

Prevalence of cannabis and cocaine consumption in French fishermen in South Atlantic region in 2012–2013 and its policy consequences

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ABSTRACT

Background: The aim of the study was to evaluate the use of cannabis and cocaine among fishermen followed in occupational medicine in the ports of Aquitaine and Charente-Maritime (Direction interrégionale de la mer Sud-Atlantique [DIRM-SA]).

Materials and methods: Thousand fishermen could be recruited during medical regulatory examination by the occupational physicians and nurses of Occupational Health Department for Seamen.

Results: About 20% of fishermen were former smokers. A third of the fishermen are at risk for excessive drinking according to the AUDIT-C. The prevalence of cannabis experimentation was estimated at 58%. The prevalence of positive urine test for cannabis was 28%. The prevalence of experimentation with cocaine was about 16%. The prevalence of positive urine test for cocaine was 4.5%.

Conclusions: In accordance with its objectives, this study allows objectifying cannabis and cocaine consumption among fishermen. The national rules for fitness at sea have to be modified by introducing the use of urinary tests by occupational physician.

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Key words: fishermen, drug consumption prevalence, alcohol consumption prevalence, urine test

INTRODUCTION

In France, cannabis use has increased since the 1990s, mainly among young people [1]. The prevalence reported by the military seamen is approximately 46.7% for experimenter consumption, 8.8% for occasional consumption and 3.9% for regular consumption. About 15% of urinary tests for cannabis for the military seamen were positive [2]. A recent study has listed in the top positions cannabis as a substance having a power to cause an addiction past tobacco and alcohol [3]. In difficult jobs on atypical workplaces where risk-taking is everywhere, seamen need to be constantly in a state (physical and psychological) to ensure their work but also any security act that may be necessary. Cognitive disorders are observed on memory or attention

after cannabis use [4] and the regular use of stimulants and opiates affect cognitive abilities [5].

Fishing is quite stressful work, with pay varying according to catch-size [6]. Working conditions such as changes in working hours or extension of shifts and weather conditions contributes to the raised fatality level in fishers [7]. Fishing is one of the most hazardous occupations and fishermen have high fatality rates [8–10]. The work accident rate is significantly higher than in other jobs, especially in terms of mortality [11]. Mortality rates from accidents while working at sea remain high in the British fishing industry [12] or in Polish seafarers [10], despite the fact that the quality of life of Polish seafarers is quite high. Pathologies such as lung cancer and cirrhosis of the



liver are frequent in seamen [13]. Seamen seem to be a special group with a high risk of fatal accidents occurring not only at sea. The association between fatal accidents other than at sea and length of employment as seamen indicates that seamen are modified by their occupation towards hazardous behaviour or a risky lifestyle [14]. Cardiovascular risk factors in a fishing environment was influenced by bad eating habits and other social and environmental factors which are common to seamen [15, 16]. The effect of alcohol on the performance degradation of marine operators has been shown in the past [17].

In 2007, the study made by Occupational Health Department for Seamen (Service de santé des gens de mer) [18–20] had shown that prevalence of a positive urine test for cannabis was 14% for all seamen, without significant difference between merchant seamen (13.4%) and fishermen (13.7%). Since this study, several aspects have indicated potential increase in cannabis use and especially among fishermen making fishing trips of more than 24 h. During consultations with occupational physicians, many fishermen declared being concerned about the increasing use of cannabis. They also reported the development of cocaine use, the purchase price of which has dropped significantly. Ship-owners are worried even more and are often dismayed by these consumptions. Information which coming from maritime and aquaculture schools (and other types of high schools) also reported an increasing consumption of cannabis among students. Many newspaper articles, written [21, 22], also report an increase in drug use in the maritime fishing sector. Finally, the accident at work remains important to the fishing sector, including the number of fatal accidents during work (8 times higher than the death rate in the Building and Public Works) [23] without however making a causal link between drug use and fatal accident.

