

Health status, sleeping habits and dyssomnia of coastal fishermen

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ABSTRACT

Background: The aim of this survey was to assess the health status, sleep habits and dyssomnia of coastal fishermen.

Materials and methods: This cross-sectional survey involved a representative sample of 948 coastal fishermen. All participants were men and had a regular activity for at least 2 years. We used an individual questionnaire inspired by those of Morphée network, the National Institute for Research and Security of France, and of the Karasek's Job Content Questionnaire.

Results: The prevalence of sociodemographic and individual parameters was similar in rotating shiftwork (RW) and in nocturnal work (NW). The average age of the total population was 38.8 ± 8.1 years. The prevalence of sleep habits and alertness disorders was similar in RW and in NW. The average daily sleep time of the total population was 5.5 ± 0.9 hours during the week, and 8.7 ± 0.8 hours during the holidays, Fridays and recovery days. Upon waking, 49.7% of the subjects felt tired and sleepy, 43.2% fit and 7.1% had a headache. 47.2% reported being chronic insomniac. The index of severity of insomnia was moderate to severe in 29.6%. The prevalence of excessive daytime sleepiness (Epworth > 10) was 16.2%. Fatigue, iso-strain and socio-economic concerns were associated with a higher risk of chronic insomnia.

Conclusions: Coastal fishermen were at a high risk of chronic dyssomnia and alertness disorders. Education initiatives should be conducted to raise fishermen's awareness on their health and safety consequences.

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Key words: health status, sleep habits, dyssomnia, alertness, stress, costal fishermen

INTRODUCTION

Fishing is a hazardous occupation with high rates of death and injury. Working at sea is associated with a number of occupational risks and challenges, such as high work-load, inconvenient working-hours, prolonged periods of absence from family, and an increased risk of accidents. Seafaring still ranks as one of the most hazardous occupations possible [1]. The dangerousness and complexity of a fisherman's activity is explained by an arduous and laborious work with

numerous and countless constraints requiring a sustained degree of attention and alertness.

The main factor of sleep disorders is fatigue related to an extremely demanding occupation that takes place in one of the most dangerous working environments [2] along with stressful working conditions (atypical work schedules, long working-hours, density of work, unsafety of job, etc.) [3–5]. Fishermen are among the most exposed categories to psychosocial risks at the workplace (stress,

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burnout, harassments, etc.). They develop psychosomatic symptoms (neurovegetative, cognitive, mood and sleep disorders, and nervous tension) and chronic diseases (cardiovascular, neuropsychiatric, musculoskeletal, digestive, metabolic, etc.) [6]. The International Maritime Organization (IMO) has identified seafarer fatigue as an important health and safety issue. The IMO defines fatigue as “a reduction in physical and or mental capability as the result of physical, mental, or emotional exertion which may impair nearly all physical abilities including: strength, speed, reaction time, coordination, decision making, or balance” [7]. The key factor in minimizing and recovering from fatigue is obtaining adequate sleep on a regular basis [8]. In coastal fishing, daily activities tend to vary markedly with factors such as weather conditions, success in finding fish, and damage to fishing gear. These factors necessarily add an element of unpredictability to the workload and sleep recovery opportunities of fishermen at sea. The earnings of a fisherman are related to the size of the catch, this provides an incentive to continue working until the holds are full or until the fishing quota is achieved. For fishermen working under these conditions, seasonal peaks in fish availability represent their best earning opportunity of the year, but it may also mean long periods at sea with minimal and irregular rest opportunities. The unpredictable and demanding working conditions foster a high potential for risks and accidents. Sleep and alertness disorders induce and increase occupational accidents which are often fatal. A fisherman was, in 2011, about 44 times more likely to die at work than workers on land [9]. The death rate on fishing vessels was, in 2006, 33.4-fold higher than that for all other occupations [10]. In the United Kingdom, the fatality rate in fishermen is 12 times higher than the general workforce [11]. Fatigue contributes to 16% of critical and 33% of personal injury accidents across all types of maritime operations [12].

The effects of fatigue include reduced situation awareness, planning deficits and an inability to adapt to new information, and difficulties in focusing attention. These negative effects of fatigue can translate into performance impairments, willingness to take risks and increased accident involvement for fishermen in safety-critical organizations [1].

Perceptions of both risk of personal injuries and ship accidents increase when seafarers are fatigued. Fatigue is related to poor sleep quality, and safety climate predicts both sleep quality and fatigue [1]. Occupational fatigue and dyssomnia represent a serious threat to the general health and well-being of fishermen and can have severe consequences in terms of accidents and fatal disasters. However, few studies have investigated the dyssomnia and alertness disorders of fishermen in Morocco [6, 13, 14]. In the current study, the health status, sleeping habits and dyssomnia and its causes among population of coastal fishermen are assessed.

MATERIALS AND METHODS

FRAMEWORK AND TYPE OF STUDY

This observational and cross-sectional study was conducted in 2018 in two ports of northern Morocco (Assilah and Tangier).

TARGET POPULATION

The survey involved a representative sample of 1,123 coastal fishermen (33.3% of the exhaustive administrative list of 3,369 fishermen working in coastal sectors). All participants were men and had a regular activity for at least two years. The fishermen were working every day, except Friday in sardine boats with nocturnal work (NW) or longline boats with rotating shiftwork (RW). The first boat contains about thirty people and the second ten to twenty. The sardine boats go out daily at sea at sunset and return in the morning at about 8 am. Longline boats go out at sea for 3 to 6 days. The work on board is done with rotating schedules often in two or three shifts. The average duration of one shift is of 11 to 12 hours. The longline boats stay in port for 1 or 2 days.

