

Sexually transmitted infections in seafarers: 2020's perspectives based on a literature review from 2000–2020

Richard Pougnet^{1, 2, 3}, Laurence Pougnet^{4, 5}, Jean-Dominique Dewitte^{1, 2, 3}, Claire Rousseau⁵,
Greta Gourrier^{1, 2}, David Lucas^{1, 2, 6}, Brice Loddé^{1, 2, 6}

¹French Society for Maritime Medicine, Faculty of Medicine and Health Sciences, University of Western Brittany, Brest, France

²Centre for Professional and Environmental Pathologies, Morvan Teaching Hospital (CHRU), Brest, France

³Laboratory for Studies and Research in Sociology (LABERS), EA 3149, Victor Segalen Faculty of Humanities and Social Sciences, University of Western Brittany, Brest, France

⁴Clermont-Tonnerre Military Teaching Hospital, Brest, France

⁵Host-Pathogen Interactions Study Group (GEIHP), EA 3142, Faculty of Medicine and Health Sciences, University of Western Brittany, Brest, France

⁶Optimisation of Physiological Regulations (ORPHY), EA 4324, Faculty of Medicine and Health Sciences, University of Western Brittany, Brest, France

ABSTRACT

Background: Seafarers are a special population. The issue of sexually transmitted diseases among seafarers is as old as navigation itself, and is a public health issue and a matter of concern for seafarers themselves. The purpose of this article is to review the literature on sexually transmitted infections (STIs) in professional seafarers in the 21st century, with a view to guiding maritime physicians in their practice.

Materials and methods: This is a Medline[®] and Scopus[®] literature review covering publications between 01/01/2000 and 31/12/2019. Out of the 224 articles, 26 were selected.

Results: This review showed that at the beginning of the 21st century, attention has been focused mainly on human immunodeficiency virus (HIV). Few seroprevalence data were available. Between 10% and 91% of seafarers had been tested for STIs. Several risk behaviours were identified: out of 4022 seafarers surveyed, 34.3% said they had several sexual partners; out of 3722 seafarers surveyed, 19.5% engaged with sex workers; out of 3493 seafarers surveyed, 63.3% did not always use condoms, while 58.0% were aware of the relevance of this protection. There was a lot of misunderstanding about STIs: 28.3% of seafarers believed that a healthy-looking person could not be HIV-positive.

Conclusions: The main pathology studied was HIV. Many seafarers had no specific training and only learned about STIs and HIV through media such as television. Maritime doctors could use new technologies to disseminate the right information on STI prevention.

(Int Marit Health 2020; 71, 3: 166–173)

Key words: sexually transmitted diseases, seafarer, HIV-positive

INTRODUCTION

Seafarers are a special population. Depending on their activities, they may travel long distances or even circumnavigate the globe. They may stay at sea for several weeks, or make stopovers in many ports. On some ships, there are seafarers from many different countries. Seafarers cross borders and geopolitical boundaries. They can

be both vectors of pathologies and victims of infectious diseases [1, 2].

The issue of sexually transmitted diseases among seafarers is as old as navigation itself, and is a public health issue and a matter of concern for seafarers themselves [3]. Data on sexual behaviour have shown, among other things, that being away from home for more than 1 month increases



Dr. Richard Pougnet, MD, PhD (Philosophy), Centre for Professional and Environmental Pathologies, Morvan Teaching Hospital (CHRU), 2 av Foch, 29200 Brest, France, e-mail: richard.pougnet@live.fr

the prevalence of sexual relations with several partners [4]. The issue of sexually transmitted infection (STIs) among seafarers can be approached from several points of view, including the prevention of infections contracted in ports of call and arresting the spread of infection after returning home [5]. Shipowners and navies have set up prevention campaigns [6]. The French Navy, for example, has a strong public health policy. On-board doctors train seamen on microbiological risks before each port of call, so that they will take all the necessary measures to avoid infections. The training is comprehensive (prevention of food-borne infections, infections related to wildlife, etc.) and covers STIs. Recently, there has been an increase in STIs among French military seafarers, due to a drop in vigilance after returning from missions [7]. In Croatia, between 1985 and 2009, 9% of human immunodeficiency virus (HIV)-positive patients were seafarers [8].

Seafarers are therefore at risk of STIs [9]. This is a centuries-old health problem that affects the entire world [10]. In some countries, the HIV rate among fishermen is 10 times higher than that of the general population [11]. The purpose of this article is to review the literature on STIs in professional seafarers in the 21st century, with a view to guiding maritime physicians in their practice: which infections and which microorganisms should they focus on? These data may help for the 2020s.

