

Public health significance of chickenpox on ships — conclusions drawn from a case series in the port of Hamburg

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ABSTRACT

Background: Despite international notification requirements, the magnitude of disease transmission on board ships remains undetermined. This case series aims to exemplify that varicella aboard ships is a topic of interest for maritime medicine and of public health significance.

Material and methods: Systematic presentation of cases of chickenpox reported to the Hamburg Port Health Authority between November 2007 and April 2008. A systematic literature search on “ships and chickenpox” was performed.

Results: Five crew cases of chickenpox were reported from two passenger ships and two cargo ships. The cases originated from Indonesia (2), the Philippines (1), and Sri Lanka (2). Three cases were notified by the shipmaster, one by a general practitioner, and one by the immigration service. Sources of infection were other crewmembers, passengers, and persons in the home countries.

Conclusions: This description of five varicella cases aboard ships points to the significance of the disease among seafarers. Many seafarers originate from tropical countries where seroconversion to varicella zoster virus generally occurs in late adolescents and adults. Thus, a substantial portion of the crew may be non-immune and have the potential to introduce the disease from their home country to the ship, or are at risk for infection on the ship. Port health authorities, shipmasters, and doctors need to be well informed about the relevance of chickenpox on ships and the recommended control measures. Travellers should be advised to report to the ship doctor with any signs of infectious disease.

Key words: chickenpox, immunity, ships, sanitation, public health, international health problems

BACKGROUND

Shipping creates an environment in which the spread of communicable disease is favoured due to the living and working conditions on the ship. The risk of infection with Varicella Zoster Virus (VZV) for people travelling in the semi-enclosed environment of a ship is characterized by a medium-long incubation period and very high infectivity, life-long immunity after infection, and the availability of a safe vaccine.

Shipmasters are required to notify Port Health Authorities about infectious diseases on board under International Health Regulations (IHR) 2005 [1] and national laws. Despite these notification requirements, the magnitude of disease transmission on international ships is unknown: No international surveillance specifically committed to shipping exists at present. Public health surveillance and control in ports differ substantially between nations and frequently

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The case series was reported in the weekly surveillance report of the Robert Koch Institute (National Public Health Institute in Germany): Epidemiologisches Bulletin Nr 14, www.rki.de

even between different ports in the same country and do not, with a few exceptions [2, 3], result in the systematic evaluation and publication of data. Even where surveillance of disease is entertained in ports, underreporting of disease by shipmasters is likely: Often, shipmasters are not fully aware of notification requirements or avoid notifications out for fear that this action will cause retardations or penalties. Since there is a lack of epidemiological data on the occurrence of communicable disease transmission on ships, case reports are an important source of information to port health authorities, ship and travel doctors, and ship owners about health risks on ships.

The case series presented by the Hamburg Port Health Centre of the Institute for Occupational and Maritime Medicine aims to exemplify that professionals in maritime medicine and port health authorities need to be prepared for the occurrence of chickenpox on ships.

MATERIAL AND METHODS

Data on cases of varicella were retrospectively collected from the charts which are produced and kept by the Hamburg Port Health Centre. A standardized form was used to retrieve the data from the charts in a six-month period from November 2007 to April 2008. The names of patients and ships were omitted to ensure confidentiality of data. The data collected from charts comprised age, sex, occupation on board, country of origin, travel history, potential source of infection, clinical picture, immunization, therapy, and control measures, and the particularities of the ships. A literature search on cases of chickenpox on ships was performed. The MESH terms – ships and chickenpox – were used to search the PubMed database and the maritime library of the Hamburg Port Health Centre of the Institute for Occupational and Maritime Medicine (www.hphc.de).

RESULTS

In the time period observed, five cases of chickenpox from two passenger ships and two cargo ships were notified to the Hamburg Port Health Centre. To the knowledge of the Hamburg Port Health Centre, no passengers on the ships were affected. The patients were male only, between 26 and 42 years old. Their countries of origin were Indonesia (2), the Philippines (1), and Sri Lanka (2). On both cruise ships, the majority of passengers were UK residents.