The study conducted in 2007 showed that prevalence of positive urine test for cannabis was 12.4% in the South West of France (DIRM-SA) only, close to the national average of 14% [18]. The Interregional Directorate of Sea South Atlantic (Direction interrégionale de la mer Sud-Atlantique [DIRM-SA]) intended to conduct an investigation to validate the results obtained in 2007. The aim of the study was to evaluate the use of cannabis and cocaine among fishermen followed in occupational medicine in the ports of Aquitaine and Charente-Maritime (DIRM-SA), for epidemiological purposes and prevention.

MATERIALS AND METHODS

SURVEY DESIGN

This study was a cross-sectional survey. The target population was all fishermen administratively dependent of Mar-

itime Interregional Directorate of South Atlantic (DIRM-SA: include Aquitaine and Charente-Maritime). The recruitment period extended from February 2012 to March 2013.

The implementation of the study was limited by the budget: 1000 urine tests could be analysed as a result of the purchase of urine cannabis / cocaine tests. The occupational categories of commercial fishing studied were: Small Fishing (less than 24 h on sea), Coastal fishing (less than 4 days at sea), Deep Sea Fishing (less than 20 days at sea) and Great Fishing (more than 20 days at sea); all other administrative categories, including shellfish aquaculture were excluded. However, on-foot fisheries (clams, bloodworms...) were included into Small Fishing.

The questionnaire “Consumption and Health Survey 2012” was proposed to each fisherman during the compulsory medical examination for maritime navigation fitness [24]. An agreement has been also asked before an analysis of his urine by a drug test. The result of urine test for cannabis and cocaine was attached to the anonymous questionnaire. The result was not taken into account during the rest of the medical examination and did not influence the doctor’s decision on the Medical fitness at sea.

QUESTIONNAIRE

An assessment of alcohol consumption to health risk was measured from the AUDIT-C test [25, 26]. It has been tested and validated [27]. Gordon et al. [28] has used this AUDIT-C questionnaire to identify drinkers with a level of risk in a large sample consumption in general practice. An addiction to alcohol is possible for a score greater than or equal to 5 for men and greater than or equal to 4 for women.

An evaluation of cannabis dependence was measured by the “Cannabis Abuse Screening Test” (CAST) [29]. It is a binary questionnaire containing 6 items. The overall score is calculated by summing each positive response (overall score ranging from 0 to 6) and three risk thresholds were made:

- A low risk for an overall score lower than or equal to 1;
- A moderate risk for a score equal to 2;
- A high risk for a score greater than or equal to 3.

The urine test used is the multi-drug test (DOA-M05-3C reference) by NarcoCheck (<http://www.narcocheck.com/fr/>). Only cannabis use (also marijuana, hashish...) and cocaine (also crack) were populated in the database. The acid detection sensitivity threshold 11-nor-delta9-THC-carboxylic acid (THC-COOH) is 50 ng/mL. THC-COOH appears in the blood few minutes after its inhalation. The cocaine detection threshold is 300 ng/mL. According to the collective expertise of the French National Institute for Medical Research [30] the urine test is the most appropriate test for fast screening for cannabis use.

MEAN WEEKLY ALCOHOL CONSUMPTION

To evaluate the mean weekly consumption of alcohol, we have crossed the frequency of alcohol intake with the amount of alcohol consumed during a typical day, which are the first two questions of the AUDIT-C questionnaire. As a reference alcohol consumption we adopted following frequencies: 1/4.35 for 1 time per month or less, 3/4.35 for 2 to 3 times a month, 2.5 for 2 to 3 times a week and 5.5 for 4 times a week or more (4.35 being the average number of weeks in a month for a non-leap year). We adopted as reference the maximum value of the range of the number of drinks consumed (2, 4, 6, 9 and 12) during a typical day.

ALCOHOL CONSUMPTION PROFILE

The methodology allows alcohol consumption to be further classified into three categories [31, 32]:

- The **non-consumers** who never drink alcohol;
- The **consumers without excessive alcohol risk** who never drink six or more glasses on a single occasion and no more than 14 drinks per week for women and 21 glasses for men;
- The **consumers with excessive alcohol risk** if they meet one of the following two conditions: either drinking 15 or more glasses per week for women and 22 drinks or more for men or drinking 6 or more glasses on one occasion more frequent than once a month.