MATERIALS AND METHODS

This is a Medline® and Scopus® literature review covering publications between 01/01/2000 and 31/12/2019. Key words used were: “Sexually Transmitted Diseases” [Mesh] (also included were: Sexually Transmitted Diseases, Bacterial, Chancroid, Chlamydia Infections +, Gonorrhoea, Granuloma Inguinale, Syphilis, Sexually Transmitted Diseases, Viral, Condylomata Acuminata +, Herpes Genitalis, HIV Infections +, Herpes Genitalis) “Hepatitis B” [Mesh], “Hepatitis C” [Mesh], “Chlamydiaceae Infections” [Mesh], “Vaginosis, Bacterial” [Mesh], “mariner”, “mariners”, “seafarer”, “seafarers”, “seaman”, “seamen”, “fisherman”, “fisherman”, “sailor”, “seafarers”, “fisher”, “fishers”, and “migrant health”. For Scopus®, the French key words were: maladies sexuellement transmissibles, infections sexuellement transmissibles, pêcheurs et marins.

Criteria for inclusion were the following: English, French or Spanish articles were selected. The pertinence of results was analysed according to titles and abstracts available on Medline® and Scopus®.

Only articles studying STIs in professional, civilian seafarers were included. Excluded were articles studying other types of infections or infections in other populations (military seafarers, recreational seafarers, port officials, etc.) or articles in which it was not possible to

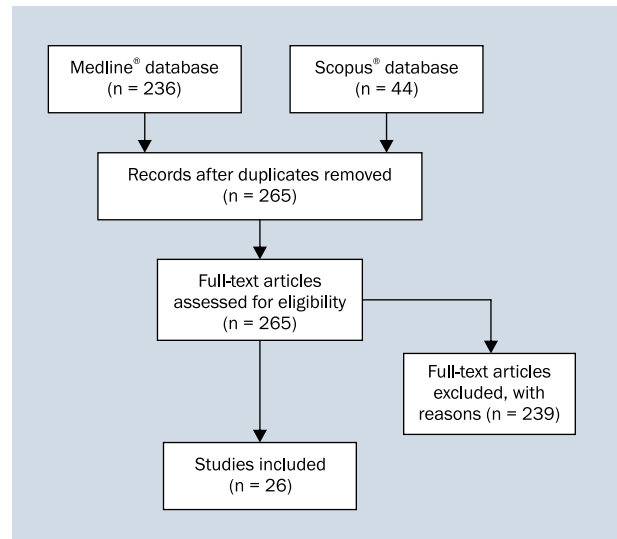


Figure 1. Flow chart

distinguish seafarers from other populations that were studied. Also excluded were anthropological articles on discourse analysis as such, or articles on pre-exposure treatments [12]. Very specific articles on Lake Victoria fishermen were excluded because this was not a marine fishery and there is a “sex-for-fish” economy specific to this location [13].

Out of the 265 articles, 26 were selected (Fig. 1).

Data on seafarers’ risk behaviour and knowledge were collected by theme. If the articles dealt with comparable data (e.g. multiple sexual partners), prevalence rates in the virtual population were calculated by adding the numerators (mariners with the same response) and the denominators (mariners who responded).

RESULTS

The results are organised according to the theme studied: microbial ecology, prevention, risky behaviour and company policies [4, 14–38].

MICROBIAL ECOLOGY

There were few seroprevalence studies. Only 9 papers studied the prevalences of STIs, and mainly HIV. The rate of seafarers having had an HIV test varied from 10% in a study in Morocco and a study in Turkey to 91% in a study in the Philippines [14–16].

In Europe. In Croatia, seafarers were the population most affected by HIV, with a prevalence rate of 246.67 per 100,000 seafarers, which is 14 times that of the general population, between 1985 and 2009 [8]. A Croatian HIV study described the non-B HIV-1 subtype dissemination [17]. Of the 145 Croatian seafarers at risk, there were 25 seafarers and 13 seafarers’ wives. The study showed

that heterosexual intercourse and travel in Europe promoted the spread of this subtype. For another Croatian study, 9.9% (43/435) seafarers ever had one STI [38].

In Africa, Asia and Oceania. Nguyen et al. [18] studied the prevalence of HIV and hepatitis B seropositivity among at-risk populations in Hai Phong, Vietnam. Among the 94 seafarers in the study, none had HIV, while 54% were hepatitis B carriers (HBs antigen and HBs antibody were positive) [18, 19].

In the majority of cases, the studies were carried out with the fishing community. Their results therefore corresponded to the lifestyle of small communities. In Cambodia, 3% (9/262) of fishermen had at least one HIV test [4]. In a systematic serology study among 446 Cambodian fishermen, 16.1% were HIV positive [20]. In 2000, 818 fishermen (582 Thai, 137 Burmese, 99 Khemer) had a serology. And 15.5% fisherman were HIV-1 positive [33]. In Myanmar, out of 2798 men receiving treatment for HIV between 2004 and 2014, 41.2% (1172) were fishermen, 22.8% of whom were also infected with hepatitis C virus (HCV) [21]. In Malaysia, 12.4% were HIV positive and 48.6% had HCV infection. But HCV infection was correlated with drug use rather than with sexual behaviour [22]. In Uganda, Katusiime et al. [24] conducted clinical assessments and serological tests on 16 fishermen. Among these fishermen, 38% (6/16) had an STI: 3 syphilis, 1 hepatitis B virus (HBV), 1 genital herpes and 1 gonorrhoea (nongonococcal urethritis).