Three cases from two cruise ships were notified by the Maritime Declaration of Health. Shipmasters had also notified preceding European ports but did not experience any response from the port health authorities. One case was notified by a general practitioner in Hamburg to whom the seafarer was referred. In one cargo ship, the shipmaster did not declare any disease by the Maritime Declaration of

Health. The disease was notified only after the immigration officer asked him to do so.

All patients were diagnosed clinically. On one cruise ship the index case was reported as a sick child on a preceding cruise. On one cargo and one cruise ship the index-patients had started a new contract, arriving directly from their home countries, Indonesia and Sri Lanka, during the incubation period. In the case of the other cargo ship, the (index-) case was a crewmember from the same ship, who had been to his home country, Sri Lanka, six weeks ago and had experienced the disease on the ship three weeks after commencing his contract. On one feeder-ship, the source of infection remained unknown.

Shipmasters from all ships had prompted isolation of the cases of the disease with the occurrence of a skin rash. The cases were isolated in their cabins.

The public health measures recommended by our service were:

- Isolation in cabin until scabs resolve, person-to-person contact only with immune crew members.
- Informing crew and passengers on the need to present to the ship doctor or master upon occurrence of symptoms (fever and rash) for reasons of passive case-finding.
- Informing crew and passengers about the option of post-exposure vaccination within 72 hours if new cases occur.
- Informing special risk groups, such as pregnant women (cruise ships only).
- Informing next port according to Art. 27 (2a) IHR 2005 and production of an attachment to Ship Sanitation Exemption Certificate acc. Art 27 IHR 2005, so that port health authorities can monitor the occurrence of further cases and the adherence to control measures.

Overall, the shipmaster, doctors, and crew were cooperative and followed the recommendations (Table 1).

A MEDLINE literature search with the MESH terms "ships" and "chickenpox" revealed one published report on communicable diseases, including chickenpox, in the US Navy [4]. In the maritime library of the Hamburg Port Health Centre, ZfAM, an abstract from the 2009 conference of the International Maritime Health Association in India was available. It describes a sero-survey from India. The author, N. Idnani, tested 121 Indian seafarers during pre-employment exams in the year 2008 for varicella IgG and IgM. Out of these, 16.53% tested IgG negative and were administered the vaccine [5].

DISCUSSION

Chickenpox is a highly contagious rash illness transmitted by airborne or droplet pathway and by person-to-person contact with a mean incubation period of 14 (10–21) days.

Table 1. Summary of Cases and Control measures

Month/ /year	Ship/ /flag	Route	Crew	Notification	Cases of illness	Measures taken	Comments
11-07	Feeder-ship Cyprus	Baltic Sea	13	By private practitioner to port health authority	Chief officer, age: 41 years from Sri Lanka	Informed next port health authority	Ship had departed by the time port health authority was notified. Source of infection not known
12-07	Cruise ship Bahamas	Europe	377 passengers 776	By shipmaster via maritime declaration of health to port health authority	Waiter age: 42 years from Indonesia. Rash for 6 days Waiter age: 33 years from the Philippines. Rash for 4 days	Cohort isolation in cabin Informed crew and passengers Informed next port health authority	Index case was probably a child who travelled with his/her parents on board
2-08	Cargo ship Liberia	Mediterranean	28	Port health authority notified by immigration service No declaration of disease by shipmaster	Engineer age: 26 years from Sri Lanka. Rash for 8 days	Isolation Informed next port health authority Post-exposure vaccination recommended with subsequent cases	Index case (from Sri Lanka) was a crew member on the same ship. The symptoms occurred 3 weeks earlier
4-08	Cruise ship Malta	USA/Caribbean	882	By shipmaster via maritime declaration of health	Steward age: 35 years Indonesian Rash for 7 days	Isolation in cabin antiviral treatment Informed crew and passengers Informed previous and next port health authorities	Index case was crew member who came on board from his home country 3 weeks previously Source of infection not known All British passengers left the ship the day before its arrival in Hamburg

Secondary attack rates reach close to 90% in susceptible household contact. While it is mostly a mild disease in healthy children, serious complications may arise in adults, the immunocompromised, pregnant women, and infants. VZV predominantly affects children in temperate countries, with near-universal seroconversion by late childhood. However, the epidemiology changes when vaccination is introduced in routine childhood immunization schedules. This is the case in countries such as Germany, the United States,

Uruguay, Qatar, Australia, Canada, and South Korea. The epidemiology of chickenpox is even more complex in tropical and subtropical regions where seroconversion generally occurs in late adolescents and adults and might be less likely in rural areas than in urban areas [6, 7].

