was higher among officers. The style of emotions-oriented (EOC) and avoidance-oriented (AOC) and mixed EOC + AOC that are associated with a higher level of stress and a higher risk of CVD [34, 35] occurred in a total of 20% of respondents. The study shows a correlation between the occurrence of EOC and a positive family history of CVD. There are reports in the literature that the tendency to use specific stress coping strategies may be hereditary [36]. More frequent occurrence of EOC in people with a positive family history may indirectly confirm this relationship.

CONCLUSIONS

In the analysed study the significant burden of psychosocial factors resulting from the specificity of work at sea was confirmed, as reflected in previous studies [10, 19–24]. The psychosocial burdens commonly found in the studied group in-

clude long working hours, shift work, insufficient sleep per day, as well as exposure to traumatic events or discrimination.

We believe that some interventions could be used to reduce the risk of negative health and psychological effects, for example increasing the pressure on shipowners to plan transports and unloading in such a way as to minimise the number of night watches and work over 55 hours a week. It would also be beneficial to organize the work in such a way that the shifts lasted 12 instead of 6 hours where possible – for example during often multi-day stopovers in the roadstead. Furthermore we need to increase commitment of shipowners to provide free Internet connectivity – currently, in accordance with the 2006 International Labour Office convention, the shipowner “should consider” providing the crew with Internet access. Providing free access to a good and stable connection would help all crew members, especially seafarers from developing countries, to stay in constant contact with loved ones, which would somehow improve the quality of life at sea and reduce the feeling of isolation. Due to the frequency of occurrences that may cause PTSD [30], it seems reasonable to introduce an obligation for the shipowner to provide psychological or religious assistance to the crew (depending on the crew’s needs and the cultural context) after a trauma, sudden death or a serious accident on board, in order to reduce the risk of psychological or psychiatric complications. Alternatively, we can consider training for the crew about coping mechanisms and strategies for stressful situations and training in interpersonal communication to reduce the stress level.

Conflict of interest: None declared

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Applications of metaverse for improving healthcare at sea

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The provision of adequate healthcare on board ships has always represented a challenge for medicine. In general, ships are at sea for days or weeks before they can reach a port and with the only exception of some large passenger or cruise ships, they do not carry health professionals on board. The maritime healthcare sector has expanded more quickly as a result of the quickening pace of digitalisation and automation, which has led to the creation of new models and new opportunities for seafarers' treatment provision at reduced costs. By enabling both onboard patients and medical personnel to have lifelike experiences, a new digital technology known as the metaverse has relevant potential for the healthcare of seafarers.

Not only how people use technology, but also how they relate to one another and the outside world, could all be altered by the metaverse. Some people think of the metaverse as more of a merging of the physical and digital worlds, where the real world is surrounded by digital surfaces and objects. These technologies working together ensure individualised, close-knit patient care. It also provides smart adaptive solutions that lower barriers between healthcare providers and patients [1].

Around the world, major corporations including Accenture, Vantage Health, Oura Ring, Mendelian, and others have started to investigate how this period would affect the healthcare system, particularly in light of the recent pandemics that has affected much of the seafarers across world. Several new use cases [2] make it evident how healthcare could change in the future various applications includes:

- Wellness for onboard patients and healthcare professionals is possible in the metaverse, just as it is for

physicians. Doctors can explain and even demonstrate illness symptoms and treatment options using immersive environments. These settings can aid in teaching caregivers how to take care of a person in a shipping environment. Better health literacy and greater adherence to treatment plans can result in better outcomes when education is improved;

- Extended reality technologies are being used in new virtual therapies to assist patients with pain management, neurological problems, mental health, and physical wellness. Utilising an evidence-based infrastructure, the healthcare forum immerses patients in virtual settings and equips them with resources and coping mechanisms that will help them deal with stress, anxiety, and terror throughout their lives;
- Interoperability and tokenisation in context to Blockchain, Web3, autonomous driving, and artificial intelligence (AI) technologies have made it possible for users to safely own, share, and manage patient, provider, and payer data such as secure NFTs, payment rewards, the health identity and most importantly the management of complex records;
- The possible option of digital diagnosis via augmented reality is there which combines space, movement, and interactions to detect diseases. For example, by observing eye movements, medical professionals can notice neurological indicators or ocular disorders like glaucoma. These use cases show how healthcare organizations are beginning to push the boundaries of metaverse technology to provide state-of-the-art operational, clinical, and recreational experiences while transitioning from a centralized to a decentralised ecosystem.

