Infectious Diseases Among Seafarers

by

Hemantha D Wickramatillake

June 1998

ISBN: 1 900 174 01 1

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and does not necessarily represent the

Seafarers International Research Centre

Seafarers International Research Centre

Cardiff University

52 Park Place

Cardiff

CF10 3AT

Telephone: +44 (01222) 874620

Fax: +44 (01222) 874619

http://www.csirc.cf.ac.uk

BIOGRAPHY

Dr Wickramatillake is a Senior Research Associate (Occupational Health) attached to the Seafarers International Research Centre. While being a medical graduate from Sri Lanka (University of Ceylon) , he also holds a Master of Medical Science degree from the National University of Singapore in Occupational Medicine, Fellowship (FIOSH) and the Membership (MIOSH) of the Institute of Occupational Safety and Health (UK) and a Safety Development Certificate from the Royal Society for Prevention of Accidents (ROSPA), UK. He is also nearing the completion of a postgraduate research degree, also in occupational medicine, from the University of Adelaide, Australia. He has served as a Surgeon Lieutenant Commander in the Sri Lanka Navy and chaired the Health and Safety Committee of the Employers Federation of Sri Lanka. Dr Wickramatillake has been invited to chair the scientific committee of the 5th International Symposium on Maritime Health to be held in the UK in May, 1999.

ACKNOWLEDGEMENTS

Compiling statistics on infectious diseases among seafarers and drafting a report have been arduous tasks as many countries or maritime organisations do not maintain data or statistics on health indices of seafarers. However, many persons have helped in making this project a success. I would like to thank Prof. S Tomazunas for drafting the section on Malaria and, Dr Henrik Hansen (Denmark), Prof. Mark Bellis (Liverpool), Dr Hans Lobel (CDC Atlanta), Dr Beherns (Travel and Tropical Health Clinic, London) for their professional advice. Drs. Mody (Shipping Corporation of India) and Kamath (Mumbai), Luisa Canalas (Spain), Mikheev (WHO) and Oca (Philippines) are thanked for their assistance in providing data and statistics. Further, I am grateful to Professors Alastair Couper and Tony Lane without the help of whom this project would not have been a success. Maria is thanked for her assistance, and lastly but by no means least, Toral is thanked for all her undaunted support in every sense.

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* By Prof. S Tomazunas

SUMMARY

Seafarers are a unique occupational group in that their travels to different parts of the world expose them to different types of infections, an exposure comparable only to airline staff. Quite different to the situation in the past, seafarers rarely get an opportunity to visit places far away from the ports of call, due to the rapid turn around time at ports. However, they are still exposed to infections at ports of call. Recent studies conducted, mostly in Europe, have shown concerns on Malaria, Hepatitis A, Hepatitis B, Hepatitis C, Human Immunodeficiency Virus and Gastro-Intestinal (GI) infections. Although much concern has been shown to the resurgence of Tuberculosis (TB) infection in many countries, whether seafarers are at risk of contracting TB at ports of call is uncertain. Some of these infections which pose a risk have also been identified at the seventh session of the ILO/WHO Joint Committee on the health of seafarers.

The present study which collected data from published and unpublished studies examined the current situation on these identified group of infectious diseases and recommends preventative measures. This study demonstrates the need for the collection and maintenance of complete data sets on seafarer health indices. The lack of even basic data is a major impediment to conducting quality seafarer health research.

INTRODUCTION

Seafarers both work and live in the same place for varying lengths of time, at times away from their usual place of residence. The time varies from hours in ferries to months in ships carrying cargoes to distant countries. Apart from the place of living being unique, international travel takes seafarers to different geographical situations, far away from their home countries, the only other similar occupation being the airline industry. Compared to these two occupations, other travellers to foreign countries on duty, like those working for multi-national companies, migrant workers or the military, stay for longer periods. Seafarers' stays being restricted more or less to port towns or cities, they are therefore, at the risk of contracting infectious diseases at ports of call in different countries. It can be argued out that, with "turn around" times at ports of call being short at present, the risk should be considered less; however, this is not the situation as demonstrated by some studies (Hansen et al. 1994, Syed et al. 1997, Arya and Plumb 1992, Hansen 1996, Hansen et al. 1996, Christensen 1985, Hansen et al. 1995) conducted in the recent past. It may be that other factors such as recruiting seafarers from countries where certain infectious diseases are endemic without conducting a proper pre-recruitment medical examination, sexual behaviour on board, intra-venous drug abuse on board, living in close proximity to infected carriers, use of unhygenic food and water obtained at ports of call for consumption on board can still, cause infectious diseases among international seafarers. Recent studies have shown concern on some infectious diseases among seafarers. The ILO/WHO committee (ILO 1994) on the health of seafarers at their 1993 meeting identified Human Immunodeficiency Virus (HIV) infection / Acquired ImmunoDeficiency Syndrome (AIDS) and Hepatitis B infection as infectious diseases against which there should be provisions for guidance on prevention.

This study examined the current situation with respect to a group of identified infectious diseases among seafarers, with the aim of drafting preventive guidelines. It was initially intended to produce a map demonstrating the incidences of the identified infections at various ports of call. However, the lack of statistics on seafarers' health indices in most countries including developed countries, and the reluctance of shipping companies and, even, maritime medical professionals to provide data and statistics made it impossible to produce a map with sufficient accuracy. However, other available statistics, from recent studies, unused data and unpublished work have been used for the presentation in this report.

The report is presented in seven sections and draws upon published and unpublished data. It discusses the following diseases and concludes with recommendations as guidelines for prevention:

Six sections describing the current situation on

- Human Immunodeficiency Virus / Acquired ImmunoDeficiency Syndrome
- Malaria
- Hepatitis A
- Hepatitis B
- Hepatitis C
- Tuberculosis

and the section on

- Conclusion

Recommended Guidelines are presented as a separate publication.

HUMAN IMMUNODEFICIENCY VIRUS/ACQUIRED IMMUNO DEFICIENCY SYNDROME

Background and Current Situation

Sexually transmitted diseases have been a scourge of seafarers for centuries (Arya and Plumb 1992). Sailors have been long regarded as being at a higher risk of STDs primarily as a result of having multiple sexual partners (Curjel 1964). An inquiry in New York revealed that 80 seamen had called in at a total of 1124 ports in 45 countries and had intercourse with 615 women (Vuksanovic et al. 1988). Therefore, not long after the recognition of Human Immuno-deficiency Virus (HIV) infection as a cause of Acquired Immuno Deficiency Syndrome (AIDS), it was recognised that seafarers are an important group, often forgotten, at risk of contracting Human Immuno-deficiency Virus (HIV) infection. They may also become carriers of the disease, possibly, to other ports of call and their country of origin. This aspect, though somewhat ignored, is of public health significance.

Long periods away from home, encourage casual sexual behaviour, often in areas where there is a known high prevalence of HIV and condoms are frequently not available or where health-screened prostitution is not practised. If seafarers require medical attention in some countries they are undoubtedly at the increased risk of contracting HIV infection from unsterile needles and syringes, etc. (Dhar and Timmins 1991).

HIV infection is caused by a retrovirus, two types having been identified HIV-1 and HIV-2. AIDS, the final stage of the infection, is a severe life threatening clinical condition, first recognised as a distinct syndrome in 1981. It, typically, results in progressive damage to the immune and other organs systems, including the Central Nervous System. Within several weeks to several months after infection with HIV, many people develop an acute self-limited illness lasting for a week or two. Infected people may then be free of clinical signs or symptoms for many months to years before other clinical manifestations, including opportunistic infections and constitutional and neurological symptoms appear.

More than a dozen opportunistic infections and several cancers were considered to be sufficiently specific for inclusion in the initial case definition of AIDS developed by CDC Atlanta in 1982. In 1987, the definition was revised to include additional indicator diseases and accept as a presumptive diagnosis if laboratory tests such as HIV antibody assays showed evidence of HIV infection. This was further revised

in 1993. The proportion of HIV-infected people who will ultimately develop AIDS is not precisely known (Benson 1995). Cohort studies conducted of HIV infected adults carried out before specific antiviral therapy was available indicated that about 15 - 20% developed AIDS in 5 years, about 50% within 7 - 10 years and close to 70 within 15 years. The case fatality rate of AIDS is very high and most patients (80% - 90%) die within 3 - 5 years.

Serological tests for antibodies to HIV have been commercially available since 1985. Most people infected with HIV develop detectable antibodies within 1 - 3 months after infection; although occasionally there may be a more prolonged interval.

Occurrence

The syndrome was first reported in 1981, but isolated cases occurred in USA and several other areas of the world (Haiti, Africa and Europe) during the 1970s; by early 1995, about 500,000 cases of AIDS had been reported in the USA. Although USA has recorded the largest number of cases, AIDS has been recorded in virtually all countries, among all races, ages and social classes. World-wide, WHO estimates that about 4.5 million AIDS cases (with more than half in sub-Saharan Africa) had occurred by 1995. HIV infections are now distributed world-wide, but are most prevalent in Sub-Saharan Africa, the Americas, Western Europe and South and South East Asia; HIV-2 has been found primarily in West Africa, with some cases in the Western Hemisphere and other African countries that are linked epidemiologically to West Africa.

Mode of Transmission

Routine social and community contact with an HIV infected person carries no risk of transmission; only sexual exposure and exposure to blood or tissues carry a risk. The routes of transmission of HIV are analogous to those of Hepatitis B. Epidemiological evidence indicates that HIV can be transmitted from person to person through sexual contact, the sharing of contaminated needles and syringes, accidental injuries with contaminated needles and syringes, and transfusion of infected blood or its components. Clotting factor concentrates manufactured from unscreened plasma were a significant source of HIV infection for people with haemophilia. Although the virus has on occasions been found in tears, urine and bronchial secretions, transmission after contact with these secretions has not been reported. Mucosal transfer i.e. by kissing has been documented recently (Padian 1997). Sexually transmitted agents

(infections) are co-factors that may contribute the transmission of HIV infection. There is no laboratory or epidemiological evidence to indicate that biting insects have transmitted HIV infection. The risk of transmission from oral sex is not quantifiable, but presumed to be low.

Current situation among seafarers

HIV infection and AIDS among seafarers is not a new phenomenon (Hansen et al. 1994). In 1959, an English seaman and in late 1960s a Norwegian seaman and his family died of HIV infection (Hansen et al. 1994). Later heterosexually acquired HIV infection became known among seafarers from several maritime countries in Europe (Goethe et al. 1989). Only a few studies, as described below, have been conducted on HIV status of seafarers. There is also a likelihood that there are a few unpublished research work conducted in different parts of the world. Some studies (Hansen 1996, Dhar and Timmins 1996) demonstrate that seafarers are at a high risk of contracting HIV infection. Other studies (see Table 1) conducted on convenient samples of volunteering seafarers at various ports of call in Europe, have computed statistics of concern. However, a study conducted on 20,000 USSR seafarers did not show any risk of HIV infection to seafarers. It is therefore important to give serious consideration to conduct further epidemiological research to examine the situation among seafarers world-wide. With the results of the few studies demonstrating in favour of a risk to seafarers, it is also important to conduct research to find the plausible reasons or causes for the increased risk, an aspect not properly addressed yet. Such knowledge will enable more stringent preventive measures to be formulated.

Results of some studies conducted in the past are summarised in Table 1.1. In Denmark, seafarers had an eight times higher risk of contracting heterosexually transmitted HIV infection than the general male population of Denmark (Hansen 1996a). In Valencia, a study found that of the 29 seafarers tested for HIV, seven were seropositive, five of these were drug users and two had contracted the infection through heterosexual contact. The prevalence in this study, of a small sample, was much higher than in the general population. Van Damme and Van Damme undertook a study of 2600 seafarers working with Belgian shipping companies. Of 321 screening tests, 15 seafarers (4.67%) yielded a positive result (prevalence in Belgian seafarers - 0.5%, Africans - 11.3%). This figure was extremely high, the average prevalence among Belgians being 0.062%(Van Damme and Van Damme 1989). In another study (Verhaert et al. 1993) conducted in Belgium, Verhaert et al. found 2 positive cases of HIV (both Africans) among 599 seafarers visiting a port in Belgium. This incidence (0.33%) was different to that observed in an earlier

study by the same group, but higher than in the general population. The study conducted in USSR did not demonstrate any risk. This survey conducted in USSR can be considered as done on a random sample (Gold et al. 1989). In Pakistan blood samples of 2776 persons presenting at the Blood Transfusion Service in Karachchi were screened for HIV antibodies (Mujeeb and Hafeez 1993). The prevalence of HIV among seafarers was estimated as 0.66% $\pm$ SD 0.93% (SD - Standard Deviation). In this survey conducted in a convenient sample, the prevalence estimated among the general population was 0.00%. In a British study (Syed et al. 1995) in Liverpool, one seafarer was found to be positive and two were equivocal. Equivocal results represent test results bordering on positive but not clearly in the positive HIV range. In this study retesting was not an option and therefore prevalence may be considered a possible minimum of 0.35% and maximum 1%.

