Survey on smoking habits among seafarers

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Summary. Background: Populations living in stressful environments experience higher mortality from lung cancer and chronic diseases. Work-related stress was identified as important determinant of smoking together to health problems caused by incorrect lifestyles. Aim of the work was to analyze tobacco smoking addiction in seafarers working on merchant ships. Only a few studies are available on this topic. Methods: The survey was conducted using an anonymous questionnaire. The total number of questionnaires filled-in was 1478, out of 2000 distributed (response rate 73.9 %). Results: About half of the sample (55.07%) has never smoked, the 28.96% is currently a smoker, while 15.97% of responders belong to the category of ex-smokers. Analysis of the number of cigarettes smoked every day based on the rank shows that captains and officers smoke more cigarettes than the crew members who smoke 10 cigarettes maximum per day. Analysis of the level of dependence among the smokers group by the Fagerström Test for Nicotine Dependence (FTND) revealed that a 89.0% of sample has a low/very low dependence level, and only the 10.98% of the sample show a high/very high dependence. A further analysis of the results of FTND in the different age groups has shown that the 41-50 and 51-60 age groups have high dependence levels. Conclusions: Working on board is associated to a high risk for chronic, lifestyle-related diseases, due also to lifestyle behaviours. This study suggests to further investigate the presence of other risk factors such as diet, physical exercise, combined with tobacco smoking, obesity. (www.actabiomedica.it)

Key words: seafarers, smoking habits, nicotine addiction, lifestyles, prevention, public health

Introduction

As found in the WHO definition about health literacy as “the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health” (1-3).

World Health Organization (WHO) has estimated that tobacco use, smoking and smokeless is currently responsible for the death of about six million people across the world each year with many of these deaths occurring prematurely (4-6), and tobacco-related diseases even claim more lives than AIDS, malaria and tuberculosis combined (7).

Active smoking and involuntary smoking have been reported to be associated with the development of many forms of cancer, cardiovascular diseases, chronic obstructive pulmonary disease (COPD), complications of pregnancy, sudden infant death syndrome, etc (8-10).

Populations living in stressful environments, smoke more heavily and experience higher mortality from lung cancer and chronic obstructive pulmonary disorder. Stress in general and work-related stress in
particular were identified as important determinants of smoking (11, 12) together to health problems caused by a lifestyle based on incorrect knowledge towards food, drugs, alcohol (13-16).

Research on the relationship between working conditions and smoking has demonstrated that smoking and occupation are related each other and that work–family conflict may be associated with increased levels of smoking (17-19). Other studies have found significant relationship between working time and smoking (20-23).

Seafarers are often represented in popular literature as heavy smokers and drinkers. Fishermen and merchant seamen are markedly subject to alcohol and cigarette consumption.

Addiction is common among seafarers as well as increased risk of occupational accident in this population (24). Many factors favor the use of drugs in seafarers: geographical remoteness, social isolation, stay on the ship, dangerous situations, stress, sleep disturbance, etc. The search for positive effects such as the stimulant effect in the fight against fatigue, or negative, as in escape from stressful situations is therefore important for seafarers. Stressful situations affect often seafarers living in an isolated and hostile environment, which involves high risk and requires vigilance and rapid reactions. For example, the use of alcohol or drugs represents a risk factor for occupational accidents, particularly fatalities, and premature deaths (25-29). For fishermen, mean voyage time has been significantly associated with nicotine dependence. The number of days spent at sea during the past 12 months has been significantly associated with nicotine dependence (25).

Health problems of seafarers can be caused both by their occupational exposure (e.g. kind and frequency of contact with hazardous substances, stress level onboard) and by lifestyle-related behavior (smoking, alcohol) (30) or incorrect eating habits (31-34). Even the misuse of drugs can sometimes cause serious allergic effects (35-40). The seafarer's cigarette consumption is considered as an important CVD risk factor higher than in the general population (41).

Besides accidents and work-related injuries, severe CVD represent a main cause of death, both in general population from industrialized countries as well as in seafaring population (42). These findings were also confirmed by the investigation on the main causes of death on board ships assisted by Centro Internazionale Radio Medico (C.I.R.M.), the Italian Telemedical Maritime Assistance Service (TMAS) (24). Working at sea is associated with specific psychosocial stressors (including long-time separation from the family, mental stress, extremely long working hours, permanent changing crews, reduced duration and quality of sleep on board, irregular working time, and permanent physical impacts such as ship movements, noise and vibration) (42). The additional effect of adverse lifestyle factors such as smoking, sedentary lifestyle, and obesity, which is also prevalent among seafarers, is regarded as multiplicative factor (43-45).