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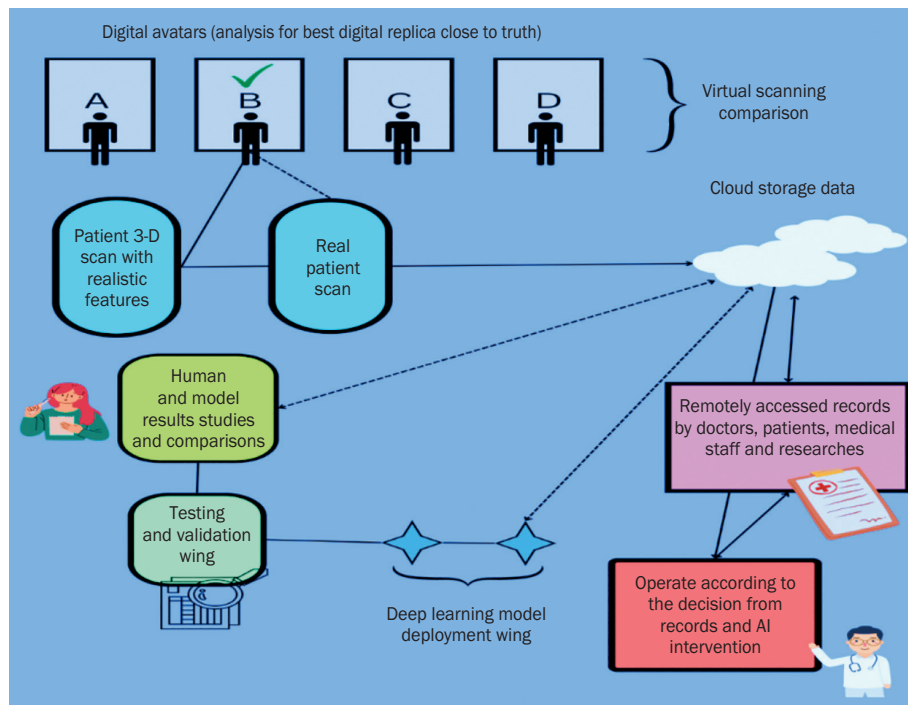


Figure 1. The working framework of intervention of metaverse in healthcare

There are many possible ways to conceptualise the workings of the metaverse in healthcare, but each model's fundamental building blocks share a common set of avatars, subsets, and connections [3]. In this, you can find the efforts that we did to illustrate how the metaverse functions when it is used as a platform for seafarers' healthcare. The identification of the eye glaucoma metaverse model has been proposed (Fig. 1). In the first phase, various avatars have been analysed to choose the one that is most realistic for a patient which is known as virtual scanning comparison [4]. The avatars, which are physical representations of individuals, replace actual patients. This information is continuously being stored in the clouds for further study. After the data is gathered, deep learning models are created and continually improved in the model deployment wing until they achieve high accuracy and minimal error. The following stage involves testing and validating the completed models. If the validation is weak, it will be sent back to the deployment wing for more model fine-tuning; if not, it will move on to the next stage for comparison for outcome analysis.

Further, this final result about the onboard patient will also be stored again on the cloud. Doctors, medical support personnel, patients, and other researchers with the proper authorisation can access the patient records that are kept on the cloud. The patient will be told about his condition and the best course of action after these records have been examined. If surgery is necessary, the patient will be instructed to arrive on the specified date. If the procedure

can be avoided based on the results thus far, the patient will just be advised to take some medication. The physical meeting between the doctor and patient is minimised in both situations. The study's findings could be expanded upon and addressed to prospective uses of the technique in the marine industry forums, such as medical marketing, telemedicine, medical education and training of seafarers, healthcare facilities, and fitness and wellbeing.

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Introduction

Dear Colleagues,

for all those who missed it at the first occasion: this is the second issue of your journal's magazine section! Our intention with this new product is to extend the journal's impact factor beyond the scientific community into maritime medical practice (See: Nix T, Smith J, Song J. Measuring impact. In: Markovac J, Kleinmann M, Englesbe M (eds). Medical and Scientific Publishing, Author Editor and Reviewer Perspectives, Academic Press, Elsevier, London, 2018). We want to be a point of contact for those responsible for health in the maritime environment, to raise existing problems or questions to the attention of applied research and to be a marketplace of information from all areas of maritime health for the frontline practitioners.

When International Maritime Health Foundation conducted its workshop on the development of the International Maritime Health journal in October 2021, the experts assembled identified the following list of topics to constitute a structure of a future magazine part: reports from practice; chronicles; reflections on state of art; book reviews; obituaries; news from regulatory bodies; reports on research and development projects (communication on state, call for cooperation); news of the industry; reports from courses/seminars/congresses/symposia; papers of educational character/lessons learned; presentation of dissertations; case reports; International Maritime Health Foundation news; debates/commentaries; journal club... the list may be extended.

Why am I giving you this enumeration? It is because we want to encourage participation from your side. If there is any question or problem you would like to be addressed, let us know. If there is any piece you would like to contribute or share with the community, please submit. Any comment on the content of our journal? Please mail your opinion.

Looking forward to a vivid dialogue!

Klaus Seidenstücker
Temporary magazine editor
International Maritime Health Foundation's Expert Panel

News

Contributed by Nebojsa Nikolic

SEAFARER'S CHARITY

The Seafarers' Charity funds new charity to support women who have experienced sexual trauma at sea.