Table 1.1. Statistics obtained from Published Literature showing the Risk of HIV Infection to Seafarers

Country	Sample size (where relevant)	Prevalence	Population rate
Denmark (1986 - 1993)		0.16/1000 person years	0.02/1000 person years
Valencia (1987)		0.23%	Higher than in the general population
Pakistan (1991)	A Cross section of low and high risk persons (n=2766)	Prevalence among seafarers in the sample) - 0.66%	Population prevalence (in the sample) 0.00%
Poland (1987 - 1992)	n = 34158	0.06%	Prevalence was more than (0.04%) in travellers but less than in persons from high risk groups (12.8%) and other worker groups (0.18%)
Belgium (1988)	n = 321 (seafarers in Belgian merchant ships of which 124 were Africans)	Belgians - 0.5% Africans - 11.3% All participants - 4.67%	0.062 in Belgian population
Belgium (1989 - 90)	n = 300 (international seafarers)	0.0%	
Spain (1990)	n = 521	1.15%	
USSR (1988)	n = 20,000	0.0%	
W. Germany(85-87)	n = 2051 international seafarers)	0.5%	
W. Germany(87-88)	n = 873	0.57%	
W. Germany(87-88)	n = 2924	0.47%	
United Kingdom(94)	n = 288(international seafarers)	0.35%	

The objectives of a study (Demissie et al. 1996) conducted in Ethiopia were to determine the prevalence and risk factors for HIV-infection among sailors in Ethiopia. A cross sectional study was carried out in a population of sailors identified from employment records. The prevalence HIV-1 infection was 9.6% and the prevalence was observed to decrease with increase in educational status. The risk of acquiring the infection was also found to increase with the use of hypodermic injections (OR = 3.42; CI: 1.19 - 9.80). Fourteen percent of the study population reported irregular use of condoms. Extra marital sex was reported by 13.4% of the married sailors. Ninety two percent of these extra marital contacts were prostitutes. Only 2.3% (6/260) had received blood transfusions. In the year preceding the study, hypodermic injections were taken by 77% (201/260) with 75% (151/201) of these taken at private clinics or the private homes. None reported intra-venous drug abuse. The higher risk with hypodermic injections was a finding in conformity with some other reports. The authors thought that findings of higher infection when injections were taken in private clinics and homes were due to the use of non-disposable needles, with less stringent sterilisation techniques in these situations.

Underestimation

It is difficult to obtain data and statistics on HIV infection among seafarers as seafarers are usually tested for HIV infection only if they complain of symptoms of illness suggestive of immunodeficiency. This prevents obtaining any information and statistics on a large number of symptomless carriers. Although data may be available they are not easily obtained as shipping companies are reluctant to provide divulge them. Some seafarers, who develop AIDS related symptoms late, may be reporting such symptoms to medical officers ashore after having left the occupation, preventing inclusion of such cases in the statistics provided by the industry. Few countries with an efficient maritime medical surveillance system e.g. Denmark are able to conduct quality research on seafarer health issues including statistics on HIV infection.

Biased samples

Due to the lack of surveillance systems most studies are conducted on convenient samples of volunteering seafarers at ports of call. These samples provide biased results. Those seafarers who indulge in casual sex and who are more likely to be at risk, may be reluctant to take part in surveillance studies. It is likely, therefore, that the risk is underestimated. Tests for HIV infection could be conducted at times of recruitment and periodically thereafter although such a suggestion is bound to face criticism from the international health profession and various human rights organisations. However, this procedure is followed

in some developing countries as a requirement of seafaring employment. The statistics provided by such companies and agencies recruiting seafarers should be of immense value to the international shipping industry. Table 1.2 shows statistics from a large shipping organisation and a seafarer health clinic conducting pre-recruitment medical examination for foreign shipping companies in Mumbai (Bombay), India. The annual incidence of HIV infection in the large shipping organisation in India is shown in Table 1.3. The incidence rates, of identified HIV cases, in the shipping organisation were less than the estimated rates for India. These were, however, from persons who were tested when reporting for HIV infection related symptoms at the health clinics managed by the shipping company. This leaves a group of symptomless carriers not included in the computation process and thus an underestimation of the risk. The prevalence identified at medical examinations (1%) i.e. at the health clinic (Table 1.2) were higher than that of the general population in India.

Table 1.2. HIV Infection Rates from a Shipping Company and a Seafarer Health Clinic in Bombay, India

Frequency	Incidence Rate[c]	Prevalence Rate[d]	Estimated Population prevalence[a b]
Shipping Company 6 (5 crew members + 1 officer)	0.016 - 0.049%	-- --	-- --
Health Screening Clinic 28 (new recruits and re-joiners)		1%	0.2% - 0.5%

NOTE: a- The rate in 1994; b - Rates among sex workers - 51%, STD patients - 36%, Pregnant women - 2.5%.

c - incidence rate per year; d - prevalence over a period of 2.5 years

Table 1.3. Annual HIV Infection Rates in a Large shipping Company in India

The Year	Number of Cases	Incident Rate per 100
From 1993 August	1	0.039
1994	1	0.016
1995	3	0.049
1996	1	0.016
Till 1997 July	0	--

NOTE: Estimated population rate (males & females) 1994 - 0.2% - 0.5%

HIV Infection Rates in Port Cities

Another method of approximating the risk to seafarers is through the evaluation of the HIV infection situation in the ports visited. Although this appears to be a good method, it is difficult or impossible to have a knowledge of the infectious diseases epidemiology of the general population at many ports of call in the world. In almost all the ports in the world such statistics are not maintained by port city health authorities. However, AIDS statistics of port cities are available in a few countries e.g. in the USA, such statistics being maintained by the Centre for Disease Control in Atlanta. Table 1.4 shows the AIDS incidence (1996) in some of the reputed port cities in the USA, worst affected being New York, San Fransisco, Los Angeles, Chicago and Philadelphia.

Table 1.4[a]. AIDS Cases and Annual Rates* in some Port Cities in USA (1996)

The City	Number of Cases	Rate*	The City	Number of Cases	Rate*
Albany	182	20.7	Norfolk	434	28.2
Baltimore	1525	61.6	Oakland	629	28.5
Baton Rouge	332	58.5	Philadelphia	1679	33.9
Boston	1102	19.0	Portland	325	18.5
Buffalo	165	14.0	Providence	168	18.5
Chicago	1841	23.8	Richmond	239	25.6
Cleveland	302	13.5	Rochester	288	26.5
Detroit	706	16.3	Sacramento	257	17.3
Honolulu	136	15.6	San Diego	984	37.1
Jackson ville	368	36.5	San Francisco	1572	95.0
Los Angeles	3715	40.7	Seattle	584	26.1
Miami	2063	99.4	Stockton	55	10.3
Milwaukee	137	9.4	Tacoma	65	9.9
Mobile	80	15.4	Tampa	793	36.1
New Haven	608	37.3	Toledo	75	12.3
New Orleans	764	58.2	Wilmington	239	43.4
New York	10385	120.1			

Notes: * - Rates per 100,000; a - courtesy of CDC Atlanta

Country statistics

The risk may also be estimated by examining the national statistics. Table 1.5 shows the AIDS incidence in some countries in Asia from which a majority of seafarers are recruited and visited by international seafarers. Some of these countries in Asia and Africa visited by seafarers have high rates of prevalence. National statistics, although available, may carry a certain degree of under reporting with them. Table 1.6 illustrates the HIV infection prevalence in world's geographical regions. Highest prevalence is demonstrated in Sub Saharan Africa (estimated 14 million (prevalence - 5.6%) people living with HIV infection) (WHO 1996).

Table 1.5. Incidence [b] (1995) of AIDS in some Asian Countries from which the Majority of Seafarers are Recruited and visited by Seafarers

Country	Incidence Rate
Philippines	0.52
India	1.29
Indonesia	0.11
Thailand	56.88
South Korea	0.11
Bangladesh	0.05
Sri Lanka	0.59
Pakistan	0.04

NOTES: a - courtesy of the WHO ; b - rate per million population

Table 1.6. Estimates on HIV Infection (1994) in Different Geographical Regions

Region	Estimated Numbers of Adults and Children with HIV infection	Prevalence	Percent of women infected	Main modes of Transmission
Sub-Saharan Africa	14 million	5.6%	> 50%	heterosexual
South and South East Asia	5.2 million	0.6%	>30%	heterosexual
Latin America	1.3 million	0.6%	20%	IDU/hom/het
N. America, W.Europe, Australia, New Zealand	1.3 million	0.3%	20%	IDU/hom/het
Caribbean	270,000	1.7%	>40%	heterosexual
Central/E.Europe, Central Asia	50,000	0.015%	20%	IDU/het
East Asia/Pacific	100,000	0.001%	20%	IDU/hom/het
North Africa, M East	100,000	0.1%	20%	IDU/het

NOTES:IDU - Intravenous Drug Use; het - Heterosexual; hom - Homosexual; Statistics from the WHO

HIV Status among Sex Workers

Another useful indicator of risk is the statistics on HIV infection among sex workers, in port cities and towns, who are the primary sources transmitting HIV infection to seafarers. Table 1.7. shows some of the available statistics on sex workers in some countries. Although the country statistics do not demonstrate the risk at individual cities, they do provide the best proxy. The HIV estimate among Thai sex workers in brothels was 35% in 1994. In Bombay, India, HIV prevalence in sex workers rose from 1% - 51% from 1987 to 1993. In Myanmar the prevalence among sex workers was 18% in 1995. It is noted that in all countries where statistics were available at two different times, there was a drastic increases were noted in the estimated incidence rates.

Table. 1.7 HIV Infection[a] Among Sex Workers in Some Cities and Countries[b]

City / Country	Past Prevalence Rate	Recent Prevalence Rate
Bombay (India)	1% (1987)	51% (1993)
Thailand	3.5%(1989)	35%(1994)
Myanmar	4.3% (1992)	18%(1995)
Malaysia	0.3% (1989)	10% (1994)
Vietnam	9%(1992)	38% (1994-95)
Dominican Republic	-	11% (1994)
Santos City, Brazil	--	27% (1994)
Nairobi (Kenya)	--	80%(1994)
Abidjan	--	55% (1994)
Miami, Florida, USA	23% (1987)	24% (1990)
Singapore	--	0.1% (1993)[a]
Georgetown, Guyana		25% (1993)

NOTES: a - prevalence of those who took part in the medical surveillance scheme
b - Official satellite symposium 1996

Discussion

Although the number of studies, evaluating the HIV infection status of seafarers, are few and the method of sample selection is not the ideal, the results available from such studies and the possible increased risk due to known life style factors unique to seafarers, have convinced health professionals that HIV infection

among seafarers should be taken with serious concern. Possible transmission of infection to the public is an additional cause for alarm. Unknown number of symptomless carriers among seafarers is the biggest threat in this regard. It will be an impossible task to curb international seafarers from having sex at ports of call and force or promote them to a state of "temporary celibacy" during their terms of duty. The monotonous life style and being away from home and the usual sexual partner for long periods of time force, at least, some of them to fulfil their desires when calling at ports. This is well demonstrated in some studies (Bellis et al. 1995) conducted recently. Such a situation however, should not brand seafarers, whether military or civil, as an occupational group with an immoral behaviour.

With much emphasis laid on the global spread of HIV infection, more and more people are now becoming aware of the dangers of contracting the illness. Some (Hansen et al. 1994) believe that sexual behaviour of seafarers will change with the public recognition of HIV infection. However, the reality of it could only be witnessed in the future. In Denmark it was observed that Danish population still indulge in risky sexual practices (Melbye and Bigger 1992). Even though there may be a change in sexual behaviour among seafarers the risk of acquiring HIV infection abroad might still increase because of the rapid spread of HIV in Asia and Africa within the last few years (Anderson and May 1992).

The interest on research and preventive actions seems to focus mainly only on the advice to use protection when having sexual intercourse. Such a comment does not, by any means, ignore the most valuable work done by international organisations like the WHO, UNAIDS, Civil-Military Alliance and various other none governmental organisations (NGOs) based in many countries. They are all promoting health education to prevent the spread of HIV infection. With much efforts given to prevent the spread of the disease it is likely that there is a reasonable global awareness with regards to the dangers involved in contracting the disease. However some people, including some seafarers, still do not wear condoms and indulge in other risky sexual behaviour. Therefore, apart from gaining further knowledge on, and intervening at, the point of exposure, knowledge on the other aspects of seafarer HIV epidemiology, especially the sexual behaviour, is also important. It would both identify future research areas and assist in planning better prevention strategies. Some of the important related issues are now discussed.