In the America. In Mexico, the central blood bank of Veracruz studied prevalence and risk factors of positive serology for several biological agents: HIV, syphilis, *Treponema pallidum*. Fishermen had a higher risk of being positive for syphilis than the general population: odds ratio (OR): 1.92; 95% confidence interval (CI): 1.13–3.25 [23].

PREVENTION AND TESTING

A study conducted in 30 countries (including India, Indonesia, Myanmar, Philippines, Turkey, Ukraine – and major beneficial ownership countries such as Germany, Italy, Norway, and South Korea) showed that 3/4 of seafarers' unions in these countries considered STIs to be a major public health problem, particularly HIV [25].

Testing. The rate of seafarers who were tested for HIV varied from study to study. It was generally around 10%. But it could sometimes be very high: 91% in a study in the Philippines; 60% of seafarer officers and 66% of crew members in a Croatian study [14–16, 38].

Training and knowledge. There were many false beliefs about STIs, especially HIV (Table 1). For example, some seafarers believed that only homosexuals could be infected with HIV (9/186) [25]. Or, many seafarers believed that HIV could be transmitted through mosquito bites (Table 1).

In Turkey, the nursing university studied seafarers' knowledge of STIs through a knowledge and perception self-questionnaire [15]. Of the 660 seafarers, 53% had inadequate knowledge about STIs and their prevention. This was particularly the case for HIV: only 44% of seafarers had adequate knowledge of protective measures. Their knowledge came mainly from the media, for 68% of them. Although the majority considered themselves at risk, only 10% had been tested.

A study of 27 Italian shipowners, involving 197 seafarers of several nationalities (Italian, Indian, Filipino, Ukrainian, Romanian, Bulgarian and others) showed that 93% of Filipino, 92% of Indian, 73% of Eastern European and 53% of Italian seafarers had received training on STIs by health professionals [26].

RISK BEHAVIOURS

Many seafarers had multiple sexual partners or engaged with professional sex workers (Table 2). Several risk factors for risky behaviours were identified.

A study of 502 seafarers in the Philippines showed that certain factors were correlated with higher rates of unprotected sex and sex with multiple partners: alcohol consumption ($p = 0.027$), being single ($p = 0.007$) and being under 35 years of age ($p = 0.05$) [27]. Similarly, Robate et al. [28] showed several risk factors for having multiple partners and unprotected sex: being aged 15 to 34 years (51.4% vs. 33.3%, $p < 0.001$), and being unmarried (60% vs. 39%, $p < 0.05$). Ford and Chamrathirithrong [29] studied STI risk behaviours among Thai workers. Seafarers engaged with sex workers more often than workers in other occupations did: OR: 6.22, 95% CI: 3.67–10.54 [29]. The same was true in Malawi [30]. For Zafar et al. [31], lower education and higher income were significantly associated (OR: 2.25, 95% CI: 1.11–4.55; OR: 3.04, 95% CI 1.03–9.02, $p = 0.04$) with negative attitude and un-safe practices towards HIV/AIDS, respectively [31].

COMPANY POLICIES

For cruise ships, a study reported several possible prevention policies by means of a questionnaire on behalf of 24 companies with a total of 155 ships. All 8 companies with a medical department had a written HIV policy. Thirteen companies required pre-sea HIV testing, 12 had a written HIV policy regarding HIV testing and prevention, and 18 had free condoms for the crew [32]. A positive HIV test would result in revocation of the employment offer from 5 companies, and another 6 companies established HIV as a pre-existing condition. Eight companies required HIV-positive seafarers to demonstrate stability at regular intervals as a condition for sailing.

For transport seafarers, the International Transport Workers' Federation (ITF) launched the ITF's Global HIV/AIDS

Table 1. Misconceptions and knowledge about sexually transmitted infections (STIs) and human immunodeficiency virus (HIV) among seafarers