QUESTIONNAIRE

An individual questionnaire inspired by those of Morphée network [15], National Institute for Research and Security of France (INRS) [16] and the Karasek’s Job Content Questionnaire (KJCQ) [17], was used. It comprised four parts.

- **Socio-demographic and professional parameters:** age, family status (living alone, living in couple), dependents (children, parents, and relatives), professional categories, educational levels, length of employment, daily working hours, and work stressors (KJCQ).
- **Health parameters:** harmful habits (tea-coffee, tobacco, cannabis, alcohol, other psychoactive substances and medicines), regular physical activities – sports (at least 3 times a week), body mass index, psychosomatic symptoms [10], and self-reported chronic diseases. The items of psychosomatic symptoms were assessed with responses on a 4-point Likert-type scale from “never” to “often”. The answers “never” and “rarely” were considered as rejected and the answers “sometimes”, “often” and “always” as occurring.
- **Sleeping habits, chronic insomnia, and its consequences:** daily sleep duration, bedtime and wake-up times, quality of wake-up, nap more than twice a week, chronic insomnia, index of severity of insomnia, and daytime alertness disorders. Insomnia is a complaint that can take different aspects (sleep initiation or maintenance disorder, early awakening or non-restorative sleep). Chronic insomnia is occurring at least 3 times a week and for more than 3 months with consequences on the quality of daytimes. The index of severity of insom-

nia allows assessing the nature of chronic insomnia, the satisfaction of the person in relation to their sleep, their daily functioning and their anxiety about sleep disorders. The scale includes seven items rated from 0 to 4. The score ranges from 0 to 28: absence of insomnia (0 to 7), mild insomnia (8 to 14), moderate insomnia (15 to 21), severe insomnia (22 to 28) [15]. Vigilance refers to the ability of the central nervous system to respond effectively to a stimulus or event. Sleepiness is a decrease in the physiological awakening manifested by a need to sleep. The Epworth scale assesses daytime sleepiness because of decreased alertness. It is based on a subjective self-assessment of the probability of falling asleep in certain commonly encountered in everyday life situations. This probability is rated from 0 (never sleepy) to 3 (strong chance to doze). The score ranges from 0 to 24; it is considered abnormal if it is greater than 10 (excessive daytime sleepiness) [18].

- **The KJCQ covers three dimensions of the psychosocial environment at work:** Psychological Demand (PD) assesses the quantity, speed, complexity, intensity, fragmentation, and predictability of work. Decision Latitude (DL) appreciates room for manoeuvring, acquisition, use and development of skills. Social Support (SS) values professional and emotional support from superiors and colleagues. It has 26 questions: 9 for PD, 9 for DL and 8 for SS. The proposed answers (on a four-point Likert-type scale) are “strongly disagree”, “disagree”, “agree” and “strongly agree” [17]. These three dimensions allow risk situations to be identified. Job strain is the combination of low decision latitude (score below 71) and high psychological demand (score greater than 20). Iso-strain is the combination of a job strain situation and a low social support of less than 24.

ETHICAL AND DEONTOLOGICAL ASPECTS

The Moroccan Ministry of Fisheries delegate, the representatives of the fishermen associations and the occupational physicians were previously contacted in order to explain the purpose of the study and to obtain their support. The interviews took place within the occupational health service of fishermen and lasted approximately 20 minutes for each participant. The singular colloquium with each fisherman was carried out with full respect of the confidentiality.

STATISTICAL ANALYSES

The statistical analysis was performed using the SPSS version 11.5 software package. The differences between groups were compared using t-tests for continuous variables and chi-square tests for categorical ones. The statistical level of significance was established at 5%. For a proportion, the lower and upper limits of the 95% confidence intervals (CI)

were calculated. In order to assess the association between chronic insomnia and several other factors, we calculated odds ratio (OR) and 95% CI. Multivariable logistic regression analysis including the factors that were statistically significant in bivariate analysis, were calculated. The OR adjusted (ORa) of each of the factors that we found in the final model, independently of the other factors, were computed.

RESULTS

The final sample was composed of 948 people who took part in the study (613 had rotating shift work and 335 had night work). The participate rate was 84.4%. Concerning the different parameters of the study, the comparison between RW and NW showed that there was no significant difference between the two groups.

SOCIODEMOGRAPHIC AND PROFESSIONAL PARAMETERS (TABLE 1)

The average age of the total population was 38.8 ± 8.1 years, 69.2% lived in couple, and 75.9% had dependents. Average job seniority was 14.3 ± 4.5 years, and 79.8% worked more than 8 hours a day. The prevalence of work stressors was 82.8% for the high psychological demand, 58.2% for the low decision latitude, and 61.2% for low social support. The prevalence of job strain was 52.1%, and for iso-strain it was 39.3%.

HEALTH STATUS (TABLE 2)

For compensation behaviours, 91.2% consumed daily more than 4 cups of coffee or glasses of tea to be stimulated at work, 63.6% smoked cigarettes or sniffed tobacco, 39.9% smoked cannabis, 27.5% used alcohol, 8.1% regularly took psychotropic medications and 25.5% used analgesics. Regular sports, and/or leisure activities were practiced by 21.3%.