On April 19th, 2023, the Seafarers' Charity has announced funding for a new service aimed at supporting women seafarers who have experienced sexual trauma while working at sea. **Salute Her UK** which operates internationally, is set to receive funding over a 2-year period to deliver their women-centric therapy and trauma counselling to women seafarers and women working in fishing.

Salute Her is a relatively new charity which emerged as a gender specific response to support female veterans who had experienced sexual trauma during their military service. The Seafarers' Charity funding will enable Salute Her to expand their therapy services to women working at sea. At Salute Her, women can choose from a range of therapeutic activities – workshops, courses, group and individual counselling or mental health therapy delivered either face to face or virtually. The service can be accessed by women in the UK or internationally. As well as offering therapeutic services, Salute Her actively campaign for 'gender specific' physical and mental health support services and trauma-informed care for women who have lived experience of bullying, harassment, discrimination, and sexual abuse.

The funding announcement from The Seafarers' Charity of this new service for women seafarers is in response of evidence revealed in a recent research report on the 'Port-Based Welfare Needs of Women Seafarers' by International Maritime Health Foundation Expert Panel member, Professor Helen Sampson and Dr. Iris Ajeco at Cardiff University's Seafarers International Research Centre. The research, funded by Seafarers' Charity, revealed female seafarers' experience of isolation and fear of sexual assault within the male-dominated environment of cargo ships.

WHO/ILO

In its 15th meeting on May 4th, 2023 the World Health Organization (WHO) **IHR (2005) Emergency Committee** highlighted the decreasing trend in COVID-19 related deaths, hospitalization, intensive care unit admissions and the high levels of population immunity. Committee members advised to transition to a long-term management of the pandemic.

The WHO Director General determined that COVID-19 is now an ongoing health issue and no longer constitutes a public health emergency of international concern.

In April 2023 International Labour Office (ILO) published an Independent High-Level Evaluation of the office's COVID-19 response. The evaluation focused on two dimensions: institutional and policy. ILO was forced to develop new policies to address this new world, under a four-pillar framework:

- Stimulating the economy and employment
- Supporting enterprises, jobs, and incomes
- Protecting workers in the workplace
- Relying on social dialogue for solutions

A report can be accessed at: <https://www.ilo.org/digitalguides/en-gb/story/evaluation-covid19>.

Announcement

16TH INTERNATIONAL SYMPOSIUM ON MARITIME HEALTH



Dear Colleagues!

As you know in light of the COVID-19, the 16th International Symposium on Maritime Health (ISMH16) was postponed. Now, when the pandemic is over on behalf of the organizing committee I would like to invite you to join us at the ISMH16 “**Maritime Medicine-from the Antiquity to the Present Day**” which will be held in Athens 5–8 October 2023 with the Pre-Symposium Research meeting on 4 October. The Symposium welcomes all physicians, scientists, trainers, legislators and stakeholders of the international shipping industry involved in maritime health, safety and welfare of seafarers worldwide.

The planning of the ISMH16 is taking a step forward. The Symposium registration and abstract submissions are open. As with previous conferences, the event will consist of oral paper presentations, keynote speeches, and chaired poster presentations.

Please, visit ISMH16 Webpage: www.ismh16.gr.

If you have any questions, please contact: maritimedoctor@gmail.com or dr_denisenko@yahoo.com.

Hope to see you in Athens soon!

Dr. Ilona Denisenko

Chair ISMH16



Reports

MARINERS MEDICO GUIDE – RIGHT IN THE POCKET OF SEAFARERS

By Jon Magnus Haga and Lise Skogstad Loftsgaard

You never know when you will face a medical emergency. What happens when it occurs at sea – far from land and with limited support?

The Mariner's Medico Guide is a new app, designed to improve medical treatment on board ships. The guide is tailored for seafarers and the equipment available on board. The guide has been developed by Haga and the Norwegian Centre for Maritime and Diving Medicine and provides step-by-step guidance for assessment and treatment of medical issues faced on board.

The Mariner's Medico Guide is free to use for all seafarers. Fully downloadable, it can be used mid-ocean and in remote parts of a ship – even without a signal.

Symptom-based approach

The guide differs from other ship medical guides in several ways. As it is digital, it provides new ways of accessing the information, both through search and interactive navigation. It covers both physical and mental health issues, using a symptom-based approach, and is easily updated in accordance with future medical developments and technological advances.

Designed and written by doctors specialised in maritime medicine, guidance is set out in simple steps and language, for users with limited medical experience and reduced accessibility to medications and medical equipment.

The guide has been developed to facilitate better use of the available resources and access to basic health care for all seafarers. It includes advice on when and how to contact public telemedical services worldwide, how to evaluate warning signs and how to treat a sick person in dialogue with the telemedical doctor.

Flag State approval

The Mariner's Medico Guide was presented to the Sub-Committee on Human Element, Training and Watchkeeping (HTW) of the International Maritime Organization (IMO) at its 9th session in February 2023. All Flag States were invited to endorse and promote the guide.