This paper has analyzed the problem of tobacco smoking addiction in seafarers working on merchant ships. Only a few studies are available on this topic, dealing with this issue and they refer to French, Spanish, Greek, Italian, Polish, Scottish and Turkish seamen (46-52). Analysis was done on a sample of seafarers working for three Italian (Finaval, D’Amico and Carboflotta), and one French (CMA CGM) shipping companies, investigating not only the tobacco smoking addiction among seafarers but also their level of knowledge and awareness of the risks for health.

Materials and methods

Study population and data collection: The survey was conducted among seafarers of the shipping companies above described, using an anonymous questionnaire. The questionnaire was sent to 80 vessels (with an average of 25 seafarers on board, for a possible sample of 2,000 people as a sample for the interview). Each seafarer received a sealed envelope containing a letter explaining the purpose of the survey, the questionnaire and instructions on how to fill in it (53). The questionnaire validity was tested by administering it to seafarers of different rank to evaluate the “face validity”. The questionnaire was distributed after health education interventions (seminars) designed to make seafarers aware of health risks linked to incorrect lifestyles, with the aim to improve the working conditions quality, and occupational safety on board ships.
The questionnaire was completely anonymous and filled only on voluntary basis. After completing the questionnaire, each participant was requested to return it in its original envelope and seal without marking. All closed envelopes were gathered by the captains and then sent to the Epidemiology group of University of Camerino (UNICAM) for data analysis. The study was conducted according to the Helsinki Declaration.

**Survey tools:** The questionnaire included three parts. The first one was centered on seafarer’s personal data (sex, age, nationality, education and rank), and asked questions about the awareness of injuries and diseases caused by tobacco smoking, habits and lifestyle. The second part was for current smokers only and included specific questions about tobacco consumption (e.g. at what age did you begin smoking? How many cigarettes do you smoke? Do you currently want to quit smoking?), and tobacco addiction. In this section, the degree of nicotine dependence in current smokers was also assessed by the Fagerström Test for Nicotine Dependence (FTND) (54). The Fagerström Test is composed of six items. Questions requiring an answer yes/no are scored from 0 to 1, whereas multiple-choice items are scored from 0 to 3. The items are summed to yield a total score of 0-10. The global Fagerström score assesses the intensity of physical nicotine addiction: low dependence (0 to 2 scores), medium dependence (3 to 4 scores), high dependence (5 to 6 scores) and very high dependence (7 to 10 scores). A score of ≥ 6 was considered as a cut-off to assess a high nicotine dependence (55). The last part of the questionnaire examined ex smokers and how they manage to quit smoking (in this paper, only current smokers will be examined).

Before the distribution, the questionnaire was validated by a previous pilot study performed on 12 seafarers working onboard cargo ships. This to assess its face validity (56).

**Analysis:** Questionnaire answers were transferred into Microsoft Excel sheets. This software was used for data storing and processing. Statistical analysis was performed by the X-L stat software (57). Descriptive statistics were used to analyze the distribution of variables. Qualitative data were described using frequencies and percentages. The Chi-square analysis and the Odds Ratio, to evaluate the differences between ages, rank, educational level, alcohol use and tobacco dependence level, has been applied. The level of statistical significance was set at p<0.05.

**Results**

The total number of questionnaires filled-in was 1478, out of 2000 distributed (response rate 73.9%). Table 1 shows the socio-demographic characteristics of the sample.

About half of the sample (55.07%) has never smoked, the 28.96% is currently a smoker, while 15.97% of responders belong to the category of ex-

| Table 1. Demographic characteristics of interviewed workers |
|----------------------------------------------------------|
| **Gender** | **n.** | **%** |
| Male | 1478 | 100.00 |
| Female | - | - |
| **Age** | | |
| <=20 | 87 | 5.89 |
| 21-30 | 443 | 29.97 |
| 31-40 | 423 | 28.62 |
| 41-50 | 330 | 22.33 |
| 51-60 | 184 | 12.45 |
| >=61 | 11 | 0.74 |
| **Nationality** | | |
| Italian | 182 | 12.31 |
| Indian | 679 | 45.94 |
| Filipino | 486 | 32.88 |
| English | 5 | 0.34 |
| Est europa | 93 | 6.29 |
| Cinese | 14 | 0.95 |
| Francese | 19 | 1.29 |
| **Educational level** | | |
| Elementary | 54 | 3.65 |
| Middle school | 198 | 13.40 |
| High school | 425 | 28.76 |
| Professional diploma | 189 | 12.79 |
| Occupational training | 581 | 39.31 |
| Degree | 31 | 2.10 |
| **Rank** | | |
| Captain | 70 | 4.74 |
| Deck officer | 251 | 16.98 |
| Engine room officer | 87 | 5.89 |
| Deck crew | 550 | 37.21 |
| Engine room crew | 408 | 27.60 |
| Galley and catering crew | 112 | 7.58 |
smokers. A great part of the sample (92.8 %) is aware that smoking cigarettes, or other tobacco products, seriously compromises health. Among the main risks associated with tobacco smoking, lung cancer was indicated by the 92.02% of participants, followed by cancers of the mouth, larynx, and esophagus (53.45%), hypertension and heart problems (52.44%), dependence (42.96%), increase in cholesterol and risk of cardiovascular disease (22.19%), nervousness, apathy, anxiety and headache (16.31%). Among the diseases less associated with tobacco smoke by interviewed people, there were mucous hyper-secretion (catarrh) (10.83%) and conjunctivitis (7.24%). The 1.83% of the sample answered ‘do not know’.