Knowledge on regional prevalence and risk

Seafarers from different countries travel to all parts of the globe as a requirement of their occupation. As countries with higher prevalence demonstrate a higher risk, seafarers and occupational health physicians should be furnished with information on prevalence rates in such areas. This should ideally be updated information on the HIV/AIDS epidemiology of ports of call, a very difficult task to achieve. To collect and provide such information, an efficient surveillance system should be established within the industry. HIV infection rates among sex workers at these ports of call will play an important role in such a surveillance system. Seafarers recruited from countries with high prevalence, especially in Asia and Africa, also pose a different risk; unknown HIV carriers among the recruits could transmit the infection to sexual contacts abroad or, in rare instances if they are drug abusers or homosexuals, to fellow seafarers aboard.

Knowledge on the mode of Transmission and Prevention

Little has been reported regarding the knowledge that seafarers have about HIV infection and AIDS and their behaviour related to it (Dhar and Timmins 1991). In a study conducted in Germany (Vuksanovic et al. 1988) it was observed that seamen from so called Third World countries (ordinary crew members as well as officers and Engineers) knew less of the basic facts on AIDS hazards than European colleagues. Seamen from 24 out of 56 ships stated that AIDS pamphlets were not available on board ship. However, Bellis et al. in Liverpool observed that in general sailors' HIV knowledge was relatively good and represented improvements over earlier studies undertaken in other countries. In this study (Bellis et al. 1995) the sailors from North America showed the highest overall levels of HIV knowledge and those from Asia and S. America the lowest. Although 94% of sailors had heard of AIDS, only 75% knew that condoms protect against HIV transmission. Furthermore, over 40% thought that AIDS was a condition that could be cured. Approximately 82% of sailors knew AIDS could be caught by sharing a syringe. In a study (Sesar et al. 1995) conducted in Rijeka, 56.3% of the ratings thought that AIDS is a curable disease. There is, thus, a need to evaluate he situation regarding the knowledge on AIDS among seafarers, especially that among the seafarers from developing countries. Such information will be beneficial when drafting preventive guidelines and planning interventions.

The number of sexual partners

The number of sexual partners that someone has, will undoubtedly increase the statistical likelihood of them coming into contact (in the sense of meeting) with a person who is already infected(Aggleton et al. 1989). In the early days of the epidemic when little was known about the cause of AIDS, the number of sexual partners did, indeed, play a significant role in predicting, in case - control studies, those who were more likely to develop AIDS. However, subsequent knowledge about HIV's mode of transmission has dramatically changed this situation, and it is important to realise that this potential risk will remain insignificant so long as the sexual behaviour of the individuals concerned does not allow HIV to be transmitted (Aggleton et al. 1989). Therefore, irrespective of the number of partners, prevention methods should aim at protecting the individual coming in contact with infected body substances (described in the next section).

Transmission of the Virus and Health Education

Most descriptions on preventive measures for HIV infections are restricted to the use of a condom with less concern shown to the other reasons that may pose as a threat for contracting the infection. Although the emphasis on the use of condoms has been in existence for sometime, the HIV incidence is still on the increase. Transmission studies show quite unequivocally that HIV can be transmitted via the following fluids and tissues (Aggleton et al. 1989):

semen	blood products
vaginal and cervical secretions	organ transplants
blood	

Further, the findings of a recent investigation (MMRW 1997) underscore the multiple routes (above) by which exposure to infectious body fluids can occur among sexually intimate persons. This case report demonstrates the possibility of transmission via mucous secretions. Thus, uninfected persons known to be at risk of infection with HIV should also be educated about the rare possibility of transmission through mucous membrane exposures e.g. kissing. The description demonstrates that seminal fluid is not the only body substance that could transmit the virus to an uninfected person. Therefore, in addition to the universal recommendation of the use of condoms, other intervention methods should also be carried out in parallel. Other aspects of sexual behaviour should also be examined as there are many ways in which people can express themselves sexually, some of them involving bodily penetration (Aggleton et al. 1989).

The provision of information by means of booklets, brochures and pamphlets, is considered by some as the most effective intervention to change the sexual behaviour. Others advocate the use of more participatory forms of learning (Aggleton et al. 1989). The aim of safer sex education should be to encourage forms of sexual expression in which the risk of HIV transmission is minimised. Given what is known about HIV's modes of transmission (vide above), safer sex should aim at ensuring that semen, blood, cervical and vaginal secretions, and mucous secretions do not pass from one person to another: via the vagina, via rectum, via breaks in the skin or via damage to the gums and the lining of the mouth. Safer sex education will need to provide opportunities for people to identify their own risks.

Transmission of infection to others

One of the issues of concern, apart from the infection to the seafarer, is the transmission of infection to secondary cases by infected seafarers. Symptomless carriers could infect their spouses and also other partners in their home country or elsewhere if they indulge in casual sex with persons other than their legal or usual partner. Further, the secondary case may pass the infection to other persons. In the Danish study (Hansen 1996, pp. 27-31) only a few secondary cases were identified. However, the author considered that, as most of the infected seafarers were still alive, and they were potentially infectious, since they were unaware of the infection (Hansen et al. 1994).

Point of intervention

Another issue of importance is the point of intervention. Seafarers should be provided with an opportunity to, freely, discuss the issue of HIV transmission and to discuss their risky sexual behaviour. Many believe that an earlier time in the career as the ideal point in time to implement interventions. This could be at the time of recruitment or better at training. Methods of intervention are also important. Who should conduct the sessions on safe sex education? Should it be qualified medical professionals or well trained health educators? Should them be group or individualised sessions? Should the language of discussions be scientific or more layman's language geared to suit seafarers from different ethnic and cultural backgrounds where beliefs on HIV may vary widely?. Should these sessions include visual interventions with real life situations e.g. video presentation?. Research activity should also involve these vital areas on intervention strategies.

Other modes of spread of HIV

While unprotected sexual intercourse accounts for more than 75% (UNAIDS 1996) of HIV infections other modes of transmission should not be ignored when considering methods of prevention. Sharing of HIV-infected injection needles by drug users accounts for 5-10% of all adult infections. Transmission via infected blood accounts for 3-5% cases. Although rare, latter should not be ignored as medical attendants on board may be at the risk of contracting the illness if they handle blood of an HIV positive seafarer. Fortunately however, no such cases have been reported so far in published literature.

If we are to bring about an effective decrease in HIV incidence among seafarers, there is much research activity to be carried out on HIV infection among seafarers. The main objective in conducting research should be to reduce the risk of HIV infection to seafarers. Health professionals, the industry and the international funding bodies should, jointly, work towards achieving this objective.

MALARIA INFECTION

Introduction

Malaria is endemic in 92 countries with small pockets of transmission occurring in further eight countries (WHO 1995). *Plasmodium falciparum* is the predominant parasite causing the illness. Over 120 million clinical cases and over 1 million deaths occur in the world each year. Eighty percent of these cases occur in tropical Africa. In other parts of the world, the distribution of malaria varies greatly from country to country and within the countries themselves. In 1990, 75% of all cases recorded outside Africa were concentrated in only nine countries: India and Brazil (50%), Afghanistan, Sri Lanka, Thailand, Indonesia, Vietnam, Cambodia and China. Malaria is a complex but it is a curable and preventable disease. Lives can be saved if the disease is detected early and adequately treated and more by prevention.

The characteristics of the infection

Malaria is a disease caused by the presence, in the red blood cells or the liver cells, of a parasite belonging to the genus *Plasmodium*. Four species cause malaria in humans*: P Falciparum, P Vivax, P malariae and P Ovale*. Most dangerous of the four is *P Falciparum* infection (malignant tertian malaria), which causes serious complications and may cause the death of an infected seafarers; in this type the fatality may be as high as 25%. The infection is transmitted from man to man by the vector, female anopheles mosquito which bites between sunset and sunrise. Mosquitoes can fly from shore to ship and cover a distance of up to 3 Kms.

Symptoms and signs of the disease appear after an incubation period (which is the interval between the mosquito bite and the clinical presentation of fever) of varying duration: from the minimum of 6 to a maximum of 25 days for *Falciparum*, and 8 - 27 days in *Vivax* infections. The clinical course of malaria consists of intermittent fever alternating with symptom free periods which contributes to the difficulties experienced in diagnosing, particularly on board ships where there is no doctor and there are no laboratory facilities for examining blood slides.

In a non immune subject a primary attack from *falciparum* infection may be fatal. The parasites multiply in red blood cells, causing rapidly developing anaemia. The other severe manifestations and complications are cerebral malaria, hyperpyrexia, hepatic and renal dysfunction, pulmonary oedema, cardiovascular and other

abnormalities and shock. The treatment of severe *falciparum* malaria is very difficult even in a hospital, and on board a ship seafarer's prognosis is very poor. The remaining 3 types are not so dangerous.

Level of endemicity

Malaria endemicity is classified according to the rates of spleen involvement and four types are identified:

Hypoendemic - spleen rates less than 10%

Mesoendemic - spleen rates 11 - 50%

Hyperendemic - spleen rates constantly above 50%, and adult rates also high

Holoendemic - spleen rates constantly above 75%, and adult spleen rates low

In areas of low endemicity, local epidemics of malaria may occur caused by climatic changes, rains, population movement, disasters etc.

Geographical distribution of Plasmodium species

Stability of malaria and seasonality of its transmission

About 40 years ago, *Plasmodium vivax* was the most widespread of the species causing malaria in man and distributed throughout the tropics and also in the temperate regions. With the success of the eradication programmes during the recent decades it disappeared from Europe, but still remains widely spread in Asia. At present it is endemic in India, Sri Lanka and Pakistan and other countries in SE Asia and also in South American continent. *Plasmodium falciparum* is particularly distributed throughout the tropical belt, and it is the prevailing species in Africa south of Sahara, in East Asia (Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam), and also in Haiti, Dominican Republic, Guyana and French Guyana. *P malariae* and *P ovale* have a patchy distribution and the percentage of human infections with these two parasite species is low in comparison *to P Falciparum* and *P vivax*. A map of the geographical distribution of the Plasmodium species would be difficult to design because the predominance of *P Falciparum* and *P vivax* in a given area varies with climatic seasons.

Transmission of malaria depends on environmental factors: temperature, humidity and rainfall. If they are favourable for breeding of the anopheles mosquito vector, transmission occurs. it may be seasonal (in temperate zones) or perennial, in hot and humid climates. Seasonality of transmission should be taken into

consideration when advice is given to seafarers. However, it is not an important factor for assessing the risk of infection of seafarers in hyperendemic coastal areas in Africa and Asia, where transmission continues throughout the year.

Malaria is also categorised as stable or unstable. "Stable" malaria is characterised by a remarkable regularity and the transmission often throughout the year: there may be a little apparent variation in incidence, from one year to another. The season of transmission may be relatively prolonged because of minor climatic changes of temperature, humidity or rainfall. Epidemics in the indigenous population may be unknown. It very often happens that the predominant species is *P Falciparum*. In the coastal areas of countries in tropical Africa and in South East Asia malaria is usually stable. "Unstable" malaria is characterised by variability of incidence from month to month and from year to year, in accordance with changes in weather, and mosquito breeding. When the transmission season is short or often interrupted, *P Vivax* tends to predominate over *P Falciparum*.

The Epidemiological situation of malaria in the world

In 1997, the World Health Organisation (WHO) published data (from 1994) on the malaria situation in the world. One hundred countries and territories were considered malarious; almost half of them are situated in sub Saharan Africa (see Map I Annexe I). Out of the total population of the world (5600 million), 2300 million lived in malarious areas: 400 million in tropical Africa where endemic malaria remains basically unchanged, and 1900 million in areas where malaria was considerably reduced or eliminated previously but transmission reinstated and the current situation being unstable or even further deteriorating. It is important to note that majority of international seafarers are recruited from some of the countries where malaria is endemic, resulting in, possibly an unknown but a significant number of carriers. The other risk is that seafarers from countries where malaria is not endemic travel to the risk areas on duty.

Africa has the highest level of endemicity in the world, *Plasmodium Falciparum* being the commonest species. In sub Saharan Africa an estimated 270 - 480 million cases occur every year (WHO) and the estimated mortality is 1.4 - 2.6 million per year. In the Americas there were 21 countries and territories where malaria is reported, nearly half (47%) being from Brazil. Thirty two percent was reported from Bolivia, Columbia, Ecuador and Venezuela, and 17% from Central American and Mexico. In countries west of India in Asia most cases were reported from Afghanistan, Pakistan and Iran. This number was

however, felt as an underestimate by the WHO the real figure being 6 - 7 times higher. The infection is also common in Bangladesh, India and Sri Lanka. In East Asia and Oceania most cases were reported from Vietnam, Solomon Islands, Thailand, Myanmar, Cambodia, Philippines, Papua New Guinea and Malaysia. In Europe numerous cases continue to be reported from Turkey. The number of cases reported in all other countries were, almost all, imported cases.