Abnormally high body mass index (BMI) (overweight and obesity) was noticed among 61.6%. Neurovegetative disorders, reported by 59.8% of total population, were palpitations (56.9%), pain in the heart (31.6%), dry mouth, nausea and/or digestive disorders (27.9%), chest tightness (22.6%) and sweats in the absence of effort (25.6%). Pain and/or muscle aches were found in 36.4% of our fishermen. The signs of nervous tension, reported by 57.1%, were manifested by headaches at the end of the day (41.6%), sensations of discomfort (46.3%) and tremor of the extremities (13.9%). Mood disorders, reported by 36.9%, were in the form of anxiety in 39.8%, irritability in 35.9% and depressive states in 26.4%. Cognitive disorders, mentioned by 39.1%, included disorders of concentration (31.6%) and memory (26.7%). Sleep disorders, cited by 51.3%, included difficulties falling asleep (36.3%), night-time insomnia (43.9%) and the feeling of not having slept (29.7%).

Table 1. Sociodemographic and professional parameters

Sociodemographic and professional parameters	Total population (n = 948)	95% confidence interval
Age [years]		
< 30	259 (27.3%)	[24.5; 30.3]
31–40	281 (29.6%)	[26.8; 32.7]
41–50	196 (20.7%)	[18.2; 23.4]
> 50	212 (22.4%)	[19.8; 25.2]
Average age	38.8 ± 10.1	[38.2; 39.4]
Family status		
Living in couple	656 (69.2%)	[66.1; 72.1]
Living alone	292 (30.8 %)	[27.9; 33.9]
Dependents (parents, relatives, children, etc.)	719 (75.9%)	[73.0; 78.5]
Professional categories		
Pilots-copilots	204 (21.5%)	[19.0; 24.3]
Mechanics	130 (13.7%)	[11.6; 16.1]
Fishermen	614 (64.8%)	[61.6; 67.8]
Educational levels		
Illiterate	183 (19.3%)	[16.9; 22.0]
Primary	498 (52.5%)	[49.3; 55.7]
Secondary	251 (26.5%)	[23.7; 29.4]
Superior	16 (1.7%)	[1.0; 2.8]
Work seniority [years]		
≤ 5	129 (13.6%)	[11.5; 16]
6–15	338 (35.7%)	[32.6; 38.8]
> 15	481 (50.7%)	[47.5; 54]
Average	14.3 ± 4.5	[14.2; 14.8]
Daily working [h]		
≤ 8	191 (20.2%)	[17.7; 22.9]
> 8	756 (79.8%)	[77.1; 82.3]
Average daily working hours	11.4 ± 1.2	[11.32; 11.48]
Work stressors		
High psychological demand	785 (82.8%)	[80.2; 85.1]
Low decision latitude	552 (58.2%)	[55.0; 61.4]
Low social support	580 (61.2%)	[58.0; 64.3]
Job strain	493 (52.1%)	[48.8; 55.2]
Iso-strain	372 (39.3%)	[36.1; 42.4]

More than one-third (37.2%) reported one or more chronic diseases. Their prevalence was 32.4% for musculoskeletal disorders, 24.2% for neuropsychiatric diseases (anxiety, depression, migraine and headache), 23.2% for cardiovascular diseases (18.7% hypertension and 15.6% varicose veins), 21.2% for respiratory diseases (18.2% rhinitis, 10.6% asthma, 7.5% chronic obstructive pulmonary diseases and 9.8% chronic bronchitis), 20.3% for digestive diseases (gastritis, reflux and ulcer), and 15.6% for metabolic diseases (8.8% diabetes, 12.1% hypercholesterolemia).

SLEEPING HABITS, CHRONIC INSOMNIA, AND ITS CONSEQUENCES (TABLE 3)

The average daily sleep time of the total population was 5.5 ± 0.9 hours during the week, and 8.7 ± 0.8 hours during the holidays, Fridays and recovery days. For 67.5% of the fishermen, studied, their bedtime schedule was between 22 and 24 pm during the holidays, Fridays and

recovery days; 87.9% used to wake up after 8 am on Fridays, holidays and recovery days. Naps occurred more than twice a week for 63.5% of them.

Among our participants, 47.2% reported a chronic insomnia. The prevalence of difficulty falling asleep was 29.3%, midnight insomnia 41.4%, late night 26.5% and the feeling of not having slept was 23.8%. The index of severity of chronic insomnia was moderate to severe for 29.6% of the sample. The prevalence of excessive daytime sleepiness (Epworth > 10) was 16.2%. Upon waking, half of the population (49.7%) felt tired and sleepy, 43.2% fit and 7.1% had a headache.

RISK FACTORS OF CHRONIC INSOMNIA (TABLE 4)

Among participants who reported a chronic insomnia, the multivariate logistic regressions showed that, iso-strain, fatigue, and socio-economic concerns were associated with a higher risk of chronic insomnia.