STATISTICAL ANALYSIS

Fishermen who work in coastal fishing, deep sea fishing and great fishing have to pass an annual medical check-up and fishermen who work in small fishing have to pass a biennial examination. By performing a systematic recruitment over a year, the probability to recruit a seaman from small fishing is 2 times lower than the probability to recruit a seaman from another kind of fishing. Statistical analysis must take into account this a posteriori weighting. The survey weight was 1 for fishermen working in coastal fishing, deep sea fishing and great fishing and 2 for fishermen working in small fishing.

The procedures “Surveyfreq” and “surveymeans” of SAS software, version 9.3, were used.

The prevalences of cannabis and cocaine use in the past 30 days have been adjusted to the respective results of the urine test according to the Fendrich’s methods of calculations [33]. Specifically, the prevalence on the reported use in the past 30 days is divided by the upper limit of the calculated sensitivity between reported consumption and consumption measured by the urine test for each substance. The sensitivity and confidence interval are calculated from the “logistic” and “freq” procedures of SAS.

Table 1. Demographics and professional characteristics of fishermen (n = 1024)

	N	Weighted per cent	95% confidence interval
Gender:			
Males	1009	98.3	97.4–99.2
Females	15	1.7	0.8–2.6
Category of age [years]:			
15–25	163	15.2	12.9–17.4
25–35	218	20.8	18.2–23.4
35–45	290	27.9	25.0–30.8
45–55	262	25.7	22.8–28.5
≥ 55	91	10.4	8.3–12.5
Marital status:			
Single	376	35.1	32.1–38.2
Married	537	54.3	51.1–58.0
Divorced, widowed	111	10.6	8.6–12.5
Children:			
No	345	33.0	30.0–36.0
Yes	679	67.0	64.0–70.0
Position:			
Fishing boat owner	420	44.6	41.3–47.8
Boatswain	43	3.6	2.5–4.7
Mechanics	81	6.3	4.9–7.7
Fishermen	480	45.6	42.4–48.8
Type of navigation:			
Great fishing	14	0.9	0.4–1.4
Small fishing	461	62.1	59.2–65.0
Deep sea fishing	185	12.5	10.7–14.2
Coastal fishing	364	24.5	22.1–26.9

RESULTS

DEMOGRAPHICS DATA (TABLE 1)

The study population was majority male (98.3%). Mean age was 40.6 ± 0.4 years. Most fishermen were married and about 33% were single. More than two thirds of fishermen had children.

OCCUPATIONAL DATA (TABLE 1)

Principal positions were fishermen (45.6%) and fishing boat owners (44.6%). Mechanics (6.3%) and boatswains (3.6%) were minority. The kind of fishing the most commonly practiced was small fishing (62.1%), ahead of the coastal fishing (24.5%) and deep sea fishing; great fishing was uncommonly represented (0.9%).

Table 2. Tobacco and alcohol consumption among French fishermen (n = 1024)

	N	Weighted per cent	95% confidence interval
Tobacco status:			
Past smoker	189	19.9	17.2–22.5
Current smoker	668	62.8	59.7–66.0
Never smoker	167	17.3	14.8–19.8
How many cigarette smoke per days (for current smoker only):			
Less than 11	147	23.0	19.6–26.5
11–19	332	50.8	46.8–54.8
20–29	155	21.1	17.9–24.3
30 or more	34	5.0	3.3–6.8
4 times a week or more	101	10.1	8.1–12.1
Number of glasses consumed in a typical day for alcohol consumer:			
1 to 2 glasses	453	50.0	46.5–53.4
3 to 4 glasses	333	36.0	32.8–39.3
5 glasses and more	131	14.0	11.6–16.4
Frequency of consumption of 6 glasses or more in one occasion for alcohol consumer:			
Never	199	23.3	20.3–26.2
Less than once a month	406	43.1	39.7–46.5
Once a week	224	24.3	21.4–27.2
Once day or more	88	9.3	7.4–11.3
Mean weekly alcohol consumption for alcohol consumers (number of glasses)	917	4.9	4.5–5.4
AUDIT-C positive test	350	33.9	30.8–36.9
Alcohol profile:			
No consumer	107	10.5	8.5–12.5
Consumer without excessive alcohol risk	208	21.8	19.0–24.5
Consumer with excessive alcohol risk	709	67.7	64.7–70.8

TOBACCO CONSUMPTION (TABLE 2)

About two-third of seamen were current smokers, 19.9% were former smokers and 17.3% had never smoked. More than half of smokers consumed between 11 and 20 cigarettes a day, a quarter of them smoked more than 20 cigarettes a day and 23% less than 11 cigarettes a day.