The actual exposure of ship crews calling at ports in endemic areas remains to be estimated, a difficult task due to the fact that there are no complete sets of data on the frequency of malaria among seafarers per se from all sea ports. From whatever the statistics available it is demonstrated that most of the cases of malaria originated from countries in sub Saharan Africa. Of course, most of these studies were skewed towards shipping companies operating in the African region.

Malaria in Seafarers

A literature search was conducted and unpublished data were collected on Malaria among seafarers, in order to assess the magnitude of this problem. The current / recent situation is presented:

Belgium

About 400 cases of Malaria are imported to Belgium every year of which about 200 are diagnosed at the Tropical Medicine Institute in Antwerp and treated in hospitals in that city. Some of these recorded cases were among seafarers, which were, of course, not reported separately to extract the data and compute statistics among seafarers. In the period 1988 - 1992, 223 cases of Malaria were diagnosed, by positive blood smears, at the Tropical Medicine Institute in Antwerp of which 22 (9.86%) were among seafarers (15 of them being due to Plasmodium Falciparum) (Gompel et al. 1993).

Denmark

Detailed information on Malaria among Danish seafarers is given in the work done by Henrik Hansen (Hansen et al. 1996, Hansen 1996a). He observed Malaria as a health risk factor for Danish Merchant seamen even though they stayed for a short period of time ashore. In his study, large majority of cases were those who visited ports in West Africa. Since 1974, the Danish Maritime Authority has recorded all actual or suspected cases of Malaria among seafarers in Danish ships. In the 12 year period from 1974 to 1985, 91 cases of Malaria or suspected Malaria were recorded, including 8 deaths. During the same period of

time, another 11 Danish seafarers, not included in the list of the Danish Maritime Authority, were hospitalised at the University Hospital in Copenhagen, suffering from Malaria.

In the period 1986-1993, 29 cases of Malaria were recorded in Denmark, and of these 17 were related to shipping; one of them died of complications of the infection. Other two fatal cases were identified by reviewing all deaths aboard Danish ships in the period from 1986 to 1993. A further 12 Danish seafarers with diagnosis of Malaria were identified by the Danish Maritime Authority; they were treated abroad or aboard ship, and subsequently brought ashore for medical attendance. In 6 of these cases, sufficient laboratory data were available to verify the diagnosis. Thus a total of 25 laboratory-verified shipping related cases were identified (vide Table 2.1). The lack of direct access to professional medical care at sea had a major influence on the outcome of in 3 fatal cases.

Table 2.1. Laboratory confirmed cases of Malaria among Danish Seafarers during 1986 - 1993 period: Type and Place of Infection.

Type of Malaria	Place of Infection		Total number of Cases
	Asia	West Africa	
Benign Malaria	1	2	3
Falciparum Malaria	1	20	21
Type unknown		1	1
Total	2	23	25

Note: This table is presented with the courtesy of HL Hansen

Prophylaxis details were recorded on the 25 shipping related cases; 11 seafarers had taken prophylactic drugs regularly, 3 irregularly, 1 had not taken any prophylaxis and there was no information on the rest. All these patients and fatal cases has had chloroquine as the recommended prophylactic drug with Paludrine (Proguanil) being added in the case of those who sailed to West African ports. The figures presented in the second study (1986 - 1993) are the ones which were confirmed on haematological investigation for malaria parasites. There may have been positive cases treated with anti-malarials without confirmation by a positive blood test. This makes the above figures an underestimation. The

exact number of seafarers who travelled to West African ports were also not known to compute an incidence rate.

France

Between 1973 and 1978, 164 cases of imported malaria were recorded only in Marseilles (Delmon and Baston 1981). Majority of cases were among tourists, servicemen and merchant seamen. In another French study (Masure et al. 1984) 42 confirmed cases of Malaria were treated in a hospital in Brest. Among the 24 Europeans treated in this hospital the majority were merchant seamen and a high proportion of them were treated for *P. falciparum* infection mainly having contracted the disease in Africa. All these *Falciparum* cases gave a history of poor prophylaxis.

Poland

Among 2300 Polish seafarers examined at the Institute of Maritime Medicine in 1958 - 1961, 24 reported Malaria infection contracted during their voyages to the tropics (Tomasunuz 1997). Further 4 seafarers were treated for *Falciparum* Malaria and 2 for *vivax* malaria at the Institute. At the same time, 7 foreign seamen and 4 Polish fishermen who fished in foreign waters (based in Guinea) were also treated at the Institute. During 1959 - 1966, 17 cases of Malaria (confirmed by laboratory tests) were treated in hospitals in Szczecin, another port in Poland (Tomasunuz 1997). During 1963 - 1972, 1800 seafarers were examined at the Institute in Gydnia. 18 cases, were detected in this study, who had contracted the infection during their tours of duty. Five new cases were diagnosed and treated in other hospitals in 1973; all were infected in West Africa. The estimated number of seafarers working on Polish ships in 1973 were about 14,000 men, 50% of whom travelled to malaria endemic zones. About thousand of them were the crew members of the West and East Africa lines. The estimated incidence rate of Malaria among Polish seafarers on ships going to West Africa in 1983 was 12/1000 per year (12 cases with 2 fatalities among crews of 25 ships belonging to the African Lines of the largest Polish national shipping company PLO) (Tomazunas 1984).

During the years 1984 - 1993 (Jarmein et al. 1996), among 95 malaria patients treated at the Institute were 37 seafarers and fishermen (34 infected in Africa, 1 in SE Asia and 2 in India). In this group 13 had not taken prophylactic drugs, 6 took them irregularly and 18 were on regular prophylaxis most

cases having taken chloroquine. During 1994 - 1996 period 23 seafarers were treated for Malaria at the Institute.

Detailed information on Polish seafarers treated abroad is not available. Further, with many Polish seafarers working on ships registered under foreign flags there is no record of Malaria among such seafarers.

Trinidad and Tobago

From 1968 to 1986 a total of 84 cases of imported malaria were reported in that country, most of them being *Falciparum* infection. Tourists, seamen and contract officers accounted for 21% of the cases and 60% of the cases had contracted the infection in Africa.

Italy

Since 1985, a rapid increase of imported cases of malaria has been recorded in Italy: from 191 in 1986 to 320 in 1988. *P. Falciparum* has been responsible for 74% of the cases. Seamen and airline staff accounted for 21% of the cases (Marjorie and Sabatinelli 1989). A publication in 1966 (Postgilone 1971), shows that 31 cases were reported during 1956 - 1965. The majority of infections were contracted in West Africa.

Spain

Data from the publications and information received through personal contact with Spanish doctors indicated that many cases of malaria have been recorded among crews of Spanish ships. In 1984 - 1994, there were 221 cases recorded among Spanish seafarers (Herrador 1996). Additional 15 cases were reported among seafarers employed in large fishing vessels operating in West African coast in 1993 and 1994. At least 43 cases of malaria were reported among Spanish crews in 1995 and 25 in 1996, most of them being seafarers in fishing vessels (Tomazunas 1997). In the Spanish Canary Islands, most of the malaria cases treated in Las Palmas were professional seamen of different nationalities, mainly from Eastern Europe and the Philippines and most of them sailed in vessels calling at ports in West Africa. Data obtained from the Radio Medical Centre (Acebes 1997) of the Institute of Maritime Medicine in Madrid, Spain indicated that during the period 1979 to 1997, of the 34 437 consultations made from ships 374 cases had a presumptive diagnosis of malaria (1.09%). The number of cases

confirmed by the response to treatment and follow up by repeated contact increased to 1031 (2.99%) in the same cohort. In the period from 1982 to 1994, the total number of Spanish seafarers and deep-sea fishermen repatriated from the ships to the home country due to illness was 2030; 60 were for malaria.

United Kingdom (UK)

About 2000 cases of imported malaria are recorded each year in the UK, However, there is no record of the number of seafarers among these patients. Data obtained from the Public Health Laboratory Service, Malaria Reference Laboratory, London School of Hygiene and Tropical Medicine, indicated that among cases diagnosed in that institute merchant seamen and airline crew numbered 1 in 1986, 4 in 1987, 8 in 1988, 6 in 1989, 6 in 1990, 8 in 1991, 3 in 1992, 1 in 1993, 2 in 1994, 3 in 1995 and 2 in 1996. While these figures were obtained from one diagnostic laboratory, the figures from other British laboratories, and the numbers of seafarers diagnosed in foreign countries are not known.

United States of America (USA)

Statistics of the incidences of malaria among US merchant seafarers are not available to be presented in this report. In an article (Krotoski 1978) published in 1978, 3 cases of malaria were reported in a study conducted over a period of six weeks. In 1993, 278 US military personnel, 519 civilians, 453 foreign civilians and 25 unknown were diagnosed with malaria (MMRW Feb. 1993). In this year, there was a 54% increase in *P falciparum* infection, from 1992. In 1993, 58.38% cases of malaria were contracted in Africa, 20.29% in Asia, 11.44% in Central America and the Caribbean, 1.8% in North America, 1.4% in South America, 3.3% in Oceania and 3.2% from unknown regions.

Norway

Malaria infections have occurred regularly among crews of Norwegian ships, but no statistical data on the incidence were available. Malaria was diagnosed in 50 - 70 patients annually, but how many of them are seafarers is not known. In one publication (Guthe 1964) an epidemic of malaria was reported among crew members of a Norwegian ship during her voyage to West Africa; 12 out of 36 crew members contracted malaria.

Bulgaria

The number of imported cases reported among Bulgarian seafarers and air crews in the years 1966-1971 was 12 (*P. Falciparum* 9, *P. Vivax* 2 and 1 mixed infection) (Kujumdschejew and Petrow 1972). All these patents contracted the infection in West Africa. During the recent years the number of reported cases were: 1991 - 0, 1992 - 1, 1993 - 4, 1994 - 12, 1995 - 20, 1996 - 4. These data may be incomplete as infections treated on board ship and in foreign ports may have not been reported to maritime or health authorities (Miteva 1997).

Germany

In the years 1956 - 1970, the number of malaria cases diagnosed among German seafarers was as follows (Mohr 1971):

Table 2.2. The number of Malaria cases among German Seafarers

Year	No. of cases	Fatalities
1956 - 57	57	3
1958 - 59	51	3
1960 - 61	49	1
1962 - 63	100	2
1964 - 65	83	6
1966 - 67	98	3
1968 - 69	63	2
1970	23	4
Total	524	24

The above figures demonstrate that the case fatality rate among German seafarers was high (4.58%). In 1956 - 1965, 52 seafarers were treated for *falciparum* malaria of which 42 were Germans (Haas et al. 1968). Of this number, 48 were contracted in West Africa, 1 in Asia and 3 in South America. Only 11 patients gave a history of having taken prophylactic treatment. In the same period there were 18 cases of *vivax* malaria in seafarers, 15 cases being German seafarers; 14 of these cases contracted the infection in Asia, 2 in West Africa and 2 in South America.

In the period 1980 - 1996, the number of reported malaria cases among German seafarers working on ships flying the national flag was as follows:

1980 - 1, 1981 -1, 1982 - 9, 1983 - 4, 1984 - 3, 1985 - 6, 1986 - 8, 1987 - 5, 1988 - 3, 1989 - 5, 1990 - 4, 1991 - 3, 1992 - 5, 1993 - 6, 1994 - 2, 1995 - 2, 1996 - 2.

During this period the number of German seafarers in actual employment was from 31,103 in 1980 to 16,938 in 1996. The computed incidence rates ranged from 0.32/10000 in 1980 to a highest figure of 3.48/10000 in 1986. This figure however took account of the seafarers who did not visit malarial endemic areas during their tour of duty, thus generating lower incidence rates.

Puerto Rico

Between 1991 and 1994, five episodes of malaria among 117 crew members of ships sailing West Africa were identified in Puerto Rico, with a total of 9 cases (2 deaths), due *to P. falciparum*. In the opinion of authors (Deseda and Lobel 1995), medical guides on the ships investigated were outdated or inaccurate. No effective drugs to treat malaria were on board, there was no adequate prophylaxis and there was a delay in medical attention and treatment; the case fatality rate was 22%.

Netherlands

Malignant tertian malaria infection was a serious health hazard for seamen. Of the 85 seamen admitted to the Harbour Hospital in Rotterdam with malaria, seven died while the condition of 39 patients was considered serious (Smithskamp and Wolthuis).

India

The Indian Shipping Corporation has recorded 37 cases of Malaria during the period August 1973 to June 1996. The incidence of malaria during the period July 1993 to August 1997 ranged from 565 cases per million in 1997 to 2462 cases per million in 1995. The incidence rate in 1995 was close to the rate estimated for the general population of India in 1995 (2497 per million).