Table 2. Health status

Health status	Total population (n = 948)	95% confidence interval
Harmful habits		
Tea-coffee consumption	865 (91.2%)	[89.2; 92.9]
Tobacco smoking or snuff	603 (63.6%)	[60.4; 66.7]
Cannabis smoking	378 (39.9%)	[36.8; 43.1]
Alcohol consumption	261 (27.5%)	[24.7; 30.5]
Other psychotropic substances	77 (8.1%)	[6.5; 10.1]
Antalgic drugs	242 (25.5%)	[22.8; 28.5]
Regular physical activities and/or sports	202 (21.3%)	[18.8; 24.1]
Body mass index [kg/m²]		
Underweight	29 (3.1%)	[2.1; 4.4]
Normal	335 (35.3%)	[32.3; 38.5]
Overweight	531 (56 %)	[52.8; 59.2]
Obesity	53 (5.6%)	[4.3; 7.3]
Average	25.2 ± 2.5	[25; 25.4]
Psychosomatic symptoms		
Neurovegetative disorders	567 (59.8%)	[56.6; 62.9]
Pain and/or muscle aches	345 (36.4%)	[33.3; 39.6]
Nervous tension	541 (57.1%)	[53.8; 60.2]
Mood disorders	350 (36.9%)	[33.9; 40.1]
Cognitive disorders	371 (39.1%)	[36; 42.3]
Sleep disorders	486 (51.3%)	[48; 54.5]
Self-reported chronic diseases		
Musculoskeletal	353 (37.2%)	[34.2; 40.4]
Musculoskeletal	307 (32.4%)	[29.4; 35.5]
Neuropsychiatric	229 (24.2%)	[21.5; 27.0]
Cardiovascular	220 (23.2%)	[20.6; 26.1]
Respiratory	201 (21.2%)	[18.7; 24.0]
Digestive	192 (20.3%)	[17.8; 23.0]
Metabolic	148 (15.6%)	[13.4; 18.1]

DISCUSSION

SOCIODEMOGRAPHIC AND PROFESSIONAL PARAMETERS

The average age of our coastal fishermen (38.8 ± 8.1 years) was consistent with the literature; for example, a Spanish study in Andalusia found a similar average age (40.3 years) [19].

Fishermen, often of rural origin, are mainly employed in heavy and risky trades (so-called 3D: dirty, dangerous, difficult), namely manual, tiring, dangerous activities, characterised by long and very intense work shifts [20]. The work of the sardines was exclusively nocturnal and that of the long liners was alternating day and night shifts. Ergonomic studies have shown “over-fatigue” of atypical work related to changes in circadian rhythm and the fact that work is done in a state of “nocturnal deactivation”, both physiological and psychological [21].

Job strain was present in 52.1% of the sample; and iso-strain in 39.3%. Stress was caused by irregular and long working hours, the irregular rhythm of work (night and rotating shifts) and the particular climatic conditions in this region (strong winds, bad weather, rough seas). The literature considers fishing as a major provider of stress [1, 6, 21]. The particularly stressful activities of fishermen are also important.

They have heavy workloads, long working hours. They work in cramped and crowded spaces with long shifts and night shifts that can alter biological cycles, such as glucose and lipid metabolism [22]. Fishermen have, in most cases, low education levels, low income, heavy workloads, long working hours, and they work in crowded space. The lower health-related quality of life in fishermen may be explained by poor social support, living and work conditions [6]. Fishermen could experience more work-related stress and fatigue, secondary to insufficient rest due to overtime work [23, 24]. To reduce work-related stress and foster interpersonal relationships in fishermen, the psychology of sustainable development may be drawn upon, as it promotes greater connection with nature and empathy. Numerous studies highlight the great risk of accidents for fishermen, as they often work in dangerous environments without safety devices available [25].

HEALTH STATUS

Smokers accounted for 63.6% of the study population. A Spanish study of fishermen in the Costa Barbarita reported an even higher percentage of 81.2% [26]. Numerous studies have pointed out that nicotine increases alertness and decreases sleeping time, while sleep disorders make

Table 3. Sleep habits, chronic insomnia and its consequences

Sleep habits, chronic insomnia and its consequences	Total (n = 948)	95% confidence interval
Sleep habits		
Average sleep time [h]		
In week	5.5 ± 0.9	[5.44; 5.56]
Recovery days and holidays	8.7 ± 1.3	[8.62; 8.78]
Bedtime schedule during recovery days and holidays		
20–22 h	38 (4%)	[2.9; 5.5]
22–24 h	640 (67.5%)	[64.4; 70.5]
After 24 h	270 (28.5%)	[25.6; 31.5]
Wake up time during recovery days and holidays		
4–6 h	19 (2%)	[1.2; 3.2]
7–8 h	96 (10.1%)	[8.3; 12.3]
After 8 h	833 (87.9%)	[85.6; 89.8]
Nap > twice a week	602 (63.5%)	[60.3; 66.6]
Chronic insomnia		
Difficulty falling asleep	447 (47.2%)	[43.9; 50.4]
Midnight	278 (29.3%)	[26.5; 32.4]
Late night	392 (41.4%)	[28.2; 44.6]
Late night	251 (26.5%)	[23.7; 29.4]
Feeling of not having slept	226 (23.8%)	[21.2; 26.7]
Index of severity of chronic insomnia		
Absent	500 (52.7%)	[49.6; 56.1]
Mild	168 (17.7%)	[15.3; 20.2]
Moderate	250 (26.4%)	[23.6; 29.3]
Severe	30 (3.2%)	[2.2; 4.5]
Alertness disorders		
Epworth > 10	154 (16.2%)	[13.8; 18.5]
Quality of awakening		
In shape	410 (43.2%)	[40.1; 46.5]
Tired and sleepy	471 (49.7%)	[46.5; 52.9]
Headache	67 (7.1%)	[5.6; 8.9]

Table 4. Risk factors of chronic insomnia: multivariate logistic regression

Risk factors	Odds ratio adjusted	95% confidence interval	P-value
Iso-strain	27	[16.2; 45.0]	< 0.0001
Fatigue	24	[14.5; 39.9]	< 0.0001
Socio-economic concerns	5.9	[3.0; 11.7]	< 0.0001
Obesity	4.1	[2.9; 12.6]	< 0.0001
Burden of family dependents	0.3	[0.2; 0.4]	< 0.0001
Self-reported chronic diseases	0.2	[0.1; 0.3]	< 0.0001

smoking cessation more difficult [27, 28]. An Italian study has shown that the main health hazard to fishermen is lung cancer secondary to smoking [29]. Tea and coffee were respectively consumed by 91.2% of our fishermen; tea remains the Moroccan national drink. This prevalence of alcohol consumption was 27.5% and remained significantly lower than the European data [4]. Cannabis is the drug of Moroccan fishermen (39.9%) because it is ubiquitous and cheap. Among Andalusian fishermen, the frequency of cannabis use