The guide has received Flag State approval from the Norwegian Maritime Authority as its national equivalent medical guide to the 2007 World Health Organization (WHO) International Medical Guide for Ships and been endorsed by the Marshall Islands and a number of international non-governmental organizations, including the International Transport Workers Federation (ITF). More flag states are currently assessing the guide in view of similar recognition.

Previously, the guide has been presented to the WHO.

For more information, please visit www.medicoguide.com.





Dr. Haga and Dr. Loftsgaard presenting Mariners Medico Guide to the Sub-Committee on Human Element, Training and Watchkeeping (HTW) of the International Maritime Organization (IMO) in London together with partners from GARD and the Norwegian Maritime Authority.

THE 3RD IMHF WORKSHOP “MANAGEMENT OF MEDICAL INCIDENTS AT SEA”

29–30 September 2022, Hamburg, Germany¹

**Professor Volker Harth, Organizer; Lukas Belz and Thomas von Münster, Rapporteurs
Report by Klaus Seidenstücker and Nebojsa Nikolic**

Introduction

Following its statutory objectives, the International Maritime Health Foundation (IMHF) decided to conduct a series of expert workshops following the proposals of its Expert Panel (EP). In parallel to IMHF’s primary project, the journal International Maritime Health (IMH), these workshops shall collect relevant expertise and knowledge to provide state of art guidance for maritime health practice.

The International Labour Office’s (ILO) Convention 2006 (as amended)² states that seafarers’ medical care should be “as comparable as possible to that which is generally available to workers ashore”. While this may leave room for interpretation the IMHF-EP held the opinion that the implementation of this rule would need specific definition and that in the end medical guidelines should be established that would reflect the conditions of the maritime environment as well as those of actual best medical practice.

A workshop conducted by the International Maritime Health Association (IMHA) in 2015 had already addressed the issue. However, its conclusions had not yet arrived at the relevant working structures of ILO and International Maritime Organization (IMO).

The IMHF-Management Board’s (IMHF-MB) request to the workshop therefore was to analyse the IMHA workshop’s consensus statement for necessary update and complementation and provide IMHF governing bodies with a recommendation for follow up activities towards above UN Organizations.

¹ The workshop was sponsored by the TK Foundation, the German Association of Maritime Medicine (Deutsche Gesellschaft für Maritime Medizin eV.; DGMM) and the Hamburg University, Medical Faculty.

² International Labour Office: Maritime Labour Convention 2006: <https://www.ilo.org/global/standards/maritime-labour-convention/lang-en/index.htm>.

Materials and methods

The 3rd IMHF workshop was held in Hamburg, Germany, September 29–30, 2022. Altogether, fourteen expert participants from international maritime medicine institutes, universities, legislative bodies and industry, actively participated in the workshop, namely: Lukas Belz (Hamburg Institute for Occupational and Maritime Medicine [ZfAM]), Jon Magnus Haga (Norwegian Centre for Maritime and Diving Medicine [NCMDM]; IMHF-EP), Marie Hamming (TMAS Denmark), Volker Harth (Hamburg University Medical Centre [UKE]; ZfAM; German Association of Maritime Medicine [DGMM], IMHF-EP), Alf Magne Horneland (IMHF-MB), Alison Kay (Trinity College Dublin; IMHF-EP), Thomas von Münster (ZfAM; DGMM), Nebojsa Nikolic (IMHF-EP), Marcus Oldenburg (ZfAM; DGMM; IMHF-EP), Klaus Seidenstuecker (IMHF-EP), Beate Stelzer (Master of container vessels; Maersk; DGMM), Markus Stuhr (Occupational Trauma Clinic Hamburg; DGMM), Jens Tuelsner (Marine Medical Solutions; IMHF-EP; DGMM), Nils Wagner (German Navy Medical Service).

Discussions on the matter were based on the report and consensus statement from the above mentioned IMHA workshop on 'The Management of Medical Emergencies at Sea'³ and were preceded by the following six presentations:

- Conclusions from IMHA Workshop 2015 in London (Alf Magne Horneland);
- Achievements of ERC Advanced Life Support/Trauma Life Support (Nebojsa Nikolic);
- Findings and Regulations of the German Navy (Nils Wagner);
- Educational Aspects and Medical Equipment (Marie Hamming);
- Outbreak Management (Jens Tuelsner);
- Psychological Aspects of Crowd and Crisis Management (Alison Kay).

The round table then discussed along the structure of the **2015 IMHA Consensus Statement Management of Medical Emergencies at Sea** and addressed training, medical chest and equipment, medical guides, Telemedical Maritime Assistance Service (TMAS) and treatment pathways especially, and produced the following consensus statement.

Results

The result of the workshop is a set of recommendations to the IMHF governing bodies for a follow up activity.

RESEARCH

International Maritime Health Foundation should encourage relevant institutions to conduct research on available databases at shipping companies (medical logbooks), TMAS centres, insurance companies and national health registries. IMHF should review research results that could provide information on the occurrence of medical incidents at sea. IMHF should encourage assessment of priority according to these data.

International Maritime Health Foundation should establish a network between research institutes and create an electronic database on medical incidents at sea.⁴

TRAINING

The workshop concludes that shortening of training intervals in between medical courses is essential to establish reliable outcomes.