Discussion

The estimated number of seafarers employed aboard ocean-going vessels in the world is circa 1.213 million (Institute of Employment Research 1995). This is the population at potential risk of malaria when calling at ports of call in malarious areas of the world. It is difficult to estimate the risk as there are no properly maintained statistics in most countries; even the data available are from health clinics

and seafarers hospitals and not from nations. Further, lack of denominator data prevents computing proper statistics on incidence rates from the data available from few countries. The recording system in Denmark made it possible to compute an incidence rate of 3/1000 seafarers / year. This figure compared to the incidence rate among Danish population is high. However, some do argue that the comparison group should be the travellers as malaria is absent in countries like Denmark and therefore the comparison with the general population demonstrates a spuriously high risk. In Poland, malaria infections have been regularly reported among national seafarers. Also, many foreign seafarers have been treated in Polish hospitals. The actual number of malaria cases among national seafarers was considered to be higher, even though there are no data and statistics available from seafarers working on board foreign registered ships. Further there are no records of cases treated abroad. Data from Spain confirmed that malaria is an important health problem among national seafarers and deep sea fishermen. Many seafarers have been treated in the UK, Germany, France, Italy and Belgium, the Netherlands and in other maritime countries. However no incidence rates are available to comment on the risk to the seafarer. The estimated number of malaria infections among international seafarers may range from 500 - 1000 per year (Tomazunas 1997). The situation among seafarers from endemic countries e.g. India is different. It is not certain whether they contract the disease elsewhere or from the endemic home country thereby preventing any comments to be made on the risk posed to them.

The important issues of concern are the risk and the accompanying severity of malaria, especially when infected with *P. falciparum*. If early diagnosis is not possible and if proper medical care are not available, case fatality rate is very high among those infected with *P. Flaciparum* malaria. Infection by other species (*P. Vivax, P. Ovale, P. Malariae*) being less dangerous, leaves much time for diagnosis and the case fatality is negligible in adults even when treatment is delayed (Tomazunus 1997). Prevention, still relies on the anti-malaria drugs as the first choice. However, prophylaxis does not seem to assure reliable prevention. None of the drugs have proved a strong action against the sporozoites which enter the human organism following the mosquito bite. Further, drug resistance and drug reactions, non compliance or irregular compliance of recommended drugs add to the issue. It is therefore necessary to pay much attention to prevention of malaria among international seafarers, main lines of action being:

- Health education to avoid being bitten by the vector
- Chemical prophylaxis to be given to those seafarers at risk

- Availability of curative drugs on board
- Availability of mosquito repellents and insecticides with immediate actions (as pyrethoids) on board ships
- To weigh the actual likelihood of bitten by a mosquito against the possible side effects of the drug or the drug combination recommended for use in any particular area (the risk of exposure to those living in some cities in most malarious countries is minimal (American Public Health Association 1990) and, in the case of seafarers, the time spent ashore at ports of call is very short)
- Medical training to be given to medical attendants on board regarding easy diagnosis, keeping in mind, of course, the non typical clinical presentations
- Requests seeking medical advice, from Radio Medical Centres, to be made during the early part of the illness

Seafarers should be

- Informed of the risk of malaria
- Informed how to protect themselves against mosquito bites
- Warned that they may contract the disease despite the prophylaxis
- Informed that Malaria can kill if treatment is delayed. Both seafarers and medical attendants should be advised to seek medical help promptly if malaria is suspected
- Questioned about drug allergies and other contraindications for drug use. If there is a history of allergy, never prescribe the same drug. If intolerance is suspected ask the patient to start prophylactic drugs early (e.g. 2 - 3 weeks before departure) and check the outcome before reaching the malarious area
- Informed, how to take the prescribed drugs for (a) prophylaxis (b) stand by treatment and, of the importance of complete compliance
- Informed that prophylaxis must be continued for 4 weeks after they leave the malarious area, whether they return to their home country or moving to a malaria free area
- Informed that some anti malaria drugs can cause serious side effects and that medical help should be sought promptly. If a serious side effect occurs, the person should stop taking the drug
- Informed that malaria may often be mild and that malaria should be suspected if one week after entry into an endemic area they suffer unexplained fever with or without other symptoms such as headache, muscular aching and weakness, vomiting, diarrhoea and cough

- Reminded that stand-by treatment be taken only if they suffer unexplained fever and when prompt medical help is not available. They should complete the treatment course and resume the anti-malarial prophylaxis 7 days after the treatment course. Medical advice still be sought after self treatment
- Aware that if they have had, or have been suspected of having, malaria while staying in an endemic area, and have been treated or have used stand by treatment, they should see a doctor on returning home or at the next port of call

Chemoprophylaxis and Treatment of Malaria

Since vaccines against malaria are not available, yet, chemoprophylaxis remains the preventive method of choice, to seafarers. Chemoprophylaxis prevents the disease and not the infection (suppressive action) (Tomazunus 1997). The risk of contracting malaria to seafarers and other travellers to the tropics varies in several endemic zones. In West Africa, without prophylaxis, estimated malaria incidence is 1.4% per person per month (a seafarer would rarely spend a month in a west African port). In South and Central America, the incidence is 0.05 and 0.01 per month, respectively. In Asia, the transmission and percentage of infection due *to P Falciparum* is much lower (Tomazunus 1997).

The dangers of chemoprophylaxis in an area at low risk for chloroquine resistant *P.Falciparum* are a reality (Tomazunus 1997) [see map 2 appendices fort chloroquine resistance]. Incompletely active drugs change clinical manifestations, and this in turn delay the establishment of a correct diagnosis, particularly on board ship during a voyage, when diagnoses are made by partially qualified personnel, with or without the assistance from a Radio Medical Centre ashore (Tomazunus 1997). The rate of adverse events to antimalarial drugs may be as high as 15 - 20%, and hospitalisation due to side effects of prophylaxis occurs 1/10000 travellers to endemic areas. Neuropsychiactric symptoms have been reported with mefloquine and chloroquine. In many countries there is an emerging drug resistance in *P Falciparum* as well as an emerging drug resistance in *P Vivax* strains (estimated 20% in Papua New Guinea and Irian Jaya in Indonesia). Thus, there is no prophylactic drug free from toxicity, and the efficacy is never 100%. (Map 3, appendices - Recommendations for malaria drug prophylaxis)

Alternatives to conventional chemoprophylaxis are encouraged in areas of low endemicity of malaria. In areas where *P Vivax* occurs primarily, and when the risk of side effects outweighs the risk of life threatening *P Falciparum*, there are two alternative strategies:

- To avoid mosquito bites and avoid the drugs. A high degree of protection can be realised with the proper use of topical DEET-containing (1N,N-diethyl-m-toluamide) or dimethyl phthalate containing insect repellents, impregnated protective clothing, and pyrethrum-impregnated mosquito netting in rooms where seafarers spend the nights on shore; or on board ships in port, when cabins are not air conditioned, or where the air conditioning system has failed. Use of anti-mosquito sprays or insecticides dispensers (mains or battery operated) containing pyrethroids, or burning pyrethroid mosquito coils in the rooms, whether in port or the ship if berthed in a port would bring additional protection.
- To have stand-by treatment, defined by the WHO as the use of anti-malarial drugs carried for self administration when fever occurs and prompt medical attention is not available. This is a safe option for seafarers travelling to areas at low risk of malaria or in areas where chemoprophylaxis may not be effective. Self therapy may also be preferred for seafarers who make frequent voyages characterised by brief and successive visits to ports in malarious and non malarious areas. This method minimises the drug over use, demands early investigation of any febrile illness on board during the voyage, and insists that effective treatment is given rapidly for life threatening *P Falciparum* malaria that occurs in non-immune persons. In this strategy, the responsibility is assumed by the officer who takes care of health on board, and by the Radio Medical Centres ashore which give advice on treatment. Crews should be well informed and aware of the risk of infection during voyages to *P falciparum* hyperendemic areas. In most situations this strategy appears to be a more advantageous approach than the classical long-term chemoprophylaxis. Seafarers may combine the two strategies. It should be mentioned that it is difficult for a partially qualified sea captain or an officer on board to take the decision of whether to issue chemoprophylaxis drugs or not, to fellow seafarers on board. In this context it is strongly advised that medical attendants on board should keep in close contact with medical advisors, may they be from their shipping companies or Radio Medical Centres regarding correct prophylaxis procedures.

New Diagnostic Technology

Recent advances in diagnostic technology further helps in choosing the stand by treatment alternative as a better method. New technology has been developed to detect P falciparum malaria in a suspected person. This test sometimes called “Malakwik” or “Parasight” enables a trained layman to detect positive cases of P falciparum infection. The test makes use of three drops of blood obtained via a finger prick using a sterile needle and using the strip provided by the manufacturer.

Drugs recommended for the prophylaxis and treatment of malaria on board ships

In 1997, the WHO recommended the use of the following drugs for people who travel to endemic areas:

Chloroquine

Proguanil (Paludrine)

Mefloquine (Lariam)

Doxycycline (Vibramycin)

Sulpha/pyrimethamine (Fansidar)

HEPATITIS A INFECTION

Introduction

Few studies are available examining the incidence of Hepatitis A infection among seafarers. It is likely to be due to the fact that seriousness and prognosis of hepatitis A infection, compared to that of Hepatitis B, are very much less and better respectively. Further, there are both active and passive methods of immunisation against hepatitis A available now and it has reduced the risk of infection. Hepatitis A is a highly contagious virus transmitted during the acute infection by the faecal-oral route. Ingestion of contaminated food, water and shellfish at ports of call in foreign countries, and male homosexual activity (Gerberding and Holmes 1994) are some of the possible methods of contracting the disease among seafarers. Infected chefs on board and at ports of call are important sources of outbreaks.

Clinical course

The clinical course, other than long term complications being very minimal, is similar to that produced by other forms of viral hepatitis. Onset of clinical illness usually is fairly abrupt with fever, headache, and generalised malaise. Acute infection is rarely fatal, and chronic infection does not occur (Gerberding and Holmes 1994). Acute HAV infection can be diagnosed serologically by assaying serum for the presence of antibodies. The presence of IgM anti-HAV distinguishes current infection from prior infection. Tests for total anti-HAV measure both IgG and IgM antibody and are useful in assaying immunity.

Global Situation *(CDC Atlanta 1997)*

World-wide, four different patterns of HAV transmission can be defined on the basis of age-specific seroprevalence data. In general, these transmission patterns correlate with socioecomomic and hygenic conditions. In many developing countries where environmental sanitation is generally poor, nearly all children <9 years of age have evidence of prior HAV infection. In these areas, distinct outbreaks rarely occur and clinical disease related to HAV infection is uncommon. As hygienic conditions improve, transmission shifts to older age groups and incidence of clinically evident disease increases. In most industrialised countries, low levels of endemic HAV transmission occur. The relatively high prevalence of prior HAV infection among older age groups in these areas is likely to be related to the presence of lower socioeconomic and hygienic conditions in the past. Because most of the population is susceptible to HAV infection, disease outbreaks are relatively common in most of these countries. However, in a few

industrialised countries hepatitis A outbreaks are uncommon, and nearly all HAV transmission occurs among drug users and travellers to high endemic areas.

Hepatitis A among Seafarers

Studies on Hepatitis A are few and the current study could obtain data only from a large shipping company in India. In examining hepatitis A infection status too, the reluctance to maintain seafarer health data and compute health indices has prevented presenting a more realistic picture. Hansen in his study in Denmark examined the incidence of Hepatitis A among Danish seafarers. In his study although the Standardised Incidence Rates (SIRs) were more than unity the confidence intervals did not show any significance in the results (Table 3.1).

Table 3.1. Hepatitis A among Male Danish Seafarers 1986 - 1993

Age Group	Years of Observation		Number of cases		Expected no. among seafarers	SIR (95% CI)
	General Population	Seamen	General Population	Seafarers		
15-19	1,492,488	8,621	51	1	0.29	3.44 (0.09 - 19.21)
20-29	3,270,807	46,955	239	5	3.43	1.75 (0.47 - 3.40)
30-39	3,069,170	28,528	188	4	1.75	2.29 (0.62 - 5.85)
40-49	3,068,600	27,052	103	1	0.91	1.10 (0.03 - 6.12)
50-59	2,155,069	16,284	45	1	0.34	2.94 (0.07 - 16.39)
60-69	1,836,667	5411	23	0	0.07	-
Total	14,892,801	132,851	649	12	6.80	1.77 (0.91 - 3.08)

NOTE: With courtesy of H Hansen

Hansen also examined the hepatitis A antibodies in 515 seafarers (Table 3.2) attending a fit-for-duty Health Examination. Selection of participants only from one health clinic was, however, subjected to some degree of selection bias. Seventy nine (15.3%) seafarers showed positivity to HAV antibody tests. The highest proportions of positive tests, both for HAV and HBV were found among seafarers of non Scandinavian origin. Hansen also analysed the data, stratifying for age (10 year age groups) and observed that seroprevalence increased with age (Table 3.3).