Type of knowledge	Altaf Chowdhury [25]	Laraqui [14]	Saniel [27]	Robate [28]	Robate [28]	Zafar [31]	Sopheab [4]	Grappasonni [26]	Faye [37]	Total prevalence
Type of maritime activities (fishing or other activity)	Seafarers	Seafarers and fishermen	Seafarers	Seafarers and fishermen	Seafarers and fishermen	Fishermen	Fishermen	Seafarers	Seafarers and fishermen	-
Country of origin of the population	International	Morocco	Filipino	Kiribati	Kiribati	Pakistan	Pakistan	International	Senegal	-
Years of study	2010–2011	2014	2008	2005	2008	2012	2005	2011	2010	
Misconceptions										
A healthy-looking person is not contagious	6% (11/186)	-	19% (96/502)	-	-	61.6% (183/297)	24% (63/262)	-	-	28.3% (353/1247)
AIDS is treatable	8% (15/186)	-	-	-	-	85.9% (255/297)	-	-	-	55.9% (270/483)
Transmission of HIV by certain vectors	Food and drink 8% (15/186)	Mosquitos 59.3%	Mosquitos 47.9% (240/502) Eating with an HIV patient 62.3% (312/502)	-	-	-	-	Insects 15% (/197) Glasses 6.6% Breathing closely 2.5%	Food 34% (55/400)	-
Correct knowledge										
Systematic condom use protects against STIs/HIV	39% (73/186)	-	76.1% (381/502)	36% (100/275)	80% (128/160)	50.2% (150/297)	-	-	56% (224/400)	58.0% (1056/1820)
HIV transmission through unprotected sexual relations	52% (96/186)	-	-	62% (170/275)	73% (113/160)	-	-	88.3% (174/197)	-	67.6% (553/818)
HIV transmission through blood (needle, razor, etc.)	-	91.2% (1255/1376)	-	62% (170/275)	73% (113/160)	44.4% (132/297)	32% (84/262)	79.2% (156/197)	-	74.4% (1910/2567)

Abbreviations — see text

Table 2. Risk behaviours in seafarers and fishermen

Type of behaviour	Altaf Chowdhury [25]	Grappa-sonni [26]	Saniel [27]	Guevara [16]	Stulhofer [38]	Prevalence for seafarers	Bailey [36]	Setiawan [35]	Entz [33, 34]	Zafar [31]	Sopheab [4]	Prevalence for fishermen	Robate [28]	Robate [28]	Laraqui [14]	Total prevalence
Type of maritime activities (fishing or other activity)	Seafarers	Seafarers	Seafarers	Seafarers	Seafarers	-	Fishermen	Fisher-men	Fishermen	Fishermen	Fishermen	-	Seafarers and fishermen	-	-	-
Country of origin of the population	International	International	Filipino	Filipino	International	-	India	Indonesia	Thailand	Pakistan	Pakistan	-	Kiribati	Kiribati	Morocco	-
Years of study	2010–2011	2011	2008	2009	2003	2005	2005	2005	2000	2012	2005	2005	2005	2008	2014	2014
Several partners	14% (26/186)	56% (110/197)	20% (100/502)	59% (59/100)	37.7% (164/435)	32.3% (459/1420)	13.4% (33/247)	-	-	90.2% (268/297)	4% (10/262)	38.6% (311/806)	37% (102/273)	47% (69/147)	32% (437/1376)	34.3% (1378/4022)
Engaging with sex workers	-	-	15% (75/502)	-	2.1% (9/435)	9.0% (84/937)	-	66% (19/29)	16% (131/818)	-	4% (10/262)	14.4% (160/1109)	34% (63/184)	47% (59/125)	26.3% (360/1367)	19.5% (726/3722)
Inconsistency in protected sexual relations	55% (103/186)	47.6% (94/197)	25% (125/502)	-	20.1% (91/435)	31.3% (413/1320)	86% (212/247)	-	-	74.4% (221/297)	78% (205/262)	79.2% (638/806)	-	-	84.9% (1161/1367)	63.3% (2212/3493)
Condoms	18% (34/186) didn't like	-	4.5% (23/502) not available	-	-	-	-	-	-	-	90% (236/262) not available	-	-	-	10.5% (101/1367) too expensive or not available	38% (365/959) didn't like

Programme in 2006, including ITF seafarer's affiliates [25]. Twenty eight unions said HIV prevention, 19 the prevention of other STIs, and 16 stigma and discrimination linked to HIV. For a second survey, 615 seafarers replied to a questionnaire. Their knowledge and behaviours were assessed to help better target prevention (Table 1).

DISCUSSION

This review of the literature on STIs in seafarers and fishermen at sea has shown that at the beginning of the 21st century, attention has been focused mainly on HIV. Few seroprevalence data were available. Between 10% and 91% of seafarers had been tested for STIs. Several risk behaviours were identified: out of 4022 seafarers surveyed, 34.3% said they had several sexual partners; out of 3722 seafarers surveyed, 19.5% engaged with sex workers; out of 3493 seafarers surveyed, 63.3% did not always use condoms, while 58.0% were aware of the relevance of this protection. There was a lot of misunderstanding about STIs: 28.3% of seafarers believed that a healthy-looking person could not be HIV-positive.