(8.5%) was significantly lower [20]. The relationship between consumption of psychoactive substances and fishermen is complex. There appears to be a multifactorial relationship involving biological, psychological, cultural and social factors. Associations between occupations and heavy or hazardous alcohol consumption were documented. Fishermen, due to the inclement weather, which traditionally offers hazardous work conditions, might explain that the regular consumption of alcohol before going to sea [30, 31]. The high consumption

of psychoactive substances by fishermen can be explained by the combination of several factors, including psychosocial risks and organizational constraints.

The prevalence of regular sports activity among our fishermen was low (21.3%). The pace of the professional activity deemed hard and painful seems to leave no time for leisure [3]. Psychotropic drugs and analgesics were regularly consumed by respectively 8.1% and 25.5%. More than half (51.6%) had an abnormally high BMI. The average BMI was $25.2 \pm 2.5 \text{ kg/m}^2$, slightly lower than that of Icelandic fishermen: 26.3 kg/m^2 . More than half of the fishermen (61.6%) had a high weight.

One of the possible explanations is the rapid migration from rural areas to urban areas with rapid changes in environmental factors, and greater consumption of energy foods associated with incorrect lifestyles and behaviour patterns. The atypical work, the nibbling, the fried food, snacks with a high fat content, and poor consumption of fruits and vegetables were responsible for the excess weight and were common issues among the fishermen [4, 32, 33].

The pathologies encountered reflected the job's harshness (weather conditions, tides, vibrations, physical loads, handling, etc.). Musculoskeletal disorders (MSDs), including low back pain and gonalgia, were reported by 37.2% of the fishermen. A recent systematic literature review, including 13 studies on work-related musculoskeletal disorders among occupational fishermen reported that MSDs ranged from 15% to 93% [34]. Psychosomatic symptoms and chronic diseases were frequent among fishermen [6, 35].

SLEEPING HABITS, DYSSOMNIA AND ITS CONSEQUENCES

During work days, the average duration of sleep was insufficient ($5.5 \pm 0.9 \text{ h}$). Similar observations were found in Andalusian [19], Breton [36] and American [37] fishermen. The variable time of falling asleep depended on the physical exertion during the day and the psychological state of the person [38]. The main days of recovery are not desired by fishermen because they are imposed by the bad weather that prevents them from going to sea.

Fishermen work every day, except Fridays, with nocturnal schedules in sardine boats, and with alternating shifts in longline boats. Ergonomic studies have shown that the "excessive fatigue" of the atypical schedule is related to changes in circadian rhythm and the fact that the work is performed in a state of "nocturnal deactivation", both physiological and psychological [38, 39]. Napping, for 63.5% of our fishermen was a good way to recover; however, it was not possible every day given the pace of fishermen's work [32].

Almost half of our fishermen reported being chronic insomniac (47.2%). The chronic insomnia of the middle or end of the night could be explained by the awakening for the prayer at the time of dawn and/or by dreamlike disorders (feeling of being always on board).

A New Zealand study, by actimetry among fishermen during working days and rest days, showed that, for the same duration of sleep, drowsiness was present during working days and absent during rest days. This drowsiness was probably related to fatigue and physical restraint [21]. An actimetric study of Breton fishermen in France showed that the circadian rhythmicity of subjective vigilance was maintained because the intense physical activity of fishermen helps to maintain vigilance and was the best behavioural means to fight against drowsiness [36]. This level of vigilance could be even better if fishermen were able to have a short night sleep: at least three hours in a row every day at the same time [40]; however, this possibility remains unachievable due to the irregular work schedule of the sailors.

Night activity, leading to fatigue and sleep disturbances, has consequences on the behavioural habits of fishermen such as smoking, excessive consumption of excitants, drugs, and thus leads to a decrease in performance at work [36, 41].

Half of our fishermen (49.7%) felt tired when they woke up. Fatigue is a common every day experience in the general working population, with prevalence estimates as high as 22% [42]. Although difficult to define, it is generally considered to be a subjective sensation on a continuum with behavioural, emotional and cognitive components. Working at sea certainly has the potential to be fatiguing [43]. Fishermen's fatigue could impact safety and may be linked to longer-term individual ill-health. It can only be addressed by considering how multiple factors combine to contribute to fatigue [43]. Insufficient sleep and rest are undoubtedly some of the most important contributors to fatigue [43, 44]. For adults, 7–9 hours was suggested as appropriate. In relation to fatigue, another review concluded that having less than 5 hours of sleep in a 24-hour period, or less than 12 hours of sleep in a 48-hour period prior to starting work may increase the risk of fatigue [45]. It is not only the duration, but also the quality of sleep that affects fatigue. Sleep quality can include quantitative aspects of sleep such as number of hours and sleep latency, as well as more subjective assessments such as the depth of sleep [46]. Poor sleep quality is positively associated with fatigue [2]. The majority of our fishermen practiced seasonally during the fishing season for certain varieties of remunerative catches (octopus, swordfish, etc.). Fishermen's income is tied to the size of the catch, giving them an incentive to keep working until the holds are full or until the fishing

quota is reached. Working for long periods at sea, fishermen have only minimal and irregular rest opportunities.