Concerning health problems declared by interviewed people, 4.53% of responders reported suffering from coughing fits (32.84% of them, productive). Among seafarers asserting to have dyspnea (35 people, representing 2.37% of the sample), 25.71% of them declared dyspnea at rest, and 42.86% of them after an effort. The 6.97% of responders declared to expectorate in the morning. The 88.70% of those who completed the questionnaire stated that cigarette smoking addiction is caused by nicotine, the 23.68% thought that addiction is also due to tar and carbon monoxide, while the 4.74% of the sample did not know at all what ingredient is involved in addiction.

Examining the sample by age, the majority of current smokers belongs to 21-30 years old group (33.88%), while former smokers belong to 31-40 years (31.36%). Among current smokers, the majority of smokers are deck crew members (35.28%), followed by engine room crew (26.40%), and deck officers (19.86%).

Table 2 shows the correlation of smoking with age, educational level, rank, and alcohol use. The prevalence of smokers was significantly related with the educational level, the working rank and alcohol use. No significant values were noticeable for the age variable. The higher Odds ratio was obtained comparing the alcohol use and smoking.

In terms of number of cigarettes smoked every day, 11.69% of people declared to smoke from 21 to more than 30 cigarettes per day. The majority of interviewed people smokes 1-10 cigarettes (63.79%), followed by those who smoke 11-20 (24.53%). Analysis of the number of cigarettes smoked every day based on the rank shows that captains and officers smoke every day more cigarettes than the crewmembers who smoke 10 cigarettes maximum per day.

Comparing the number of cigarettes smoked per day with the age of subjects working in the captain category or in the crew category, no statistically significant correlation between the number of cigarettes smoked and the age of the subjects was observed. In the crew category, a statistically significant correlation between age and number of cigarettes smoked per day has been found (Pearson value = -1.000; p=0.0001).

| Variables                      | Number (percent) | P-value | OR   | 95%CI       |
|-------------------------------|------------------|---------|------|------------|
|                              | Smoker | Non smoker |      |            |
| Age                           |        |            |      |            |
| Less than 30                  | 171    | 300        | 0.285| 1.14       |
| Educational level             |        |            |      |            |
| Elementary/middle school      | 74     | 155        | 0.0002| 1.76*    |
| Equal to High school          | 354    | 1305       | 0.0002| 0.57      |
| Rank                          |        |            |      |            |
| captain/officer               | 135    | 189        | 0.0019| 1.52*    |
| crew                          | 293    | 625        | 0.0015| 0.66      |
| Alcohol                       |        |            |      |            |
| No drink                      | 22     | 91         | 0.0042| 0.47      |
| Outside of meals, drunk, often| 98     | 190        | 0.0042| 2.13*    |

*Correlation significant of the P (α<0.05)
This correlation is negative, in particular when comparing the age and the number of cigarettes in the range 1-10 cigarettes per day.

The analysis of the results of FTND in the different age groups has shown that the 41-50 and 51-60 age groups have high dependence levels (18.09% and 19.61% respectively). Considering the rank, the captains and the deck officers are the groups characterized by high dependence (30.00% and 22.35% respectively).

Comparing the results of FTND in the captains with those obtained in the deck crew, engine room crew, and galley/catering crew, the captains showed a risk of developing a medium/high dependence two times higher than other ranks (Table 3).

| Rank                  | P    | OR   | 95%CI         |
|-----------------------|------|------|---------------|
| Galley and catering crew | 0.0225 | 0.50 | 1.430 to 2.549 |
| Engine room crew       | 0.0056 | 0.43 | 1.421 to 2.559 |
| Deck crew               | 0.0001 | 0.31 | 1.409 to 2.571 |
| Captain                | 0.0002 | 2.45* | 1.523 to 2.457 |

*Correlation significant of the P (α<0.05)

This study showed that a low percentage (about one fourth) of seafarers interviewed on board of merchant ships were smokers. This percentage was lower than the general prevalence rate of smoking among seafarers (51, 52). Data processing showed a good perception about the possible effects of tobacco smoking on health. In particular, this awareness concerns cancer (lung, mouth, larynx, and esophagus), cardiovascular diseases (hypertension, heart problems, high cholesterol, etc), nervousness, and anxiety.