The workshop suggests additional onboard medical refreshment training (drills, exercises) and the use of tele-teaching, including simulation training and augmented reality training. It is recommended, that exercises and drills are conducted under supervision preferably of TMAS-centres or other professional maritime medical institutions. (TMAS-centres should be encouraged to adapt their structures according to this new task.)⁵

Institutions or organizations providing such AR/VR simulation training for seafarers should record and debrief training drills and make outcomes/lessons learned to supervisory/regulatory bodies on an anonymized basis, if possible. Whilst challenges to the sharing of such data may exist and were acknowledged by the participants, the benefits of shared training outcomes, e.g., for the purpose of certification, potential risk and hazard identification with a wider Maritime Community should not be underestimated.

Training curriculum should be developed in concordance with the course curriculum under IMO responsibility. These should be evaluated and certified at regular intervals by relevant inspection/certification authorities⁶.

³ The workshop was held in London, February 2nd to 3rd, 2015. A report was drafted but is unpublished yet. We intend to have an article on that workshop in one of our next journal issues.

⁴ An expert conference maybe the way to start this process.

⁵ See remarks on "experiential learning" in the report of 2nd IMHF workshop on medical training (Nikolic N, Haga JM, Tuelsner J, et al. Medical training of seafarers: International Maritime Health Foundation (IMHF) Expert Panel Consensus Statement. Int Marit Health 2023; 74(1): 15–23).

⁶ Suggestion was to consider a follow up workshop on this.

MEDICAL EQUIPMENT

Changes and amendments for the medical equipment on board should follow requirements derived from the data mentioned above and they should support skills and knowledge according to defined learning outcomes referenced in the second **IHMF Workshop on Medical Training on Board**, to be updated according to actual state of art.

International Maritime Health Foundation sees a necessity to ensure direct telecommunication from the sick bay or any likely place for a medical incident to onshore assistance.

MEDICAL GUIDE

Medical guides should be up to date with the best medical practice at any time. The IHMF prefers an online version, that allows ships to download updates regularly for offline use. We recommend that ships have medical guidance available wherever an emergency occurs.

Further recommendation is that a physical guide should be kept on board for reference during such times as when there is no power available to access electronic versions (for instance: abandon ship situations).

PATHWAYS

Pathways reflecting the special situation at sea should be developed and then included in the medical guides. To develop such pathways existing medical guides should be analysed for suitable solutions (research effort).

The IHMF recommends a permanent expert group be established to consider state of the art guidelines or pathways.

A further workshop is recommended with a 4-step approach:

1. Look at databases.
2. Determine what is a relevant priority?
3. Consider what to expect from the seafarer and how this can be achieved?
4. Develop pathways suitable for inclusion in the medical guides.

We proposed to use a similar methodical approach for the pathways as was applied for the development of training outcomes at 2. IMHF workshop in Bergen, Norway. Possible interrelations between both subjects need to be kept under consideration.

Summary

The result of the workshop is a set of recommendations on the management of medical incidents at sea. This consensus statement was drafted by an editorial group and then circulated to the workshop participants for further tuning. Comments, add-ins, or changes were communicated with all participants in several rounds of tuning. A final draft was then produced by the editorial group and submitted to the IMHF-EP for comment.

The final document was submitted to IMHF governing bodies for approval and to decide on the further steps. Such steps had already been suggested in the IMHA workshop report (see appendix). Eight years have passed since the London workshop. We feel that it is more than overdue to have a viable solution for the demands of the Maritime Labour Convention of 2006 (!) regarding the level of healthcare available to seafarers!

Appendix (cited from the IMHA London workshop report)

“The next steps

This consensus statement is to be agreed by all those present. A full report will be compiled, agreed by all and published within two months.

After wider discussion a working group will need to be established with clear guidelines and timelines. A reference group will also need to be established with representatives from the relevant international agencies, social partners and national maritime authorities in an appropriate timeline.

Research is necessary to establish the numbers and types of cases that the seafarer encounters. This can guide the priorities for pathway development and for training.

Any new system of medical incident handling must be reviewed on a regular basis with appropriate audit, feedback and research. Quality assurance and enforcement is key to the success of any system.”

Reflections of State of Art

BEST PRACTICE AND PERFORMANCE INDICATORS FOR SEAFARER HEALTH

By Professor Tim Carter

How can the quality of healthcare provided for seafarers be measured? Why does this matter? Who cares?

Right now, there is a lack of accountability for good maritime health practice in the shipping industry and probably only a minority of ship operators have even thought about this beyond meeting the minimum requirements of the Maritime Labour (MLC) and other relevant Conventions.¹ However, there are established key performance indicators for other aspects of ship and crew management, and these are becoming an important way for those who have cargoes to transport to assess which ship operators to charter from, at least in certain industry sectors such as oil and chemical transport and container shipping.