RISK FACTORS OF CHRONIC INSOMNIA

In our study, we found that iso-strain and fatigue are the two highest risk factors leading to having chronic insomnia. Nevertheless, job strain represents a burnout risk factor only if it is associated with insomnia. Insomnia can be considered as a relevant clinical marker that should be targeted in mental health prevention programs at the workplace [47].

LIMITATIONS OF THE STUDY

This cross-sectional study encountered certain limitations. The healthy worker effect may create a selection bias because active fishers would be healthier than the rest of the population because those with impaired health are assumed to be absent. Weaknesses of subjective self-reporting should be highlighted. There is no solution to avoid or limit individual variations. However, our study, having as its main objective a global approach, can be considered as a reliable representation of the situation. Thus, our study provides a clear picture of sleeping habits and dyssomnia in Moroccan fishermen.

CONCLUSIONS

Our Moroccan coastal fishermen are at high risk of chronic dyssomnia and alertness disorders with their causes (fatigue and stress) and consequences (psychosomatic symptoms and chronic diseases). While it is not possible to completely eliminate sleeping disorders in fishermen, it is imperative to help them improve material conditions, the environment on board and overall working conditions. Fishermen's health services should be aware of the causes of fatigue in fishermen which may affect their sleep quality and vigilance when working at sea. The preventive approach needs a cooperative spirit; it will be more accepted and applied if all fishermen and their representatives are involved in its elaboration. While certain procedures fall under the responsibility of the occupational health services (awareness campaigns on sleep disorders and their consequences, the fight against the consumption of psychoactive substances, etc.) and of the shipowners (organization of work), most of them fall under the responsibility of the national occupational health policy.

Conflict of interest: None declared

REFERENCES

- Walters D, Bailey N. *Lives in Peril. Profit or safety in the global maritime industry?* Palgrave Macmillan, London, UK 2013.
- Hystad SW, Nielsen MB, Eid J. The impact of sleep quality, fatigue and safety climate on the perceptions of accident risk among seafarers. *European Review of Applied Psychology*. 2017; 67(5): 259–267, doi: [10.1016/j.erap.2017.08.003](https://doi.org/10.1016/j.erap.2017.08.003).
- Landsbergis P, Dobson M, LaMontagne A, et al. *Occupational Stress*. Oxford Scholarship Online. 2017, doi: [10.1093/oso/9780190662677.003.0017](https://doi.org/10.1093/oso/9780190662677.003.0017).
- Lawrie T, Matheson C, Ritchie L, et al. The health and lifestyle of Scottish fishermen: a need for health promotion. *Health Educ Res*. 2004; 19(4): 373–379, doi: [10.1093/her/cyg045](https://doi.org/10.1093/her/cyg045), indexed in Pubmed: [15199010](https://pubmed.ncbi.nlm.nih.gov/15199010/).
- Frantzeskou E, Jensen O, Linos A. Prevalence of Health Risk Factors among Fishermen – A Review. *Occupational Medicine & Health Affairs*. 2014; 02(02), doi: [10.4172/2329-6879.1000157](https://doi.org/10.4172/2329-6879.1000157).
- Laraqui O, Manar N, Laraqui S, et al. Occupational risk perception, stressors and stress of fishermen. *Int Marit Health*. 2018; 69(4): 233–242, doi: [10.5603/IMH.2018.0038](https://doi.org/10.5603/IMH.2018.0038), indexed in Pubmed: [30589062](https://pubmed.ncbi.nlm.nih.gov/30589062/).
- International Maritime Organization. *Guidance on fatigue Mitigation and Management*. MSC/Circ. 1014 London: 2001: International Maritime Organization, 103 p. <https://wwwcdn.imo.org/localresources/en/OurWork/HumanElement/Documents/1014.pdf>.
- Hystad SW, Eid J. Sleep and Fatigue Among Seafarers: The Role of Environmental Stressors, Duration at Sea and Psychological Capital. *Saf Health Work*. 2016; 7(4): 363–371, doi: [10.1016/j.shaw.2016.05.006](https://doi.org/10.1016/j.shaw.2016.05.006), indexed in Pubmed: [27924241](https://pubmed.ncbi.nlm.nih.gov/27924241/).
- Kowalski JM. Les marins et la mort. Actualité d'un mythe. *La Revue Maritime*. 2011; 492: 90–102.
- Maritime New Zealand; maritime accidents 2003-2004; 2006. https://www.maritimenz.govt.nz/publications/accidents/Accidents_2003-2004.pdf.
- Roberts S, Williams J. Update of mortality for workers in the UK merchant shipping and fishing sectors. https://webarchive.nationalarchives.gov.uk/ukgwa/20121211154730/http://www.dft.gov.uk/mca/bckgrd/rp_578_final_report_revsn_2-2.pdf.
- Raby M, Lee JD. Fatigue and workload in the maritime industry. In: Hancock PA, Desmond PA (eds.). *Stress, Workload and Fatigue*. Lawrence Erlbaum, Mahway, NJ .
- Laraqui O, Laraqui S, Manar N, et al. Risk-taking behaviours among fishermen in Morocco by the evaluation of “ordalique” functioning. *Int Marit Health*. 2017; 68(2): 83–89, doi: [10.5603/IMH.2017.0016](https://doi.org/10.5603/IMH.2017.0016), indexed in Pubmed: [28660610](https://pubmed.ncbi.nlm.nih.gov/28660610/).
- Laraqui O, Laraqui S, Manar N, et al. Prevalence of consumption of addictive substances amongst Moroccan fishermen. *Int Marit Health*. 2017; 68(1): 19–25, doi: [10.5603/IMH.2017.0004](https://doi.org/10.5603/IMH.2017.0004), indexed in Pubmed: [28357832](https://pubmed.ncbi.nlm.nih.gov/28357832/).
- Questionnaire du sommeil, réseau Morphée. <https://questionnaire.reseau-morphee.fr/> (Accessed on 05/12/18).
- Pichené A. Dépistage du stress psychique chronique au moyen d'un questionnaire. Notes techniques et scientifiques de l'INRS. Institut national de recherches et sécurité, Paris 1995: 64.
- Karasek RA, Theorell T. *Healthy work: Stress, Productivity, and the Reconstruction of working life*. Basic Books, New York 1990: 381.
- Johns MW. A new method for measuring daytime sleepiness: the Epworth sleepiness scale. *Sleep*. 1991; 14(6): 540–545, doi: [10.1093/sleep/14.6.540](https://doi.org/10.1093/sleep/14.6.540), indexed in Pubmed: [1798888](https://pubmed.ncbi.nlm.nih.gov/1798888/).
- Piniella F, Novalbos JP, Nogueroles PJ. Artisanal fishing in Andalusia (II): Safety and working conditions policy. *Marine Policy*. 2008; 32(4): 551–558, doi: [10.1016/j.marpol.2007.10.005](https://doi.org/10.1016/j.marpol.2007.10.005).
- Porru S, Arici C. *Gruppi vulnerabili-Migranti*. In: *Trattato di Medicina del lavoro*, 1st ed.; Alessio L, Franco G, Tomei F. Ed; Volume II. Piccin; Publisher, Italy 2015.
- Gander P, van den Berg M, Signal L. Sleep and sleepiness of fishermen on rotating schedules. *Chronobiol Int*. 2008; 25(2): 389–398, doi: [10.1080/07420520802106728](https://doi.org/10.1080/07420520802106728), indexed in Pubmed: [18533331](https://pubmed.ncbi.nlm.nih.gov/18533331/).