Table 3.2. Prevalence of Hepatitis A and B Antibodies among Danish Seafarers

Group	No. of Persons Tested	HAV Antibody +ve	HBV Antibody +ve
Total (male + female)	515	79 (15.3%)	47 (9.1%)
Male	441	78 (17.7%)	45 (10.2%)
Female	74	1 (1.4%)	2 (2.7%)
Scandinavian origin	483	62 (12.8%)	38 (17.9%)
Non-Scandinavians	21	11 (54.4%)	6 (28.5%)
Origin uncertain	11	6 (54.5%)	3 (27.3%)

NOTE: With courtesy of H Hansen

In the study conducted in the health clinic, none of the 248 seafarers below 40 years of age, of Scandinavian origin, had antibodies against HAV. This showed that the risk of contracting HAV was minimal or none. These results were in agreement with a study of 1,744 seafarers assigned to US Naval vessels deployed to South America, West Africa and the Mediterranean where none seroconverted during a six month period (Hawkins et al. 1992). In another study in the USA 1.3% seroconverted during a period of six months in West Africa and the Indian Ocean (Hooper et al. 1988). This incidence was influenced by an epidemic aboard one of the ships.

Table 3.3 Prevalence of Hepatitis A Antibody among a Group of Scandinavian Seafarers

Age Group	Number of Persons Tested	Frequency of HAV postivity	Frequency of HAV positivity (vaccination excluded)
>20	11	0 (0.0)	0 (0.0)
20 - 29	177	1 (0.6)	1 (0.6)
30 - 39	141	1 (0.7)	0 (0.0)
40 - 49	71	10 (14.1)	10 (14.1)
50 - 59	69	39 (56/5)	38 (55.1)
60 - 69	14	11 (78.6)	10 (71.4)

NOTE: With courtesy of H Hansen

Hepatitis A among US Navy and Marine Corps Personnel

A prevalence study (Hawkins et al. 1992) of 2072 male shipboard personnel scheduled for deployment to South America / West Africa and the Mediterranean was conducted to determine whether serological evidence of prior hepatitis A, B or C infection was associated with exposure in foreign countries. The Table 3.4 below shows the seroprevalence status for HAV among the large study population. Of the subjects evaluated before deployment 210 (10.1%) were seropositive for anti-HAV. There was a steady increase in prevalence of anti HAV with age, from 7.8% in subjects 18 - 24 years old to 28.7% in subjects >34 year old. An independent association was observed between anti-HAV positivity and prior Caribbean deployment (<1 year) but not prior duty in the Mediterranean, after adjustment for other risk factors.

Table[a] 3.4 Hepatitis A Seroprevalence in 2072 US Navy and Marine Corps Personnel

Factor analysed	Frequency of Anti - HAV seroprevalence	Prevalence (%)*
Rank		
Enlisted	206 / 1986	10.4
Officer	4 / 85	4.7
Race / ethnicity		
White	74 / 1485	5.0
Black	55 / 385	14.3
Hispanic	53 / 147	36.1
Filipino	15 / 17	88.2
Other	13 / 36	36.1
Birth location		
United States	155 / 1932	8.0
Foreign	55 / 140	39.3
Prior deployment[+]		
Caribbean	107 / 951	11.3
Mediterranean	97 / 842	11.5
Scandinavia	16 / 131	12.2
Okinawa	21 / 271	7.7
South Pacific	31 / 235	13.2
Africa	2 / 14	14.3
Prior duty		
Mediterranean	8 / 36	22.2
Okinawa	9 / 97	9.3
South Pacific	2 / 52	3.8

NOTES: a - (Hawkins et al. 1992) * Variations in denominator totals reflect incomplete responses to questions; HAV - hepatitis A virus; Hbc, hepatitis B core antigen; + deployment, <12 months; duty > 12 months

Hepatitis A among Indian Seafarers

Hepatitis A infection among a group of 6091 seafarers (2517 officers and petty officers and 3574 other crew members) is shown in Table 4.3. The annual incidence rates (1993 - 1997) ranged from 0.016% to 0.15%. In a country like India where the prevalence of food and water borne diseases are high, it is difficult to comment whether these seafarers contracted the disease in another country or it is a reflection of the prevalence of infection in the general population. In depth studies have to be conducted to find out the sources of transmission.

Discussion

Contrary to the mode of transmission for HBV, Hepatitis A virus is transmitted via food and water and thus the risk depends on the awareness of this fact and the concern given to it by seafarers when eating and drinking water in foreign countries. However, the quality of the food supplied by shipping agents and carriers among chefs could still bring about instances of outbreaks in ships. In the Danish study the author considered that the relative risk for HAV was only slightly higher among seafarers than in non seafarer population although he commented on taking into consideration that a high proportion of the cases in the general population also are among travellers. This may have underestimated the observed risk for the seafarers. The risk to seafarers was thought to be less than that for the traveller. Hansen in his Danish study concluded that on the basis of its findings and other US studies it can not be recommended that merchant seafarers in general should be vaccinated against HAV. As transmission aboard is rare it was recommended that seafarers from low endemic countries who eat and drink ashore in endemic areas should be advised to be vaccinated. Seafarers regularly doing repair and maintenance of sanitary installations aboard should be advised vaccination. A single dose seems to be effective for inducing rapid sero protection, with a booster dose at month six ensuring long lasting protection. Preventive methods including vaccination schedules are described in the guidelines to be published by this centre.

HEPATITIS B VIRUS

Introduction

Hepatitis B is one of the major human diseases (WHO 1994). It is estimated that more than 2000 million people have been or are affected. As a result of these infections, 350 million people are chronically infected carriers of hepatitis B virus (HBV) and are at risk of death from the long term consequences of HBV infection such as cirrhosis of the liver and primary carcinoma of the liver. These carriers also represent a large reservoir of infection which serves to perpetuate the infection through various modes of transmission. Although it is a preventable disease, through improved work practices and vaccination, unfortunately it does not always happen.

World Situation

In much of the world, HBV is primarily an infection of children, being transmitted from mother to child or from child to child. In Europe, North America and Australia, however, most infections occur in adult 'high risk groups' defined by lifestyle or occupation. In many developing countries more than half the population has been infected by the virus and up to 20% are chronic carriers (Hollinger 1990). Hepatitis B is very common in Asia, China, Philippines, China, Africa and the Middle East (Health on the Internet 1997). In most European countries and North America, known as countries of low endemicity less than 10% of the general population have been infected by the virus, less than 2% are chronic carriers and many infections occur in high risk groups. Nevertheless, acute and chronic HBV infection are important public health problems even in these areas, and the disease is responsible for much morbidity, mortality, economic loss and human suffering.

Clinical course

HBV has an incubation period of 40 - 180 days. The period of infectivity precedes the development of jaundice by 2 - 7 weeks and correlates with the presence of HBsAg in the serum. Five to ten per cent of persons with acute (but often clinically silent) infection develops chronic antigenaemia (Gerberding and Holmes 1994).

Transmission of Hepatitis B Virus

Hepatitis B is a blood borne virus transmitted by direct exposure to blood and other infected body fluids. Children born to infected mothers are at high risk for HBV infection. Breast feeding has been suggested as an additional mechanisms by which infants may acquire HBV infection, because small amounts of Hepatitis B surface antigen (HBsAg) have been detected in some samples of breast milk (WHO 1996). Persons parenterally exposed to blood, including multiply transfused patients, haemophiliacs, dialysis patients, and intravenous drug users, also are at significant risk. Sexual contact with infected partners is another efficient mode of HBV spread. In most industrialised countries adult infections usually are acquired sexually or by intravenous drug use(Gerberding and Holmes 1994). HBV is a relatively hardy virus and can survive on environmental surfaces and on fomites. Transmission in households is well documented and may, in part, be attributable to mucosal contact with fomites contaminated with secretions from infected persons.

Healthcare providers and others at risk of occupational blood exposures through percutaneous, mucosal, or dermal routes can acquire HBV. The risk associated with accidental needle stick inoculation of infected blood to susceptible health care workers varies between 5% to 35% depending on the titre of the virus in the source fluid. In up to 50% of occupational infections, a discrete exposure cannot be identified.

Occupational Risk

The occupational transmission of hepatitis B was first recognised after clinical cases of hepatitis in healthcare workers were associated with out breaks of jaundice in their patients. Subsequent studies showed that healthcare workers had a higher incidence of hepatitis B and a greater prevalence of markers of infection than those who had no occupational exposure to patients or blood products. One study in haemodialysis units in the USA revealed that approximately half of the patients and one third of the employees had evidence of current or previous hepatitis B infection (Szmuness et al. 1974). Furthermore, the prevalence of markers indicating previous infection increased with age and/or years in occupation (Smith et al. 1976, Schiff et al. 1986). It has now become accepted that Hepatitis B is the major occupational hazard to workers in the health care settings and to those who may come into contact with blood or other contaminated body fluids in their work place (WHO 1994). Certain group of seafarers can be considered to fall into this category i.e. the medical attendants on board ships.

Transmission in the workplace

HBV is present in extremely high concentrations (up to 1012 infectious doses per ml) in the sera of patients who are acutely infected or who are HBsAg positive carriers. Infectious fluids include:

◊ blood, blood components and blood products

◊ semen

◊ cerebrospinal, vaginal, synovial, pleural, pericardial, peritoneal and amniotic fluids

◊ other body fluids contaminated with blood

The virus may be transmitted when contaminated blood or fluids penetrate the skin or splash into the eye or onto the mucous membrane of a susceptible individual. In health care activity on board ships, this may occur via needle stick injuries and blood splashes to the eye. Workers in healthcare and other at-risk environments may also become infected by less obvious routes of transmission. For example, infectious fluids may enter pre-existing skin lesions that were acquired at work or home. Such inapparent exposures are rarely reported to the occupational health service. Contaminated medical instruments are rarely responsible for transmission of infection in countries where equipment is sterilised and disinfected routinely. However, contaminated acupuncture needles, lancet devices for blood sampling of diabetics and certain jet guns have been implicated in transmission (Kent et al. 1988, Polish et al. 1992). There have also been cases of transmission caused by inadequately sterilised medical equipment in certain eastern and central European countries.

HBV is not transmitted by the respiratory route, contaminated food or water, insects or other vectors. It is not present in urine or faeces unless these are contaminated by blood. saliva itself does not contain the virus, but saliva in the mouth may contain small quantities of virus excreted by crevicular fluid, bleeding gums or oral lesions. However, saliva is not thought to be important in hepatitis B transmission except in dentistry, where gross bleeding is common.

Studies in workers who may have contact with patients and / or blood and blood products outside hospitals show raised levels of serological markers for HBV infection in paramedics (Table 4.1) and in teachers and support workers in residential schools for developmentally disabled children.

Table 4.1. Prevalence of HBV markers in Paramedics[a]

%HBsAg	%HBV Markers	Control Group %HBV Markers
0.6	13.0	2 - 4
1.1	18.0	
-	22.0	4.5

NOTE: Study done in three places; a - WHO 1994

Epidemiological studies have also shown that HBV markers in those at occupational risk increase with:

◊ length of employment - independent of age, personal injury or assault

◊ increased responsibilities without training

◊ as a function of contact with blood and not contact with patients (Dienstag and Ryan 1982).

Transmission to patients

Transmission of HBV from healthcare workers to patients occurs much less frequently than transmission from patients to healthcare workers. Virtually all cases of transmission to patients occur when HBeAg-positive healthcare workers perform invasive procedures and cuts on their hands bleed into open lesions of patients. Transmission has also occurred when HBeAg-positive healthcare workers with exudative dermatitis performed invasive procedures without gloves.

Hepatitis B among seafarers

Seafarers carry the risk of contracting HBV infection via different routes:

- Sexual contact at ports of call or on board i.e. homo and hetero sexual practices
- Intravenous drug abuse
- When (medical attendants) treating patients who are carriers
- When treated by persons (medical attendants) who are carriers
- Unsafe medical practices using unsterile medical equipment in some countries
- When handling clinical waste

No studies are available to comment whether sexual or intravenous transmission aboard is higher than in the general populations. There have been no studies on transmission by, or, to healthcare workers on board, either.