This review was limited by several factors. The notion of sea worker includes different populations that are not comparable. Commercial seafarers and offshore fishermen do not have the same constraints as coastal fishermen, especially those from the poorest countries. Some studies have shown in particular the specific vulnerability of fishermen in certain countries. The cultural environment may encourage engaging with sex workers, or value sexual philandering, or devalue the use of condoms [39]. Some coastal fishermen may belong to groups with particular cultural representations or economic situations, making the data not generalizable. These articles were therefore removed from the review [40]. Commercial seafarers, on the other hand, have access to port areas where brothel density or access to alcohol and drugs may vary from country to country. This type of article is also limited due to publication bias. Not all data on seafarers' STIs are available in medical databases. Each reader should review the data from his or her own health authorities for an assessment of the prevalence in his or her country. However, this review provides a global view of the problem. This global and worldwide vision is relevant, since some seafarers are required to travel to several countries around the world. Doctors providing medical follow-up for this population could therefore draw information from it; risk behaviours were sometimes quantified, which could help guide prevention campaigns.

There were few studies on the prevalence of STIs in seafarers. Several explanations are possible. The difficulty of studies with examinations and the disparity of tests could hinder this type of study. Moreover, there could be a psychological barrier: seafarers in some parts of the world might

not want to be tested, whereas in other regions testing was systematic. Some teams have suggested better screening of seafarers using personal screening kits. Seafarers could then act as a relay to their peers [41]. Without better assessing the prevalence of certain STIs, this could help seafarers begin to undertake treatment.

The issue of STI care must be integrated into comprehensive health care [42]. Certain behaviours can interfere with medical follow-up or with proper compliance with treatment [43]. Other socio-economic factors such as age, income and education could influence adherence to treatment or to prevention rules [44].

Prevention policies must also take into account cultural differences, especially around condom use. In some countries and in some communities, gender hierarchies and cultural representations hinder consistent condom use [45]. This review has also highlighted the wide disparity in condom availability [46]. Seafarers' doctors could take decisive action on this issue. For example, they could inform the health authorities to help them target information and condom distribution campaigns. Or they could encourage shipowners to make condoms available. Prevention policies are possible. Altaf Chowdhury et al. [25] have shown that unions can help raise awareness and take action. Interaction between the different social partners and the states could help [47]. Prevention campaigns must take into account language proficiency. A study of immigrant workers (including seafarers) showed the correlation between mastery of the local language and the level of knowledge of preventive measures [48]. Seafarers are often migrant worker [49]. STI screening is all the more important as seafarers are often migrant workers, likely to be carriers of mild symptoms [50]. They can therefore ignore their state of health.

CONCLUSIONS

Sexually transmitted infections among seafarers were a major health issue at the beginning of the 21st century. The main pathology studied was HIV. There was a wide variety of situations. Nearly half of the seafarers interviewed in different studies did not consistently use condoms, and nearly a third of seafarers had sex with multiple partners or even sex workers. Information was not always available. Many seafarers had no specific training and only learned about STIs and HIV through media such as television. Maritime doctors could use new technologies to disseminate the right information on STI prevention, especially HIV prevention. For example, internet training or smartphone campaigns have not been reported in the literature. A better understanding of the risks could encourage the use of testing and could also help to better integrate HIV-positive people socially.