ALCOHOL CONSUMPTION (TABLE 2)

Only 10.5% of fishermen claimed not to drink alcohol. On a typical day of alcohol consumption, mostly fishermen drank mostly 1 or 2 glasses; more than a third of them drank 3 or 4 glasses, 14% more than 5 glasses. 43.1% of fishermen had exhibited excessive alcohol consumption (6 or more glasses in one occasion) less than once a month,

24.3% had exhibited excessive alcohol consumption once a month and 8% had exhibited excessive alcohol consumption once a week. A third of seamen were positive according to the AUDIT-C. Two-thirds of seamen presented a risk of excessive alcohol profile.

CANNABIS CONSUMPTION (TABLE 3)

The prevalence of experimentation (consumption at least one time in the life) of cannabis was 58%. The prevalence of consumption in the past 12 months was 28.6%. 28% of fishermen had a positive urine test for cannabis. The prevalence of cannabis use in the past 30 days adjusted on the urine test results according to the Fendrich's method was 24.5% (95% CI 21.7–27.4).

Table 3. Drugs consumption among French fishermen (n = 1024)

	N	Weighted per cent	95% confidence interval
Experimentation of cannabis ¹	623	58.0	54.8–61.2
Cannabis consumption in the last 12 months ¹ :			
No	708	71.4	68.6–74.3
1 to 2 times	125	11.6	9.5–13.6
3 to 9 times	62	5.5	4.0–6.9
More than 10 times	129	11.5	9.5–13.5
Cannabis consumption in the last 30 days:			
No	767	77.0	74.3–79.6
1 to 2 times	135	11.9	9.8–13.9
3 to 9 times	55	5.1	3.7–6.4
More than 10 times	67	6.1	4.6–7.6
Positive urine test for cannabis ¹	311	28.0	25.2–30.9
Experimentation of cocaine ¹	179	15.9	13.6–18.2
Cocaine consumption in the last 12 months ¹	75	6.3	4.9–7.8
Cocaine consumption in the last 30 days ¹	42	3.6	2.5–4.8
Positive urine test for cocaine ¹	55	4.5	3.3–5.8

¹Only the modality “Yes” was presented

CANNABIS CONSUMPTION BEHAVIOURS FOR RECENT CANNABIS CONSUMERS (TABLE 4)

About 43% of recent cannabis users had a high risk of dependence, 24.7% a moderate risk and 32.6% a low risk. Over 80% used cannabis at sea (95% CI 74.4–86.0).

COCAINE CONSUMPTION (TABLE 3)

The prevalence of experimentation of cocaine was about 16%. The prevalence of consumption in the past 12 months was 6.3%. 4.5% of fishermen had a positive urine test for cocaine. The prevalence of cocaine use in the past 30 days after adjusting the results of the urine test using Fendrich's method was 4.5% (95% CI 3.1–6.0).

COCAINE CONSUMPTION FOR EXPERIMENTERS

Of the 181 experimenters of cocaine, 39.8% (95% CI 32.3–47.4) were also users in the past 12 months and 22.9% (95% CI 16.4–29.4) were recent users. The prevalence of a positive urine test was 20.9% (95% CI 14.7–27.2).

Approximately 22% of experimenter fishermen reported a consumption of cocaine at sea. 42 fishermen were cocaine users in the past 30 days. Over 61% of them (95% CI 44.7–77.5) reported a consumption at sea.