Research work on Hepatitis B among seafarers is limited. Inferences have to be made with caution using the results of these studies, some on small samples. In this context higher population prevalences, especially from SE Asian countries, must be taken with concern as if studies are conducted on seafarers from these countries a higher prevalence is bound to be demonstrated as a notable proportion could be chronic carriers. The situation among seafarers from other countries is different. Some studies have been conducted on seafarers from non endemic countries. In a Norwegian study a higher prevalence of serological markers for hepatitis B was found than in other groups (Siebke et al. 1989). In multiple regression analysis, years in occupation and casual sex abroad were statistically related to the presence of serological parameters for hepatitis B. A relationship to tattooing was demonstrated on the 10% level, but non was found to medical treatment under unsatisfactory conditions. In another study (Hooper et al. 1988), a very high annual sero conversion rate was found among crew members aboard ships of the US Navy. Shipboard transmission was proposed as an important risk factor because of the crowded living conditions aboard naval vessels). In a comparable study also from the US Navy, however, the sero conversion rate was lower (Hawkins et al. 1992).

Some of the data obtained from recent studies and the current study are presented in the tables below. Table 4.2 shows the Standardised Incidence Ratio (SIR) of Hepatitis B among male Danish seafarers. The incidence of hepatitis B in the age group 15 - 69 was 1.4 cases per 10,000 years for men. SIR for hepatitis B was highest among young seafarers. According to the notifications the mode of transmission among males was intravenous drug abuse in 10 cases, heterosexual contacts outside Scandinavia in 4, and unknown in 4. One of these cases was a mate, but it is unknown if he had performed medical treatment in the period before he got sick and had thus possibly been exposed while performing his duty aboard.

Table[a] 4.2 Hepatitis B among Male Danish Seafarers 1986 - 1993

Age Group	Years of Observation		Number of cases		Expected no. among seafarers	SIR (95% CI)
	General Population	Seamen	General Population	Seamen		
15-19	1,492,488	8,621	33	1	0.19	5.26(0.00 - 30.17)
20-29	3,270,807	46,955	266	12	3.82	3.16 (1.62 - 5.53)
30-39	3,069,170	28,528	124	5	1.15	4.39(1.38 - 10.31)
40-49	3,068,600	27,052	69	0	0.61	0.00
50-59	2,155,069	16,284	26	0	0.20	0.00
60-69	1,836,667	5411	10	0	0.03	0.00
Total	14,892,801	132,851	528	18	6.00	3.02 (1.79 - 4.78)

Note: a - With the courtesy of HL Hansen

Hepatitis infection among Indian Seafarers.

Table 4.3 shows the incidence of hepatitis infection (1992 - 1997) including hepatitis B in a large shipping company in India. The number of Hepatitis B infection ranged from 1 in 1993 to 2 cases each in the years 1994 and 1996. It is difficult to comment on the risk as the age profile of the study group and the age and sex stratified Indian population rates are not known.

Table 4.3 Incidence Rate[a] of Hepatitis Infection among a Group[b] of Indian Seafarers (August 1993 - July 1997)

Type of Hepatitis	1992	1993	1994	1995	1996	1997
Hepatitis A	0.016	0.049	0.049	0.15	0.114	0.049
Hepatitis B	--	0.016	0.032	--	0.032	--
Amoebic Hepatitis	--	--	--	0.016	--	--

NOTE: a - Rate per 100; b = 6091 seafarers per year

Incidence of Hepatitis B Virus in Vietnam

An investigation was carried out among 95 seafarers (66 merchant seamen and 29 military sailors) and 45 maritime workers in the city of Hai Pong in Vietnam, in 1995 (Duc Lung 1997). Assays were done for both hepatitis B surface antigen (HBsAg) and hepatitis B antibody levels. Table 4.4 shows the incidence of HBV infection in the study sample. This study demonstrated that 57.89% of seafarers in the sample had contracted HBV infection.

Table 4.4 Incidence of Hepatitis B infection among a Sample of Seafarers in Vietnam (1995)

The type of Test Conducted	Frequency of Positive cases	Incidence (%) in the Sample
HBsAg (antigen)	25	26.32
HBsAb (antibody)	30	31.57
Total of Infected seafarers	55	57.89

Table 4.5 shows the age stratified incidence rates among the sample participants. HBV incidence (tested by the assay of the antigen) was demonstrated to be higher among the younger age groups and the results were very similar to that observed in the study by Hansen in Denmark.

Table 4.5 Incidence of Hepatitis B Infection by the Age Group of the Seafarer

Age Group	Frequency	Incidence Rate
20 - 29	13	52.00
30 - 39	08	35.00
40 - 49	04	16.00

The proportions of positive cases (HBsAg test) were compared in the two different groups of seafarers i.e. military and merchant. Table 4.6 shows the results of the analysis. Although the merchant seafarers demonstrated a higher incidence, it was not statistically significant (CI = 0.87 - 6.15).

Table 4.6 Comparison of the Incidence of Hepatitis B Infection among Different Groups of Seafarers

Type of Seafarer	The Frequency of Positive Cases	Incidence Rate
Military	21 (n = 66)	31.82%
Merchant	04 (n = 29)	13.79%

NOTE: Relative Risk = 2.31 (CI-0.87 - 6.15)

The incidence of HBV infection was also compared with a different group of on shore workers. Table 4.7 shows the results of the comparison conducted with a group of other Maritime workers in a port. The incidence among seafarers was significantly higher than that of the on-shore occupational group.

Table 4.7 Comparison of the Seafarer Hepatitis B Infection With a Group of on-shore Workers

Type of Occupation	The Frequency of Positive Cases	Incidence Rate
Seafarers	25 (n = 95)	26.32
On shore workers	03 (n = 45)	6.70

NOTE: Relative Risk = 3.95 (CI-1.26 - 12.39)

Hepatitis B among US Navy and Marine Corps Personnel

A prevalence study (Hawkins et al. 1992) of 2072 male US shipboard military personnel scheduled for deployment was conducted from July 1989 to January 1991. Seventy six subjects (3.7%) were sero positive for anti HBc, five had HBsAg (Table 4.8). There was a general trend of increasing prevalence of anti HBc with increasing age: 2.2% in subjects 18 - 24, 7.2% in subjects 25 - 34, and 8.3% in subjects > 34 year of age. Anti HBc was found most commonly in Filipino subjects and in those borne outside the United States. Analysis of prior assignments indicated an increased risk of anti HBc positivity in participants who had been deployed (<12 months) to the South Pacific or Indian Ocean and who had been on duty (>1 year) in the South Pacific or the Mediterranean. The prevalence of anti HBc was higher in the 387 subjects (19%) with a history of STDs; 6.7% vs 3.0%; P = 0.007). Although

there was an association between prior prostitute contact and STD (P <0.001), there was no significant association between prostitute contact and anti HBc positivity.

Table[a] 4.8 Hepatitis A Seroprevalence in 2072 US Navy and Marine Corps Personnel

Factor analysed	Frequency of Anti - HAV seroprevalence	Prevalence (%)*
Rank		
Enlisted	73 / 1986	3.7
Officer	3 / 85	3.5
Race/ethnicity		
White	43 / 1485	2.9
Black	20 / 385	5.2
Hispanic	3 / 147	2.0
Filipino	7 / 17	41.2
Other	3 / 36	8.3
Birth location		
United States	61 / 1932	
Foreign	15 / 140	
Prior deployment		
Caribbean	33 / 951	3.5
Mediterranean	34 / 842	4.0
Scandinavia	8 / 131	6.1
Okinawa	6 / 271	2.2
South Pacific	23 / 235	9.8
Africa	0 / 14	0
Prior duty		
Mediterranean	7 / 36	19.4
Okinawa	6 / 97	6.2
South Pacific	9 / 52	17.3

NOTES: a - (from Hawkins et al. 1992.); * Variations in denominator totals reflect incomplete responses to questions. HAV, hepatitis A virus; Hbc, hepatitis B core antigen. + deployment, <12 months; duty > 12 months

A study in Belgium

In a study (Verhaert et al. 1993) conducted in Belgium, Verhaert et al. found 227 positive cases of among 599 seafarers visiting a port in Belgium, an incidence rate of 38%. Fourteen percent of these positive cases (32/227) were carriers. Of these carriers some persons still carried the hepatitis B surface Ag. These persons were able to transmit the disease by each sexual or blood contact. These findings were slightly lower than in an earlier study where they observed a positive serology in 42% of persons, and a positive carrier status of 10%. These high rates were thought to be due to the distribution of nationalities in the study sample.

A study in the UK (Liverpool)

In a study (Bellis et al. 1995) of 279 sailors arriving at the port of Liverpool in the UK, the presence of core antibodies for HBV was tested in saliva i.e. indicative of an infection at some point with hepatitis B. Of the tests 12.2% (34/279) gave a positive result, with no equivocals. prevalence of previous exposure to hepatitis B was found to be significantly associated with the continent of origin (i.e. birth) of the seafarers with the prevalence among the Asians being almost 75% greater than the next highest group (North America and Western Europe).

A study in Spain

Medical documents of 2348 seafarers attending health clinics in Spain were examined for hepatitis B incidence in 1988 (Cerdeiras et al. 1990). Ninety eight seafarers who had symptoms suggestive of hepatitis were investigated for hepatitis B and C infection. Of the 98 cases 50 (51.02%) had serum markers for hepatitis B virus while 18 (18.36%) had HBsAg antigen. All age groups (of 10 years between <20 to > 60) had Hbs Ag positive (>20%) except in the age group 30 - 39 in which the prevalence was 14.7%. This study however, could not be considered a true prevalence study as only those seafarers who presented with symptoms were examined leaving a group of carriers without being examined.

Discussion

The studies relating to the incidence or the prevalence of Hepatitis B are few. In the Danish study the author, also taking some other Scandinavian and US studies into consideration, concludes that shipboard transmission of any importance in merchant ship as unlikely. One of the major reasons given was the fact that the life aboard merchant ships being not crowded today, where almost all have their

own cabin, and with no more physical contact than at work places ashore. Whether one could generalise the living conditions on board is doubtful. However, the incidence rate, but in a small sample study in Vietnam revealed different statistics. There is a likelihood that the higher population prevalence rates found in countries in SE Asia are carried to their work places. This argument, however, could be challenged if the incidence of hepatitis B among merchant seafarers in the Vietnam study is compared with that of military seafarers and the onshore occupational group; merchant seafarers showed significantly higher rates. It is, therefore, difficult to generalise the comment made by the Danish author although it is quite acceptable in the Scandinavian context. Further in-depth studies should be carried out using large seafarer samples from Asia and other developing countries if we are to infer findings to the international population of seafarers. These studies should not merely evaluate the incidence and the prevalence, but also examine the plausible causes for the higher incidence of hepatitis B infection among seafarers.

If we, at the present juncture, accept that there is a risk of hepatitis B to seafarers we should advocate effective preventive measures including effective health education which should, on the long term, reap benefits to the global seafarer population. Possible routes by which a seafarer could contract Hepatitis B were described earlier. Methods of prevention including vaccination against Hepatitis B infection are described in the separate publications to be made on prevention.

Placement of employees

There are also other issues that have to be addressed. Placement of seafarers known to be carriers or who have suffered with HBV infection is an important issue to be discussed. At risk workers who make a full recovery should not be restricted from working. Those who become chronic carriers may be candidates for treatment with interferon, which may result in significant clinical improvement, and even loss of antigen, in those for whom treatment is indicated. When treatment is not successful, the worker should be provided with individual counselling from experienced occupational health professionals or infection control specialists. They should not have their work practices restricted as a routine measure (WHO 1994). Work practices should be examined to decide whether non-invasive procedures can be substituted or if correction of previously faulty technique will remove the risk of transmission.

HEPATITIS C INFECTION

Introduction

Hepatitis C virus (HCV) a blood borne pathogen is considered by many as the silent epidemic of the past two decades (Cohen et al. 1997). The existence of other types of hepatitis than hepatitis A and B, formerly called "non A, non B hepatitis", has been known for years (Hansen 1996a). But only since 1989 has it been possible to diagnose antibodies to hepatitis C (Kuo et al. 1989). Till recently there were diagnostic problems, and newer serological methods are under development (Waumans et al. 1993, Uyttendaele et al. 1994)). The virus is mainly transmitted parenterally via blood, but it may in some cases be transmitted sexually (Garcia-Bengoechea et al. 1994), though several earlier studies have failed to identify sexual transmission of importance (Bresters et al. 1993, Shev et al. 1991). However, a recent study (Marshal 1998) in the United Arab Emirates (UAE) has suggested that hepatitis C can be transmitted through sexual contact. In a case control study (Salleras et al. 1997) it was observed that the relative risk of HCV infection increased according to the increased number of sexual partners. The research group considered that sexual transmission must be considered a possible mode of infection in HCV infected persons without parenteral exposures. Hepatitis C is mainly transmitted by percutaneous exposure to the virus, although it may in some cases have other modes of transmission including tattooing and sexual transmission (Seeff 1995, Ko et al. 1992). Acute hepatitis C leads to symptoms in a minority of cases. Its clinical course is mild, and only 10% cases become jaundiced. However, HCV infection persists in 50% - 80% of acutely infected individuals (David et al. 1994, Van der Poel 1991), usually leading to chronic persistent or chronic active hepatitis with 20- 30% patients developing cirrhosis (David et al. 1994, Van der Poel 1991, Esteban et al. 1991). In one study the prevalence of hepatocellular carcinoma was 19% (Takahashi et al. 1993). Thus the health consequences of an HCV infection are potentially serious.