REFERENCES

1. Koren ES. [The health of sailors—at sea and in port towns]. *Tidsskr Nor Laegeforen*. 2007; 127(24): 3259–3263, indexed in Pubmed: [18084384](#).
2. Mant M. For those in peril on and off the sea: Merchant marine bodies in nineteenth-century St. John's, Newfoundland. *Int J Marit Hist*. 2020; 32(1): 23–44, doi: [10.1177/0843871420904188](#).
3. Ramos Gregorio E. The Filipino seafarers' lived experiences aboard international shipping vessels: A basis for health promotion intervention. *Acta Medica Philippina*. 2012; 46(3): 69–74.
4. Sopheab H, Fylkesnes K, Vun MC, et al. HIV-related risk behaviors in Cambodia and effects of mobility. *J Acquir Immune Defic Syndr*. 2006; 41(1): 81–86, doi: [10.1097/01.qai.0000174654.25535.f7](#), indexed in Pubmed: [16340478](#).
5. Schofield CB. Venereal disease imported by mariners. *Br J Vener Dis*. 1965; 41: 51–59.
6. Korzeniewski K, Konior M, Lass A, et al. Occurrence of Chlamydia trachomatis in military environment on the example of professional soldiers in the Polish Armed Forces. *Int Marit Health*. 2014; 65(3): 137–141, doi: [10.5603/IMH.2014.0028](#), indexed in Pubmed: [25471163](#).
7. Pougnet L, Pougnet R, Drouillard I. Commentary to the article by Korzeniewski et al. *Int Marit Health*. 2014; 65(4): 235, doi: [10.5603/IMH.2014.0044](#), indexed in Pubmed: [25522709](#).
8. Mulić R, Vidan P, Polak NK. HIV infection among seafarers in Croatia. *Int Marit Health*. 2010; 62(4): 209–214, indexed in Pubmed: [21348014](#).
9. den Hoed W. Morbidity among international seafarers examined at the Port Health Centre in Rotterdam in the years 1999 and 2000. *Int Marit Health*. 2002; 53(1-4): 167–171.
10. Nikolić N. AIDS prophylaxis—achievements due to appropriate strategies. *Int Marit Health*. 2011; 62(3): 176–182.
11. Michalopoulos LM, Jiwatram-Negrón T, Choo MKK, et al. The association between psychosocial and structural-level stressors and HIV injection drug risk behavior among Malaysian fishermen: A cross-sectional study. *BMC Public Health*. 2016; 16: 464, doi: [10.1186/s12889-016-3125-7](#), indexed in Pubmed: [27250497](#).
12. Mack N, Odhiambo J, Wong CM, et al. Barriers and facilitators to pre-exposure prophylaxis (PrEP) eligibility screening and ongoing HIV testing among target populations in Bondo and Rarieda, Kenya: results of a consultation with community stakeholders. *BMC Health Serv Res*. 2014; 14: 231, doi: [10.1186/1472-6963-14-231](#), indexed in Pubmed: [24886646](#).
13. Camlin CS, Kwena ZA, Dworkin SL. Jaboya vs. jakambi: Status, negotiation, and HIV risks among female migrants in the “sex for fish” economy in Nyanza Province, Kenya. *AIDS Educ Prev*. 2013; 25(3): 216–231, doi: [10.1521/aeap.2013.25.3.216](#), indexed in Pubmed: [23631716](#).
14. Laraqui S, Laraqui O, Manar N, et al. The assessment of seafarers' knowledge, attitudes and practices related to STI/HIV/AIDS in northern Morocco. *Int Marit Health*. 2017; 68(1): 26–30, doi: [10.5603/IMH.2017.0005](#), indexed in Pubmed: [28357833](#).
15. Acaroglu R. Knowledge and attitudes of mariners about AIDS in Turkey. *J Assoc Nurses AIDS Care*. 2007; 18(1): 48–55, doi: [10.1016/j.jana.2006.11.007](#), indexed in Pubmed: [17338985](#).
16. Guevara N, Pineda M, Dorotan M, et al. Cross-sectional survey on the knowledge, attitude and practice of male Filipino seafarers on sexual health. *Int Marit Health*. 2010; 62(4): 224–232, indexed in Pubmed: [21348016](#).
17. Ramirez-Piedad MK, Lepej SZ, Yerly S, et al. High prevalence of non-B HIV-1 subtypes in seamen and their sexual partners in Croatia. *J Med Virol*. 2009; 81(4): 573–577, doi: [10.1002/jmv.21433](#), indexed in Pubmed: [19235840](#).