22. Mannocci A, Pignalosa S, Nicosia V, et al. Cardiovascular diseases risk factors in oil and gas workers: a ten years observational retrospective cohort. *Ann Ig*. 2016; 28(2): 122–132, doi: [10.7416/ai.2016.2091](https://doi.org/10.7416/ai.2016.2091), indexed in Pubmed: [27071323](https://pubmed.ncbi.nlm.nih.gov/27071323/).
23. Lu CH, Luo ZC, Wang JJ, et al. Health-related quality of life and health service utilization in Chinese rural-to-urban migrant workers. *Int J Environ Res Public Health*. 2015; 12(2): 2205–2214, doi: [10.3390/ijerph120202205](https://doi.org/10.3390/ijerph120202205), indexed in Pubmed: [25689996](https://pubmed.ncbi.nlm.nih.gov/25689996/).
24. Xing H, Yu W, Chen S, et al. Influence of social support on health-related quality of life in new-generation migrant workers in eastern China. *Iran J Public Health*. 2013; 42(8): 806–812, indexed in Pubmed: [26056633](https://pubmed.ncbi.nlm.nih.gov/26056633/).
25. Biering K, Lander F, Rasmussen K. Work injuries among migrant workers in Denmark. *Occup Environ Med*. 2017; 74(4): 235–242, doi: [10.1136/oemed-2016-103681](https://doi.org/10.1136/oemed-2016-103681), indexed in Pubmed: [27550909](https://pubmed.ncbi.nlm.nih.gov/27550909/).
26. Nogueroles Alonso de la Sierra P, Juan Agüera S, Almenara Barrios J, et al. [The tobacco habit among fishermen of the Barbate coast (Cádiz)]. *Rev Sanid Hig Publica (Madr)*. 1992; 66(5-6): 299–305, indexed in Pubmed: [1366228](https://pubmed.ncbi.nlm.nih.gov/1366228/).
27. Hamidovic A, de Wit H. Sleep deprivation increases cigarette smoking. *Pharmacol Biochem Behav*. 2009; 93(3): 263–269, doi: [10.1016/j.pbb.2008.12.005](https://doi.org/10.1016/j.pbb.2008.12.005), indexed in Pubmed: [19133287](https://pubmed.ncbi.nlm.nih.gov/19133287/).
28. Uderner M, Paquereau J, Meurice JC. Tabagisme et troubles du sommeil. *Revue des Maladies Respiratoires*. 2006; 23(3): 67–77, doi: [10.1016/s0761-8425\(06\)71589-3](https://doi.org/10.1016/s0761-8425(06)71589-3).
29. Mastrangelo G, Malusa E, Veronese C, et al. Mortality from lung cancer and other diseases related to smoking among fishermen in north east Italy. *Occup Environ Med*. 1995; 52(3): 150–153, doi: [10.1136/oem.52.3.150](https://doi.org/10.1136/oem.52.3.150), indexed in Pubmed: [7735384](https://pubmed.ncbi.nlm.nih.gov/7735384/).
30. Perez-Carceles MD, Medina MD, Perez-Flores D, et al. Screening for hazardous drinking in migrant workers in southeastern Spain. *J Occup Health*. 2014; 56(1): 39–48, doi: [10.1539/joh.13-0119-oa](https://doi.org/10.1539/joh.13-0119-oa), indexed in Pubmed: [24430840](https://pubmed.ncbi.nlm.nih.gov/24430840/).
31. Mucci N, Traversini V, Giorgi G, et al. Migrant workers and physical health: an umbrella review. *Sustainability*. 2019; 11(1): 232, doi: [10.3390/su11010232](https://doi.org/10.3390/su11010232).
32. Olafsdóttir L. The relationship between fishermen's health and sleeping habits. *Work*. 2004; 22(1): 57–61, indexed in Pubmed: [14757907](https://pubmed.ncbi.nlm.nih.gov/14757907/).
33. Gele AA, Mbalilaki AJ. Overweight and obesity among African immigrants in Oslo. *BMC Res Notes*. 2013; 6: 119, doi: [10.1186/1756-0500-6-119](https://doi.org/10.1186/1756-0500-6-119), indexed in Pubmed: [23531273](https://pubmed.ncbi.nlm.nih.gov/23531273/).
34. Berg-Beckhoff G, Østergaard H, Jepsen JR. Prevalence and predictors of musculoskeletal pain among Danish fishermen – results from a cross-sectional survey. *J Occup Med Toxicol*. 2016; 11: 51, doi: [10.1186/s12995-016-0140-7](https://doi.org/10.1186/s12995-016-0140-7), indexed in Pubmed: [27891170](https://pubmed.ncbi.nlm.nih.gov/27891170/).