DISCUSSION

RELIABILITY OF URINE TEST

The reliability of urine test is, according to the instructions, “close to 99%”. This reliability is probably obtained

under optimal laboratory conditions. Indeed, Lecompte et al. [34] has conducted between 2005 and 2009 a confirmatory test for 986 cannabis urine screening (gas chromatography coupled with mass spectrometry). At the threshold of 15 µg/L (threshold usually used, according to the international standard), positive predictive value (PPV) was only 63.9%. On the threshold of 5 µg/L recommended by the authors, the PPV was better than 80%. According to these authors, the reasons can be cited for false positives could be the niflumic acid intake (1/3 false positive in 2005), the pump inhibitors taken protons (gastroesophageal antacids) and efavirenz (antiviral), or misinterpretation of testing.

The prevalence of cannabis use in the past 30 days was very close to the prevalence of positive urine test, thus enhancing the reliability of fishermen statements regarding the recent use of this drug.

According to the collective expertise of the national institute for medical research [30] the urine test is the most appropriate test for fast screening for cannabis use.

CAST

The Cannabis Abuse Screening Test (CAST) has been validated in the French version [29]. It contains only factual questions exclusively concerning cannabis and allows the display of precision regarding the nature of the problems due to use of cannabis.

AUDIT-C

The first three questions of the Alcohol Use Disorders Identification Test (AUDIT) developed by the World Health

Table 4. Cannabis consumption behaviours for recent cannabis consumers (n = 257)

	N	Weighted per cent	95% confidence interval
Have you ever smoked cannabis before midday? ¹	183	70.5	64.5–76.5
Have you ever smoked cannabis while on your own? ¹	176	67.8	61.7–74
Have you ever had difficulty remembering things while smoking cannabis? ¹	47	17.1	12.3–21.8
Have your friends and family ever told you that you should smoke less cannabis? ¹	95	35.7	29.5–41.9
Have you ever tried to consume less or to stop taking cannabis and failed? ¹	61	21.6	16.5–26.8
Has the fact that you smoke cannabis ever caused you problems such as arguments, fights, or bad results at school? ¹	22	9.4	5.4–13.3
Level of cannabis dependence according to CAST:			
Low	79	32.6	26.4–38.9
Moderate	64	24.7	19.1–30.3
Strong	113	42.6	36.2–49.1
Consumption at sea:			
The same	17	5.8	3.0–8.7
Null	47	19.3	14.0–24.6
More important at sea than on land	5	2.0	0.2–3.9
More important on land than at sea	188	72.8	67.0–78.6

¹Only the modality “Yes” was presented

Organisation [35] and designed to identify alcohol consumption risk have been tested and validated [36]. Gordon et al. [28] has used this AUDIT-C questionnaire to identify drinkers with a level of risk in a large sample consumption in general practice. AUDIT-C has a sensitivity between 54% and 98% and a specificity between 57% and 93% according to the different categories of excessive alcohol consumption [36].

CANNABIS CONSUMPTION

The positive test, established at 28%, is high, even with false positives. The prevalence of positive urine test according to age class was 46% for fishermen aged less than 35 years. The fact that youngest people smoke cannabis more often is not new but this rate is very high, well above the French rate calculated in the latest Barometer Health 2010 [1] (prevalence of use in the past 30 days was 18%; prevalence of regular use was 9%).

CONSUMPTION DURING WORK AT SEA

Only 19% of fishermen who were recent users of cannabis (consumption reported in the past 30 days) have declared no consumption during work at sea. Cannabis consumption at sea was considered as possible for 81% of fishermen. One hypothesis may explain this high rate. Physical and psychological isolation (including

emotional), the difficulty to manage working time and waiting time at sea could explain these high rates of drug consumptions. Recently Jégaden et al. [37] have shown a higher propensity for boredom proneness according to the Boredom scale for seamen in comparison with officers and sedentary employees. This boredom can be seen as a breeding ground for all kinds of addictions: tobacco, alcohol and drugs.

COCAINE CONSUMPTION

A positive urine test for cocaine consumption probably reflects consumption in the four previous days. The prevalence of positive urine test was estimated at 4.5%. Although found rates are much lower than for cannabis, this consumption has become a concern given the strongest possible addiction to the product. The positivity rate for young seamen (under 25 years old) was 8%, far above of consumption prevalence reported by French young people which was 3.7% in 2010 [1].