18. Nguyen CH, Ishizaki A, Chung PT, et al. Prevalence of HBV infection among different HIV-risk groups in Hai Phong, Vietnam. *J Med Virol*. 2011; 83(3): 399–404, doi: [10.1002/jmv.21978](#), indexed in Pubmed: [21264859](#).
19. Ishizaki A, Cuong NH, Thuc PV, et al. Profile of HIV type 1 infection and genotypic resistance mutations to antiretroviral drugs in treatment-naive HIV type 1-infected individuals in Hai Phong, Viet Nam. *AIDS Res Hum Retroviruses*. 2009; 25(2): 175–182, doi: [10.1089/aid.2008.0193](#), indexed in Pubmed: [19239356](#).
20. Samnang Po, Leng HB, Kim A, et al. HIV prevalence and risk factors among fishermen in Sihanouk Ville, Cambodia. *Int J STD AIDS*. 2004; 15(7): 479–483, doi: [10.1258/0956462041211315](#), indexed in Pubmed: [15228734](#).
21. Ousley J, Nesbitt R, Kyaw NT, et al. Increased hepatitis C virus co-infection and injection drug use in HIV-infected fishermen in Myanmar. *BMC Infect Dis*. 2018; 18(1): 657, doi: [10.1186/s12879-018-3558-y](#), indexed in Pubmed: [30547747](#).
22. Choo MKK, El-Bassel N, Adam PCG, et al. Prevalence and correlates of HIV and hepatitis C virus infections and risk behaviors among Malaysian fishermen. *PLoS One*. 2015; 10(8): e0118422, doi: [10.1371/journal.pone.0118422](#), indexed in Pubmed: [26244844](#).
23. López-Balderas N, Hernández-Romano J, Cámara-Contreras M, et al. Trends in prevalence of HIV and syphilis in a central blood bank of Veracruz, Mexico. *Transfus Apher Sci*. 2019; 58(1): 94–99, doi: [10.1016/j.transci.2018.12.001](#), indexed in Pubmed: [30554960](#).
24. Katusiime C, Schlech WF, Parkes-Ratanshi R, et al. Characteristics of Sexually Transmitted Infections among High-Risk HIV-Positive Patients Attending an Urban Clinic in Uganda. *J Int Assoc Provid AIDS Care*. 2016; 15(1): 36–41, doi: [10.1177/2325957413506493](#), indexed in Pubmed: [24144639](#).
25. Altaf Chowdhury SA, Smith J, Trowsdale S, et al. HIV/AIDS, health and wellbeing study among International Transport Workers' Federation (ITF) seafarer affiliates. *Int Marit Health*. 2016; 67(1): 42–50, doi: [10.5603/IMH.2016.0009](#), indexed in Pubmed: [27029929](#).
26. Grappasonni I, Paci P, Mazzucchi F, et al. Survey on HIV risk perception and sexual behaviours among seafarers. *Int Marit Health*. 2011; 62(2): 131–137, indexed in Pubmed: [21910117](#).
27. Sanieel OP, De los Reyes SJ. Prevalence of risky behaviours and determinants of multiple sex partnerships among male Filipino seafarers. *Int Marit Health*. 2010; 62(4): 215–223, indexed in Pubmed: [21348015](#).
28. Robate M, Toatu T, Kirition R, et al. Sexual behaviour of Kiribati seafarers: second generation surveillance in 2005 and 2008. *Int Marit Health*. 2010; 62(4): 195–200, indexed in Pubmed: [21348012](#).
29. Ford K, Chamrathirithong A. Sexual partners and condom use of migrant workers in Thailand. *AIDS Behav*. 2007; 11(6): 905–914, doi: [10.1007/s10461-007-9207-x](#), indexed in Pubmed: [17323124](#).
30. Soldan VA, deGraft-Johnson JE, Bisika T, et al. Social, economic and demographic determinants of sexual risk behaviors among men in rural Malawi: A district-level study. *Afr J Reprod Health*. 2007; 11(2): 33–46, indexed in Pubmed: [20690286](#).
31. Zafar M, Nisar N, Kadir M, et al. Knowledge, attitude and practices regarding HIV/AIDS among adult fishermen in coastal areas of Karachi. *BMC Public Health*. 2014; 14: 437, doi: [10.1186/1471-2458-14-437](#), indexed in Pubmed: [24886122](#).
32. Dahl E. HIV (human immunodeficiency virus) testing and prevention in the cruise industry. *Int Marit Health*. 2011; 62(1): 3–7, indexed in Pubmed: [21534219](#).