The relationship between the prevalence of unhealthy lifestyles, as smoking with some pathologies and ranks on board was further evaluated. This as some studies highlighted a positive correlation between the onset of pathologies linked with an elevated blood cholesterol, high blood pressure, fat in food, smoking, and the different job positions (58, 59), whereas other studies reported only a marginal relationship (60).

In terms of rank, merchant ships should be considered as a working environment to be kept under control because stressful, and characterized by a high prevalence of smokers than general population ashore (51, 61). Even if the prevalence of smokers between the seafarers employed on board of the merchant ships, enrolled in this epidemiological study, is not very high, the smoking habits seem to be circumscribed in specific categories of our sample. The highest percentage of current smokers on board is in the range of age between 21 to 30 years. Other studies have reported a statistically significant correlation between smoking and educational level (52, 62-65), whereas a similar correlation was not found in relation to the different nationality of subjects. In terms of activity on board of merchant ship our data indicate that the seafarers employed as crew were the smokers more at risk. Analysis of the data on the number of cigarettes smoked per day, the captain and officers were the strongest consumers, smoking the maximum number of cigarettes (21 to 30 cigarettes per day).

In contrast, crew members heaviest smokers took 10 cigarettes per day. The worrying result was the high prevalence of hard smokers among captains and officers. These results were confirmed by statistical analysis because people with a role of control and high respon-
sibility showed a positive statistically significant correlation with the smoking habit, with an increasing Odds ratio compared with people with a lower rank.

Furthermore, the crew people were those with the higher number of subjects which never smoked or stopped smoking. These data can be explained considering that captains and officers have more freedom to choose when and how much to smoke. Another worrying result is the positive and statistically significant correlation between smoking and alcohol use. Probably, the contemporary presence of the smoking and alcohol habits indicates that the subjects which have the necessity to smoke perceive also the necessity to drink alcohol to tolerate the stress or fatigue. These findings are consistent with those of other studies suggesting a possible correlation between the increase of smoking and alcohol use, and the work-related stress. Alcohol and cigarettes could also be used as anti-anxiety or antidepressant agents to relieve the impact of job stress, and to self-medicate physiological effects induced by stress (elevated cortisol, suppressed serotonin, and catecholamine secretion) to achieve the internal homeostasis (65, 66).

In terms of age analysis, younger crews represented the main smokers. In fact, a positive statistically significant correlation was found between the younger age groups (<30 years) and smoking. These findings could be explained because even if the number of cigarettes smoked by younger crews is not elevated, the frequency of smoking in this category is higher than frequency registered in the other crews (>30 years). The observation that younger people are the main smokers is worrying as they are at risk of dependence because of their low awareness of how much they smoke.

A less straightforward question is whether seafarers are also at heightened risk of dependence if employed in the higher ranks. Besides to the raw analysis on the number and the frequency of cigarettes smoked for single ranks and single range of age, the level of dependence has been analyzed.

The FTND showed that all people interviewed has been assessed on a low or very low dependence level.

As regards as the awareness, the galley crew has been associated with six times less awareness than captains on the amount of smoking. Compared to the engine room crews, a statistically significant correlation between this category and the captains, was not found.

Although this study has some limitations, such as the choice of sample (convenience and non-randomized) that could represent a possible bias, our results are in agreement with data of literature, in particular concerning the correlation between smoking and alcohol use, strengthening the relationship between the high levels of nicotine and alcohol consumption in seagoing workers (30, 51, 67). Probably, the free availability of cigarettes on board, could be another element contributing to continue or to start smoking between seafarers (25, 68, 69). Sailors work away from home for a long time and they do not benefit from many anti-smoking policies or rules that are the most smoking cessation interventions for the general population (63).

Traditionally, the seafaring has been perceived by the public as a risky activity, mainly because of the shipping accidents and recently the piracy. Only in recent studies, the work on board of ships has been associated to a high risk for chronic, lifestyle-related diseases, such as cancer and coronary heart disease, due to a high exposure to chemicals as well as sunlight, but also to lifestyle behaviours, such as smoking, alcohol consumption and diet (25, 30, 51, 70). Therefore, the results of this study suggest to further investigate the presence of other risk factors such as diet, physical exercise, combined with tobacco smoking, and obesity (71).

All these considerations highlight the strong need to activate prevention campaigns directed towards this particular working category. A first approach is represented by the ‘Healthy ship’ project (Health Protection and Safety on Board Ships), an initiative of CIRM (Centro Internazionale Radio Medico, the Italian Telemedical Maritime Assistance Service) and the University of Camerino, focused on the prevention of diseases on board ships through information campaigns about the major health risks for seafarers and their prevention (13, 14, 72, 73).

**Conflict of interest:** Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.
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