A large part of the work force on ships originates from (South-East) Asia and Eastern European countries. Port health doctors, ship doctors, and the shipping management need to be aware that a substantial portion of their employees from

Asia and Africa may be non-immune to VCV. As seen in our case series and from the seroepidemiological studies in India, non-immune employees may introduce the disease from their home countries to the ship if they start a new contract within the incubation period, and are at risk to be infected by children or other crew-members on board ships. Therefore, it may be a prudent decision to include a test of VZV serostatus and subsequent immunization – if needed – in the pre-employment exam to protect disease transmission and morbidity in persons at risk on cruise ships, as suggested by Idnani [5].

Neither the case series presented in this paper nor the results of the literature search allow the quantification of the incidence of chickenpox on ships in international waters. A Google search of varicella and seafarers revealed 1010 hits and a search of varicella and cruise ships 9220 hits (last access February 2010). This is in contrast to the rarity of published reports of outbreaks of chickenpox onboard ships in the scientific literature. We suggest that there is a publication bias to the occurrence of gastrointestinal and waterborne diseases. This may be the result of the focus of specific public health programs such as the Vessel Sanitation Program [2] on water and food sanitation. Schlaich et al. conducted an epidemiological study on the incidence of communicable diseases during more than 1.5 million person-days at sea in cargo ships under the German flag. In this study, out of 68 outbreaks, 66 were caused by acute respiratory infections and only two by gastrointestinal disease [8].

In the authors' experience, the assessment of the medical and public health significance of chickenpox onboard varies substantially between health professionals, depending on the country of origin and the specialty practiced. This may result in contradictory recommendations and actions in ports. The European Centre of Disease Control (ECDC) recognized the need for guidance in connection with ongoing varicella transmission among crew members of a large Italian cruise ship. Ten crew members were reported sick to the European Warning Response Network (ERWS) of the European Public Health Authority. The ECDC published risk assessment and public health advice regarding this in the year 2008, which mentions not only isolation of the sick persons, but also post-exposure prophylaxis (vaccination and VZ – immunoglobulin) and active surveillance [9]. On ships without a medical doctor on board, the widely used International Medical Guide for Ships, 3rd edition, published by the World Health Organization [10] gives clear and easy-to-follow recommendations for diagnosis and for the required action by the shipmaster.

In this case study, only three out of five cases of disease were notified to the port health authorities by the shipmasters by use of the Maritime Declaration of Health, as required by the IHR (2005). On average, the Hamburg Port Health Centre received 700 Maritime Declarations of Health monthly, from both passenger and cargo ships, in the years 2007 and

2008. Underreporting of cases of disease, to an unknown extent, is to be assumed. There may be several explanations for this. In many ports, notification of disease is neither enforced nor made technically simple (e.g. missing or non-functioning contact details). Shipmasters may avoid alerting the port health authorities due to fears, or experience, that notification will cause delays or penalties. On the other hand, shipmasters often report that no action is taken by port health authorities despite them notifying disease onboard.

It can be concluded that cruise ships must have clear policies for shipmasters and doctors for when cases of chickenpox occur on board. For the population of seafarers from tropical or subtropical countries, tests of VZV serostatus and subsequent immunization during the pre-employment exam is a consideration and may even be cost-effective. Passengers of cruises should be advised to report to the ship doctor with any signs of infectious disease. Travel doctors could advise travellers on vaccination in non-immune persons at special risk before departure. The risk assessment of the European Centre of Disease Control [9] guides the port health authorities in deciding on the appropriate control measures when confronted with the occurrence of chickenpox on board ships. For appropriate case management, the responsible medical person needs a thorough knowledge of the natural history of the disease in healthy and at-risk persons and must be aware of the global epidemiology and national vaccination schemes of VZV.

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