The Seafarers Hospital Society in the United Kingdom recently commissioned research on the barriers to improving health care for seafarers, both in terms of physical illness and the psychosocial determinants of wellbeing.² One of the key conclusions was that a new concept of a 'caring culture' needed to be framed and that the development of markers for best practice in maritime health and for the effectiveness of interventions to improve health and wellbeing were an essential tool in taking this concept forward.³

That said, these ideals are confronted by the reality of an industry that prides itself on being global, flexible, and cost-effective, so how can they best be developed. One route would be by means of an internationally agreed legal instrument. In principle this already exists in the form of the MLC. However, this is limited by the inertia inherent in international agencies where action is only taken following a high level of public concern as well as a lack of consistent international implementation and compliance, and perhaps by an attitude to legal requirement where just enough is done to stay out of trouble rather than looking at how benefits from its requirements and recommendations can be maximised. Most MLC provisions relate to inputs and facilities and the convention does not major on measurement of outputs or outcomes in terms of health benefits. There may be greater scope for improvement by inclusion of crew health in other instruments that have legal backing such as the International Safety Management code or by means of guidelines from international agencies, such as those produced on medical examinations or health and safety management.

Voluntary measures are a simpler and speedier option, at least for those parts of the industry where the reputation of a ship operator matters, either in terms of customer chartering decisions or because of the need to recruit and retain seafarers who are competent and committed. The key performance indicators originally developed by Intermanager, the ship managers trade association, and now promoted by Baltic and International Maritime Council, a ship owners' service and support organization, have gained currency in some sectors and could be developed to include criteria for crew healthcare.

The Seafarers Hospital Society is exploring these options and considering how best it can form partnerships to develop a set of best practice and performance standards for seafarer health and wellbeing. This is an ambitious and probable a long-term project but one that, if successful, could do much to help create the 'caring culture' that is often lacking in the industry as well as encouraging practicable ways in which ship operators can be accountable for health and wellbeing and improve the quality of crew health for the future.

Maritime health professionals are important partners in this work, but at this stage the key challenge is to look at how best to influence industry cultures. To this end the Society is working with those who have practical experience of ship management, insurance and maritime decision taking. Workshops involving maritime health professionals will be held once the boundaries of what is practicable have been better defined.

¹ Guillot-Wright S. The changing economic structure of the maritime industry and its adverse effects on seafarers' health care rights. *Int Marit Health* 2017; 68(2): 77–82.

² Slade MD. Seafarer health: research to date and current priorities. Seafarers Hospital Society and Yale University, August 2022. <https://seahospital.org.uk/yale-university-report-seafarer-health-research-to-date-and-current-practice/>.

³ On course for a Culture of Care. Seafarers Hospital Society, 2023. <https://seahospital.org.uk/seafarers-health-on-course-for-a-culture-of-care/>.

Particulars/IMHF News

CHANGE OF COMMAND ON THE BRIDGE OF THE INTERNATIONAL MARITIME HEALTH FOUNDATION

By Klaus Seidenstücker¹

Since 2018 this journal is owned and published by the International Maritime Health Foundation (IMHF). The foundation then took over from the Polish Society of Maritime, Tropical and Travel Medicine that still is a founding member of the IMHF.

Statutory objectives of the foundation are:

- inspiration and support of scientific research and studies on maritime health;
- developing, editing, publishing promoting and disseminating a scientific journal under the name International Maritime Health;
- spreading information and knowledge as well as facilitating discussion on the subject;
- attracting people to professions related with maritime health;
- participating in the organization of seminars, events, workshops, conferences, and scientific conventions in order to increase knowledge on maritime health and adjacent fields;
- cooperating with national and international institutions and organizations with same or similar interest.

Founders of IMHF are:

- the IMH journals prior owner, the Polish Society for Maritime, Tropical and Travel Medicine, Gdynia, Poland;
- the Norwegian Association for Maritime Medicine;
- the Haukeland University Hospital, both Bergen, Norway.

These three entities constitute the IMHF “cooperating institutions” and were joined in 2022 by the International Transport Worker Federation’s Seafarers’ Trust (ITF-ST).

Governing bodies of the IMHF are:

- the Board of Governors, the supervisory organ of the foundation;
- the Management Board, the executive organ of the foundation.



President of the Management Board since the establishment of the IMHF was **Alf Magne Horneland**, formerly director of the Norwegian Centre for Maritime Medicine.

Alf Magne completed medical school at the University of Bergen in 1977 and specialized in general practice and family medicine. For 20 years he worked as district medical officer in municipalities along the Norwegian coast, 8 years as advisor to the national social insurance.

From 1998 to 2008 he was Surgeon Commander in the Royal Norwegian Navy and chief medical instructor for the Norwegian Navy Schools.

Alf Magne is head of the appellate body of the Norwegian Maritime Authority and the Norwegian Coastal Administration.

He held membership of the International Maritime Health Association (IMHA) from 2001, was member of the IMHA board of directors since 2009, IMHA vice president from 2011 to 2013 and president from 2013 to 2015. In that position he organized the 13. International

Symposium on Maritime Health (ISMH) in Bergen, Norway, which many of us will have in good memory.