Global Situation

HCV infection is widespread throughout the world (WHO 1997). WHO estimates that up to 3% of the world's population has been infected with HCV. There may be more than 170 million chronic carriers at risk of developing liver cirrhosis and/or liver cancer. Published studies on the prevalence of hepatitis C in various subgroups of the population world-wide showed rates from 05 to 70%: in many countries, for example, the prevalence of HCV is very high among drug users. The estimated prevalence of HCV varies geographically (Van der Poel et al. 1994). The prevalence among blood donors in Japan, the southern part

of the USA, the Mediterranean countries of Europe, Africa, and the Middle East ranges from 0.5% to 1.5%, where as in Northern Europe, the Northern part of USA, and Canada it is 0.01 - 0.05% (Van der Poel et al. 1994).

Hepatitis C among Seafarers

Hansen (1996a) in Denmark examined the hepatitis C situation among the Danish seafarers. In a study of 515 seafarers attending a health clinic antibodies against hepatitis C were found in 6 subjects: 5 Danes (prevalence 1%) and one non Scandinavian. The prevalence for males was 1.2% (Confidence interval 0.4% - 2.8%). Three of the 5 positive Scandinavians were also positive for hepatitis B antibodies. All five had tattooing done and sex abroad. A study among Spanish seafarers showed increased prevalence in this group (Ollero et al. 1992). The main risk factor was former intravenous drug use, but tattooing was also found to be an independent risk factor.

In a prevalence study (Hawkins et al. 1992) of 2072 male US shipboard military personnel scheduled for deployment to South America / West Africa and the Mediterranean, 9 (prevalence of 0.4%; mean age -29 years) were positive for anti-HCV by immunoblot assay and one of them was also positive for anti HBc. Eight were white and one black. None of them were transfused or had a history of jaundice. Three had a history of an STD, and 7/9 had a contact with a prostitute.

Discussion

Studies on hepatitis C among seafarers are few. As such it is difficult to comment on the risk involved to the population of international seafarers. Hansen's comparison with the general population of Denmark was thought to be an overestimate as he considered that hepatitis C was more common than the prevalence rate estimated from blood donors in the general public, with which he compared his findings. In his conclusions he commented that as hepatitis C seems to be transmitted sexually only to a limited extent, that such mode of transmission was not of significance. This comment can be, however, challenged by the findings of the above described US Navy study. Further, WHO's estimation of a higher prevalence among drug abusers prevents us ignoring that mode of transmission in our prevention strategies. In general, the prevention recommendations against HIV HBV and HCV should be the same. Measures to prevent should include:

- Effective compliance with recommended universal precautions and barrier techniques (e.g. use of sterile equipment and gloves)
- Destruction of disposable needles and adequate sterilisation of reusable material and instruments
- Health education (on sexual behaviour, drug abuse, tattooing etc.)

TUBERCULOSIS INFECTION

Introduction

Tuberculosis is caused by *Mycobacterium tuberculosis* and, rarely today, by *M bovis*. The incidence of TB declined till 1980s but a resurgence has caused an alarm among the health professionals. The resurgence of the disease is more evident in some developing countries e.g. India, China and Brazil. The reason for this increase is not entirely known, but the concurrent HIV epidemic and crowding of homeless individuals are certain major factors. Tuberculosis is transmitted by inhalation of aerolized droplet nuclei derived from the respiratory secretions of patients with active respiratory TB. Prolonged exposure is usually required. Ingestion of unpasteurised milk from cows infected with *M Bovis* is no longer an important source in most industrialised countries.

Seafarers are usually screened for active TB before recruitment. The prevalence of TB in developed countries being minimal or negligible, seafarers from these countries are more or less free of the disease. The situation in developing countries, where TB is endemic, is somewhat different. Although it is expected that seafarers are free of "active" TB, the sensitivity and specificity of the tests used for identification, transmission ashore in countries where prevalence is high, re-activation of the illness among active seafarers and rare instances of on board transmission may still contribute to the presence of the disease among seafarers.

Clinical course

Primary infection usually is asymptomatic in adults. Teenagers and young adults are at higher risk for rapid progression to active disease, than the older adults. Primary TB in persons with advanced HIV infection is commonly asymptomatic and progressive.

Once the infection sets in, the organism may disseminate from the lungs to other sites, including the gastrointestinal and genitourinary tracts and bone. Normally the infection is contained by the host's immune response at this stage. The risk for reactivation is highest in the first year after exposure and declines thereafter. However, ageing and stressors such as immunosuppression (e.g. HIV), intercurrent illness, and chronic malnutrition may increase the risk for reactivation or dissemination of the disease.

The Global Tuberculosis Situation

An estimated 8.9 million people developed TB in 1995, bringing the global total of sufferers to about 20 million, of whom about 3 million will have died in the same space of time (WHO 1997). This huge toll is the price the world is paying for complacency. It is the cost of learning that TB is not, after all, a disease of the past. The magnitude is such that WHO declared it a global emergency in 1993. About 95% of the sufferers are in the developing world, with South East Asia, the Western Pacific and Africa the worst affected regions. To make the global situation worse, TB has formed a lethal partnership with HIV infection. Tuberculosis is an opportunistic infection that most frequently kills HIV-positive patients.

Tuberculosis among Seafarers

Exposure to TB may occur ashore in countries where TB is common, or from infected seafarers. It can spread rapidly aboard crowded naval vessels, as had occurred in US naval vessel (Distasio and Trump 1990). Studies on TB too are few. Hansen examined the incidence between 1990 - 1993 (Table 6.1). He found 9 cases of TB among male seafarers during this period. The standardised incidence ratios (SIRs) for male seafarers were non significantly elevated.

Table[a] 6.1 Standardised Incidence Ratios for TB among Danish Seafarers (1990 - 1993)

Age Group	Years of Observation		Number of Cases		Expected No. of cases	SIR (95% CI)
	General Population	Seafarers	General Population	Seafarers		
15 - 19	730,226	4069	20	0	0.11	-
20 - 29	1,636,215	29,714	159	1	2.89	0.35 (0.01 - 1.93)
30 - 39	1,528,630	17,599	154	4	1.77	2.26 (0.62 - 5.79)
40 - 49	1,586,849	15,525	149	3	1.46	2.05 (0.42 - 6.00)
50 - 59	1,111,286	9,782	83	1	0.73	1.37 (0.03 - 7.63)
60 - 69	901,978	3,816	82	0	0.35	-
Total	7,495,184	80,505	647	9	7.31	1.23 (0.56 - 2.34)

NOTES a - (from Hansen 1996a)

Tuberculosis status among Indian seafarers are shown in the Table 6.2 below. The incidence varied between 0.016% to 0.113% per annum. The incidence rate in 1997 (0.11% i.e. 1125 cases per million) was closer to the crude incidence rate (0.12% i.e. 1213 cases per million) among the general population of India. There was also an increasing trend observed in the incidence from 1993 to 1997.

Table 6.2 Incidence of Tuberculosis among Indian Seafarers

The Year	Number of Cases	Incident Rate per 100
From 1992 June	1	0.032%
1993	1	0.016%
1994	3	0.049%
1995	5	0.080%
1996	5	0.080%
Till 1997 July	4	0.113%

NOTE: The crude incidence rate among the general population = 0.12%

Discussion

The incidence of TB among Danish seafarers was found to be close to the incidence in the rest of the population, although a few cases may have been caused by exposure aboard or ashore in endemic areas. The situation of TB among Indian seafarers can be considered serious with the incidence rate in 1997 being almost equal to that in the general population. This may be a reflection of the (i) pre-recruitment medical screening procedure (ii) reactivation of old infection or (iii) transmission of disease aboard or ashore at ports of call, issues that have to be examined more closely to plan preventive measures.

The general increase in TB world-wide and recruitment of seafarers from endemic countries who have escaped the screening process will continue to be a threat to the shipping industry. Tuberculin testing, BCG vaccination should be made compulsory at least in countries where TB is known to be endemic, together with Xray evaluation of the chest. With more and more multinational crews aboard being the norm, rather than the exception, serious thought may have to be given in the future regarding vaccination of seafarers from non endemic countries before they join ships. Continuous monitoring of the epidemiological situation globally and among seafarers is necessary to identify the trends.

CONCLUSION

This study examined the current situation on an identified group of infectious diseases with reference to seafarers. The main issue that has surfaced out of this exercise is the fact that there is no proper maintenance of statistics on seafarer health indices in most countries including the developed and reputed maritime nations. This situation makes it almost impossible to make firm conclusions on the risk posed to international seafarers from these infections. However, the few studies that have been published and the unpublished data point out more in favour of risks rather than not. Hansen in Denmark conducted one of the most comprehensive studies. There are also other studies (as described earlier in the text) conducted by Scandinavian, European, US and former Soviet Block nation researchers. Recently two important studies conducted on seafarers from Vietnam (hepatitis B) and Ethiopia (HIV) have been published. These add more information to the depleted stores of information. The important aspect of these two studies are that they have been conducted among seafarers from developing countries which are also situated in the tropics. These two studies were on infectious diseases which are known to be transmitted via sexual intercourse or by contact with other infected body substances. They were also conducted in countries where the infections were highly prevalent among the general population. The interesting finding was that in both studies the risk of infection (HIV and HBV) among seafarers was higher than among the general population. Such a finding refutes the general belief that the higher prevalence of certain infections among seafarers recruited from nations where such infections are endemic is a reflection of their higher prevalences in the general population.

Malaria has demonstrated it to be an infection of much concern. Some of the plausible reasons for the higher risk are the non use of prophylactic drugs, the prescription of drugs not appropriate to the geographical region of travel i.e. not effective against the malaria species prevalent in such regions, the presence of more than one parasite species in rare instances at ports of call and the resistance to prophylactic anti malarial drugs. Fatalities are thought to be due to the delayed calls for medical assistance by medical attendants on board, possible lack of effective drugs on board and in almost all cases *M.falciparum*, the deadly form of the parasite which could result in cerebral malaria, being the cause. If the numbers of fatalities are to be decreased these issues have to be addressed.

Availability of a vaccine and immunoglobulins against the infection, and the good prognosis of the disease make hepatitis A, a less risky infection. However, the influence of other life style factors, especially the consumption of alcohol during the recovery period could bring harm to a recovering seafarer. Also the morbidity due to hepatitis A infection could be a burden to the shipping companies especially in instances of epidemics. The seriousness of hepatitis B and C have been discussed in the respective sections. There is no clear indication of whether there is a risk of transmission of these infections aboard. As far as findings of current research are concerned such a risk is minimal. Therefore, all efforts should be diverted to fight against transmission ashore, especially transmission via sexual intercourse. There is a need to conduct more research to find out the reasons for the increase in transmission sexually transmitted blood borne infections like HIV, HBV and HCV, although many seafarers are aware of the modes of transmission and the precautions that they should take.

The risk of Tuberculosis infection to seafarers is not clearly demonstrated, possibly because the number of research studies conducted so far are limited. In India, the incidence was high, almost equal to that of the general population, which is one of the highest in the world. The high incidence may be a reflection of the prevalence in the general population. However, if the medical screening procedures are well conducted such high rates should not be expected. If screening procedures are good, the higher incidence may be due to reactivation of old infection or contracting the disease on board or ashore after recruitment.

One of the objectives of this study was also to draft preventative guidelines against the selected group of infections. This has been done separately so as to publish them as booklets to be available for (i) medical officers and medical attendants and (ii) seafarers. One of the issues that has been considered in drafting the guidelines is the different nature of risk to seafarers, especially the short periods of stay at ports compared to the earlier sailing days. Attention is also being paid to prevent transmission of infection via sexual intercourse and improving both eating habits and food hygiene when visiting ports abroad. In the case of Malaria, issues on drug resistance and prophylaxis have been addressed.

Drafting preventive guidelines should not be the only means to lessen the risks of infections among seafarers. Other avenues such as adopting appropriate national medical standards, which will in turn screen diseased seafarers, health education (which of course forms a part of the guidelines) during pre-sea and refresher training courses etc. should also be made use of to prevent both infectious diseases and other non communicable diseases.

This study has attempted to examine the current situation with limited data resources and lack of response to provide data and statistics, from many partners that make the shipping industry. However, the study has collated a substantial portion of the current published and unpublished data and statistics to make the report a useful tool for future researchers, health professionals involved in maritime health and the industry as a whole.

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