33. Entz AT, Ruffolo VP, Chinveschakitvanich V, et al. HIV-1 prevalence, HIV-1 subtypes and risk factors among fishermen in the Gulf of Thailand and the Andaman Sea. *AIDS*. 2000; 14(8): 1027–1034, doi: [10.1097/00002030-200005260-00015](https://doi.org/10.1097/00002030-200005260-00015), indexed in Pubmed: [10853985](https://pubmed.ncbi.nlm.nih.gov/10853985/).
34. Entz A, Prachuabmoh V, van Griensven F, et al. STD history, self treatment, and healthcare behaviours among fishermen in the Gulf of Thailand and the Andaman Sea. *Sex Transm Infect*. 2001; 77(6): 436–440, doi: [10.1136/sti.77.6.436](https://doi.org/10.1136/sti.77.6.436), indexed in Pubmed: [11714943](https://pubmed.ncbi.nlm.nih.gov/11714943/).
35. Setiawan IM, Patten JH. The organization of STI/HIV risk-taking among long-line fishermen in Bali, Indonesia. *Int Marit Health*. 2010; 62(4): 201–208, indexed in Pubmed: [21348013](https://pubmed.ncbi.nlm.nih.gov/21348013/).
36. Bailey A. Left at sea: HIV vulnerability among migrant fishermen in Goa, India. *Int Marit Health*. 2011; 62(2): 116–122, indexed in Pubmed: [21910115](https://pubmed.ncbi.nlm.nih.gov/21910115/).
37. Faye A, Faye MD, Leye MM, et al. Knowledge and attitudes of Senegalese seafarers about HIV/AIDS. *Int Marit Health*. 2013; 64(3): 148–153.
38. Stulhofer A, Brouillard P, Nikolić N, et al. HIV/AIDS and Croatian migrant workers. *Coll Antropol*. 2006; 30 (Suppl 2): 105–114, indexed in Pubmed: [17508483](https://pubmed.ncbi.nlm.nih.gov/17508483/).
39. Seeley JA, Allison EH. HIV/AIDS in fishing communities: challenges to delivering antiretroviral therapy to vulnerable groups. *AIDS Care*. 2005; 17(6): 688–697, doi: [10.1080/09540120412331336698](https://doi.org/10.1080/09540120412331336698), indexed in Pubmed: [16036255](https://pubmed.ncbi.nlm.nih.gov/16036255/).
40. Ombere SO, Nyambedha EO, Bukachi SA. Wimbo: implications for risk of HIV infection among circumcised fishermen in Western Kenya. *Cult Health Sex*. 2015; 17(9): 1147–1154, doi: [10.1080/13691058.2015.1018949](https://doi.org/10.1080/13691058.2015.1018949), indexed in Pubmed: [25774858](https://pubmed.ncbi.nlm.nih.gov/25774858/).
41. Choko AT, Nanfuka M, Birungi J, et al. A pilot trial of the peer-based distribution of HIV self-test kits among fishermen in Bulisa, Uganda. *PLoS One*. 2018; 13(11): e0208191, doi: [10.1371/journal.pone.0208191](https://doi.org/10.1371/journal.pone.0208191), indexed in Pubmed: [30496260](https://pubmed.ncbi.nlm.nih.gov/30496260/).
42. Kiene SM, Sileo KM, Dove M, et al. Hazardous alcohol consumption and alcohol-related problems are associated with unknown and HIV-positive status in fishing communities in Uganda. *AIDS Care*. 2019; 31(4): 451–459, doi: [10.1080/09540121.2018.1497135](https://doi.org/10.1080/09540121.2018.1497135), indexed in Pubmed: [30022681](https://pubmed.ncbi.nlm.nih.gov/30022681/).
43. Sileo KM, Kizito W, Wanyenze RK, et al. A qualitative study on alcohol consumption and HIV treatment adherence among men living with HIV in Ugandan fishing communities. *AIDS Care*. 2019; 31(1): 35–40, doi: [10.1080/09540121.2018.1524564](https://doi.org/10.1080/09540121.2018.1524564), indexed in Pubmed: [30241440](https://pubmed.ncbi.nlm.nih.gov/30241440/).
44. Sileo KM, Wanyenze RK, Kizito W, et al. Multi-level Determinants of Clinic Attendance and Antiretroviral Treatment Adherence Among Fishermen Living with HIV/AIDS in Communities on Lake Victoria, Uganda. *AIDS Behav*. 2019; 23(2): 406–417, doi: [10.1007/s10461-018-2207-1](https://doi.org/10.1007/s10461-018-2207-1), indexed in Pubmed: [29959718](https://pubmed.ncbi.nlm.nih.gov/29959718/).
45. MacPherson EE, Sadalaki J, Njoloma M, et al. Transactional sex and HIV: understanding the gendered structural drivers of HIV in fishing communities in Southern Malawi. *J Int AIDS Soc*. 2012; 15 (Suppl 1): 1–9, doi: [10.7448/IAS.15.3.17364](https://doi.org/10.7448/IAS.15.3.17364), indexed in Pubmed: [22713352](https://pubmed.ncbi.nlm.nih.gov/22713352/).
46. Mullany LC, Maung C, Beyrer C. HIV/AIDS knowledge, attitudes, and practices among Burmese migrant factory workers in Tak Province, Thailand. *AIDS Care*. 2003; 15(1): 63–70, doi: [10.1080/0954012021000039761](https://doi.org/10.1080/0954012021000039761), indexed in Pubmed: [12655834](https://pubmed.ncbi.nlm.nih.gov/12655834/).
47. Vignier N. Profils de santé des migrants en France [The faces of migrant health in France]. *Rev Prat* 2019;69(5). 2019; 69(5): 555–560.
48. Fuller TD, Chamratrithirong A. Knowledge of HIV risk factors among immigrants in Thailand. *J Immigr Minor Health*. 2009; 11(2): 83–91, doi: [10.1007/s10903-008-9163-1](https://doi.org/10.1007/s10903-008-9163-1), indexed in Pubmed: [18604584](https://pubmed.ncbi.nlm.nih.gov/18604584/).
49. Ford K, Chamratrithirong A, Apipornchaisakul K, et al. Social integration, AIDS knowledge and factors related to HIV prevention among migrant workers in Thailand. *AIDS Behav*. 2014; 18(2): 390–397, doi: [10.1007/s10461-013-0410-7](https://doi.org/10.1007/s10461-013-0410-7), indexed in Pubmed: [23325377](https://pubmed.ncbi.nlm.nih.gov/23325377/).
50. Wagner KS, Lawrence J, Anderson L, et al. Migrant health and infectious diseases in the UK: findings from the last 10 years of surveillance. *J Public Health (Oxf)*. 2014; 36(1): 28–35, doi: [10.1093/pubmed/ftd021](https://doi.org/10.1093/pubmed/ftd021), indexed in Pubmed: [23520266](https://pubmed.ncbi.nlm.nih.gov/23520266/).