Alf Magne was the main inspirator and driver in the establishment of the IMHF when the International Maritime Health journal was in a severe financial situation from 2016 to 2018. It is his merit that maritime medical professionals can still read and rely on a source of information specializing in maritime health. From 2018 to 2022 Alf Magne was president of the IMHF’s Management Board. And it is fair to say that he took almost all responsibility on his shoulders to keep the ship afloat in these years.

Alf Magne devoted his life and his professional career to maritime medicine in an exemplary way. He stepped down from the IMHF Management Board’s (IMHF-MB) presidency by the end of 2022 and we owe to thank him for his dedication to the cause as well as for the diligence, methodical approach and expertise he invested in every obligation he accepted – even in times when his health was at stake.

¹ CVs based on contributions from Alf Magne Horneland and Nebojsa Nikolic



By the end of 2022 Alf Magne handed over IMHF-MB presidency to **Nebojsa Nikolic**. He still lends his expertise to the IMHF Expert Panel as advisory member. We are happy to have him alongside for the many challenges ahead and wish to thank him for his outstanding contribution to our common cause in the past!

Nebojsa is a founding member of IMHF's Expert Panel. Many of our readers will know him as IMHA member and IMHA president from 2008–2009 and chair of the 8th International Symposium on Maritime Health, held in Rijeka, Croatia in 2005.

He was the chair of Maritime Medicine at the Faculty of Maritime Studies and lecturer on maritime medicine at the faculty of medicine at Rijeka and the University of Cadiz, Spain. Nebojsa was awarded a medal of the Institute of Tropical and Maritime Medicine at Gdynia, Poland. He is honorary professor at the Institute of Transport in Odessa, Ukraine, court expert of maritime medicine and medical advisor of ITF and the Ministry of Transport in Croatia.

Nebojsa has a legend as invited speaker at international conferences and is author of 70 scientific papers and 3 books. He is author of the chapter on maritime medicine in World Health Organization International Travel and Health annual editions. He is member of this journal's editorial board and past board member of the Journal of Travel Medicine and of Medicina Marittima.

He is vice president of the medical commission of the World Sailing, president of the medical committee of the Croatian Sailing Association and member of the Association of Summer Olympic Games Medical and Science Consultative Group within the International Olympic Committee. He was chief medical officer for the sailing events at the Olympic Games in Rio 2016 and Tokyo 2020.

With Nebojsa not only do we have an expert contributing a new set of views on maritime health but also someone who will provide continuity as well as lay out the path for a next generation to carry IMHF into the future.

We wish him always fair winds and following seas at the helm of our foundation!

Presentations

CENTRE FOR OCCUPATIONAL AND MARITIME MEDICINE, HAMBURG

Provided by Professor Volker Harth



The Hamburg Centre for Occupational and Maritime Medicine (Zentrum für Arbeitsmedizin und Maritime Medizin [ZfAM]) is an institution of the ministry of Justice and Consumer Protection (BJV) of the Free and Hanseatic City of Hamburg, connected with the Medical Faculty of the Hamburg University through the university professorship for occupational medicine and maritime medicine. The combination of occupational medicine polyclinic and 6 research working groups (Clinical Occupational Medicine, Epidemiology, Maritime Medicine, Mental Health, Public Health, Toxicology) offer ideal prerequisites for a successful interdisciplinary cooperation in research, teaching and patient care. The Institute is located in the St. Pauli Health Centre.

Responsibilities

The remit of the Institute is the performance of occupational scientific and medical investigations in order to increase knowledge about work-related adverse effects on human health. The Institute is responsible for basic and applied research, communicating health care methods and further training, academic lectures, the assessment of safety at work and hygiene, as well as the counselling of physicians, ministries, authorities, accident insurance claimants, local employees (including seafarers) and employer organizations.

In close cooperation with its clinical-experimental working groups, current research topics are taken up that arise from the constant change in the working world “on land and at sea”. Thematically, the focus is on the development of workplace-related and at the same time public health-related prevention strategies, e.g. on the increasing absenteeism and early retirement due to mental stress and diseases or on health burdens caused by the increasing work intensification, the globalized commodity trade and new industries and technologies. In this context, the ZfAM draws on extensive expertise, but at the same time sets thematic priorities in newly established research projects, e.g. on the health effects of night and shift work and on quality-assured methods in the early diagnosis of occupational respiratory and lung diseases.

The Institute continues to deal in particular with research topics that have a Hamburg-specific connection, an example of which is the complex of topics “Psychomental stress in shipping”. For the coastal states, the emerging technology sector of “offshore wind energy” poses a challenge to employee and workplace-related prevention, to which the institute contributes its expertise. The diagnostics of the “classical” chemical-irritative, toxic, carcinogenic and biological stresses also continue to be a focus at ZfAM. Cooperation with the UKE takes place within the framework of the Hamburg City Health Study (HCHS), for which ZfAM developed questions of occupational and environmental medicine in particular; involvement in the Centre for Health Care Research (CHCR), the UKE association for health care research, was also expanded.