35. Laraqui O, Hammouda R, Laraqui S, et al. Prevalence of chronic obstructive respiratory diseases amongst fishermen. *Int Marit Health*. 2018; 69(1): 13–21, doi: [10.5603/IMH.2018.0003](https://doi.org/10.5603/IMH.2018.0003), indexed in Pubmed: [29611609](https://pubmed.ncbi.nlm.nih.gov/29611609/).
36. Tirilly G. Horaires de travail, sommeil et vigilance chez les marins : quelles incidences sur les risques d'accidents en mer ? Perspectives interdisciplinaires sur le travail et la santé. 2005(7-1), doi: [10.4000/pistes.3255](https://doi.org/10.4000/pistes.3255).
37. Sanquist TF, Raby M, Forsythe A, et al. Work hours, sleep patterns and fatigue among merchant marine personnel. *J Sleep Res*. 1997; 6(4): 245–251, doi: [10.1111/j.1365-2869.1997.00245.x](https://doi.org/10.1111/j.1365-2869.1997.00245.x), indexed in Pubmed: [9493524](https://pubmed.ncbi.nlm.nih.gov/9493524/).
38. Weibel L. Stress, sommeil et horaires atypiques. Documents pour le médecin de travail, INRS, 93, 2003. Notes du congrès. DMT 93 TD 126.
39. Akersted T. Shift work and disturbed sleep/wakefulness. *Occup Med*. 2003; 53: 89–94.
40. Stampi C. Polyphasic sleep strategies improve prolonged sustained performance: A field study on 99 sailors. *Work & Stress*. 1989; 3(1): 41–55, doi: [10.1080/02678378908256879](https://doi.org/10.1080/02678378908256879).
41. Jepsen JR, Zhao Z, van Leeuwen WMA. Seafarer fatigue: a review of risk factors, consequences for seafarers' health and safety and options for mitigation. *Int Marit Health*. 2015; 66(2): 106–117, doi: [10.5603/IMH.2015.0024](https://doi.org/10.5603/IMH.2015.0024), indexed in Pubmed: [26119681](https://pubmed.ncbi.nlm.nih.gov/26119681/).
42. Büttmann U, Kant I, Kasl S, et al. Fatigue and psychological distress in the working population; psychometrics, prevalence and correlates. *J Psychosomatic Research*. 2002; 52(6): 445–452, doi: [10.1016/s0022-3999\(01\)00228-8](https://doi.org/10.1016/s0022-3999(01)00228-8).
43. Wadsworth EJK, Allen PH, McNamara RL, et al. Fatigue and health in a seafaring population. *Occup Med (Lond)*. 2008; 58(3): 198–204, doi: [10.1093/occmed/kqn008](https://doi.org/10.1093/occmed/kqn008), indexed in Pubmed: [18310605](https://pubmed.ncbi.nlm.nih.gov/18310605/).
44. Oldenburg M, Baur X, Schlaich C. Occupational risks and challenges of seafaring. *J Occup Health*. 2010; 52(5): 249–256, doi: [10.1539/joh.k10004](https://doi.org/10.1539/joh.k10004), indexed in Pubmed: [20661002](https://pubmed.ncbi.nlm.nih.gov/20661002/).
45. Dawson D, McCulloch K. Managing fatigue: it's about sleep. *Sleep Med Rev*. 2005; 9(5): 365–380, doi: [10.1016/j.smrv.2005.03.002](https://doi.org/10.1016/j.smrv.2005.03.002), indexed in Pubmed: [16099184](https://pubmed.ncbi.nlm.nih.gov/16099184/).
46. Buysse DJ, Reynolds CF, Monk TH, et al. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989; 28(2): 193–213, doi: [10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4), indexed in Pubmed: [2748771](https://pubmed.ncbi.nlm.nih.gov/2748771/).
47. Metlaine A, Sauvet F, Gomez-Merino D, et al. Association between insomnia symptoms, job strain and burnout syndrome: a cross-sectional survey of 1300 financial workers. *BMJ Open*. 2017; 7(1): e012816, doi: [10.1136/bmjopen-2016-012816](https://doi.org/10.1136/bmjopen-2016-012816), indexed in Pubmed: [28087546](https://pubmed.ncbi.nlm.nih.gov/28087546/).