COMPARISON WITH THE 2007'S FRENCH MARITIME SURVEY

In the 2007 French maritime study, restricted to the only marine fisheries sector [18], about 48% of fishermen were current smokers while the prevalence of current smokers was estimated at 62.8% in our study. In addition, 58% of

fishermen have tried cannabis, 18 points more than in 2007. However, a closer analysis of the 2007 data shows an experimental cannabis prevalence of about 50% for fishermen in the geographical area Poitou-Charentes/Aquitaine (6), p. 91 [18]. In fact, the prevalence of consumption in the past 12 months was comparable between the 2 surveys after restriction to the same geographical area (28.6% in 2012 and 25.8% in 2007). The prevalence of cannabis use in the past 30 days is also comparable (23% in 2012 vs. 22.8% in 2007). In our study, 28% of the fishermen were detected positive in urine screening test for cannabis, a much higher prevalence than that observed in the 2007 study, 13.7% of all marine fisheries and 16.2% for the fishermen in the geographical area Poitou-Charentes-Aquitaine.

COMPARISON WITH OTHER STUDIES IN SEAMEN POPULATION

Smoking prevalence varies greatly between studies in others countries; yet it is strong enough ranging from 37% to 72% [38–41]. Over 80% of Scottish fishermen reported drinking alcohol [42] and 45% of Greek seamen had daily consumption of wine [43]; in our study, French fishermen were 89.5%.

Marine lifestyle is associated with diseases such as lung cancer or liver cirrhosis [13]. These diseases partly explain the excess mortality observed in this population that workplace accidents are the leading cause of high mortality. In a cohort study in Iceland, the author observed an increase of the standardized mortality rate for causes of death related to accidental alcohol poisoning with seniority of occupational the seamen [14]. In an Italian study, the risk of lung cancer was not associated with the occupation of seafarer but only to smoking [44]. However smoking has been associated with the time spent at sea. Studies on the health of marines have shown an increased risk of cardiovascular or coronary heart disease [15, 16].

THE PREVENTION PLAN

A prevention plan was approved by Seamen's National Council in 2013 following the results of this study. Five major issues have been decided. Firstly, information in maritime schools has to be improved. Secondly, information among seamen has to be improved. Thirdly, a coordination of the prevention plan in each regional administration has to be developed. Fourthly, urinary tests for seamen have to be used systematically, especially when seamen have security or watch keeping functions. And fifthly, the national rules for fitness at sea have to be modified by introducing the use of urinary tests by occupational physician.

As a consequence, the Decree of 30 January 2015 (amending the Decree of 16 April 1986) and then the Decree 2015–1575 of 3 December 2015 concerning the conditions

of physical fitness for work as a seaman on board merchant ships, fishing and boating has been taken by the French authorities [45, 46]. This text has introduced the use of urinary tests at each annual or bi-annual medical examination for each candidate for professional navigation, watch-keeping and armed guards and seamen having tasks needing «high vigilance» (seamen on bridge, night working...). The results of urinary tests are just part of the decision of the maritime navigation fitness.

CONCLUSIONS

In accordance with its objectives, this study allows objectification of consumption among fishermen. The issues of cannabis consumption and cocaine consumption should not minimize other consumptions such as tobacco, which does not affect alertness but which remains the main risk factor implicated in nearly 70,000 deaths in the French population and alcohol which causes about 30,000 deaths a year in France. The simplest tools for screening people having problem with alcohol and cannabis and easily used by healthcare professionals are standardized questionnaires such as the AUDIT-C and CAST. The national rules for fitness at sea have been modified by introducing the use of urinary tests by occupational physician.

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CONTRIBUTORS

Author Emmanuel Fort managed the literature searches, undertook statistical analysis and wrote the first draft of the manuscript. Authors Thierry Lassiège and Alain Bergeret have contributed to manuscript. All authors contributed to and have approved the final manuscript.

CONFLICT OF INTEREST

All authors declare that they have no conflicts of interest.

WHAT IS NEW IN THE PAPER

The prevalence of cannabis experimentation in fishermen was estimated at 58%.

The prevalence of positive urine test for cannabis was 28%.

The prevalence of experimentation with cocaine was about 16%.

The prevalence of positive urine test for cocaine was 4.5%.

The French national rules for fitness at sea have to be modified by introducing the use of urinary tests.

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