History

In 1968, the Senate of the Free and Hanseatic City of Hamburg converted the Extraordinariate into a full Chair of Occupational Medicine and created the Central Institute of Occupational Medicine (ZfA). Shipping Medicine was founded in 1966 as a department of the Bernhard Nocht Institute but was integrated into the ZfA in 2000 which was manifested with the renaming to the Central Institute for Occupational Medicine and Maritime Medicine (ZfAM) in 2007. In 2019, Prof. Harth's professorship was reassigned to occupational medicine and maritime medicine.

Current externally funded projects

- EU Horizon: Healthy Sailing – Prevention, mitigation, management of infectious diseases on cruise ships and passenger ferries (2022–2025)
- EU4Health: SOLACE: Strengthening the screening of Lung Cancer in Europe (2023–2026)
- EVALUNG – Evaluation and quality assurance in the extended screening programme of the German Social Accident Insurance for early detection of asbestos-related lung diseases using low-dose computed tomography (2021–2024)
- GerES VI – Analysis of pollutants in human samples as part of the German environmental study on adult health (2019–2024)
- Light and Shift – Intervention Study on Short- and Long-Term Health Effects of Dynamic Lighting at the Workplace (2020–2023)
- BEHAVIMS – Health Behaviour of persons with Multiple Sclerosis in Germany: Current status and development of supportive strategies for smoking cessation and dietary behaviour change (2022–2025)
- Prä-GiNa project – Prevention of violence and aggression towards staff in emergency departments (2021–2023)

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The ZfAM in house 1 of the St. Pauli Health Centre, formerly known as the harbour hospital

INFORMATION FOR AUTHORS

The International Maritime Health will publish original papers on medical and health problems of seafarers, fishermen, divers, dockers, shipyard workers and other maritime workers, as well as papers on tropical medicine, travel medicine, epidemiology, and other related topics.

Typical length of such a paper would be 2000–4000 words, not including tables, figures and references. Its construction should follow the usual pattern: abstract (structured abstract of no more than 300 words); key words; introduction; participants; materials; methods; results; discussion; and conclusions/key messages.

Case Reports will also be accepted, particularly of work-related diseases and accidents among maritime workers.

All papers will be peer-reviewed. The comments made by the reviewers will be sent to authors, and their criticism and proposed amendments should be taken into consideration by authors submitting revised texts.

Review articles on specific topics, exposures, preventive interventions, and on the national maritime health services will also be considered for publication. Their length will be from 1000 to 4000 words, including tables, figures and references.

Letters to the Editor discussing recently published articles, reporting research projects or informing about workshops will be accepted; they should not exceed 500 words of text and 5 references.

There also will be the section Chronicle, in which brief reports will be published on the international symposia and national meetings on maritime medicine and health, on tropical parasitology and epidemiology, on travel medicine and other subjects related to the health of seafarers and other maritime workers. Information will also be given on training activities in this field, and on international collaborative projects related to the above subjects.

All articles should be submitted to IMH electronically online at www.intmarhealth.pl where detailed instruction regarding submission process will be provided.

Only English texts will be accepted.

Manuscripts should be typed in double line spacing on numbered pages and conform to the usual requirements (Ref.: International Committee on Medical Journals Editors. Uniform Requirements for Manuscripts Submitted to Biomedical Journals, JAMA, 1997; 277: 927–934).

Only manuscripts that have not been published previously, and are not under consideration by another publisher, will be accepted.

Full texts of oral presentations at meetings (with abstracts printed in the conference materials) can be considered.

All authors must give written consent to publication of the text.

Manuscripts should present original material, the writing should be clear, study methods appropriate, the conclusions should be reasonable and supported by the data. Abbreviations, if used, should be explained.

Drugs should be referred to by their approved names (not by trade names). Scientific measurements should be given in SI units, except for blood pressure, which should be expressed in mm Hg.

Authors should give their names, addresses, and affiliations for the time they did the work. A current address of one author should be indicated for correspondence, including telephone and fax numbers, and e-mail address.

All financial and material support for the reported research and work should be identified in the manuscript.

REFERENCES

References should be numbered in the order in which they appear in the text. At the end of the article the full list of references should give the names and initials of all authors (unless there are more than six authors, when only the first three should be given followed by: et al.).

The authors' names are followed by the title of the article; the title of the journal abbreviated according to Medline; the year of publication, the volume number; and the first and last page numbers. **Please note:** References you should include DOI numbers of the cited papers (if applicable) – it will enable the references to be linked out directly to proper websites. (e.g. Redon J, Cifkova R, Laurent S et al. Mechanisms of hypertension in the cardiometabolic syndrome. J Hypertens. 2009; 27(3): 441–451, doi: 10.1097/HJH.0b013e32831e13e5.).

Reference to books should give the title, names of authors or of editors, publisher, place of publication, and the year.

Information from yet unpublished articles, papers reported at meetings, or personal communications should be cited only in the text, not in References.

For full information for authors refer to the web page: www.intmarhealth.pl.

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