

SHORT REPORT

Vibrio vulnificus septicaemia in Japan: an estimated number of infections and physicians' knowledge of the syndrome

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(Accepted 12 March 2004)

SUMMARY

Questionnaire surveys were implemented to study the incidence and physicians' knowledge of *Vibrio vulnificus* infections in Japan. Registered emergency physicians were selected by stratified random sampling for a questionnaire survey. A total of 235 out of 386 physicians (61%) responded to the questionnaire and 12 *V. vulnificus* septicaemia cases were reported from 10 respondents. The annual estimated number of *V. vulnificus* septicaemia was calculated as 425 (95% CI 238–752). The study also revealed that only 15.7% (95% CI 11.3–21.0) of responding physicians had a basic knowledge of *V. vulnificus* infection. Education for both physicians and people in the high-risk group for developing the infection (e.g. immunocompromised, chronic liver disease) will be necessary for the prevention, early diagnosis and appropriate treatment of the disease.

Vibrio vulnificus grows in warm estuaries and seawater. It can cause septicaemia, which is life threatening, especially for the immunocompromised or people with chronic liver disease. The infection has been a leading cause of seafood-related deaths [1]. The food implicated in most reported cases has been raw oysters. Illness occurs after ingestion of the seafood or exposure to estuarine water; oysters harvested in warmer months are major vehicles of the disease in the United States [2]. The clinical course is very acute and severe and one third of patients with *V. vulnificus* infection go into endotoxic shock in a few days following exposure to the organism with up to a 50% case fatality rate [3, 4]. Despite the limited data available on the epidemiology of the infection, approximately 70–90 cases of *V. vulnificus* infections

are reported annually in the United States [5] and 40–50 septicaemia cases are reported in South Korea [6].

Japan is the largest importer and biggest consumer of seafood in the world [7]. Many types of seafood, especially oysters, shrimp and the other crustaceans are often eaten raw or undercooked. Most Japanese people may, therefore, be at high risk for foodborne microbial infections from seafood. There are more than 400 outbreaks reported annually due to *Vibrio parahaemolyticus*, involving 3000–9000 people, and most of them were associated with the consumption of raw or undercooked seafood [8]. Furthermore, more than 2 million people are estimated to suffer from chronic liver disease, an important risk factor for *V. vulnificus* infections [9]. Sampling tests showed approximately 30% of local oysters (species not suitable for human consumption) were contaminated with *V. vulnificus* [10].

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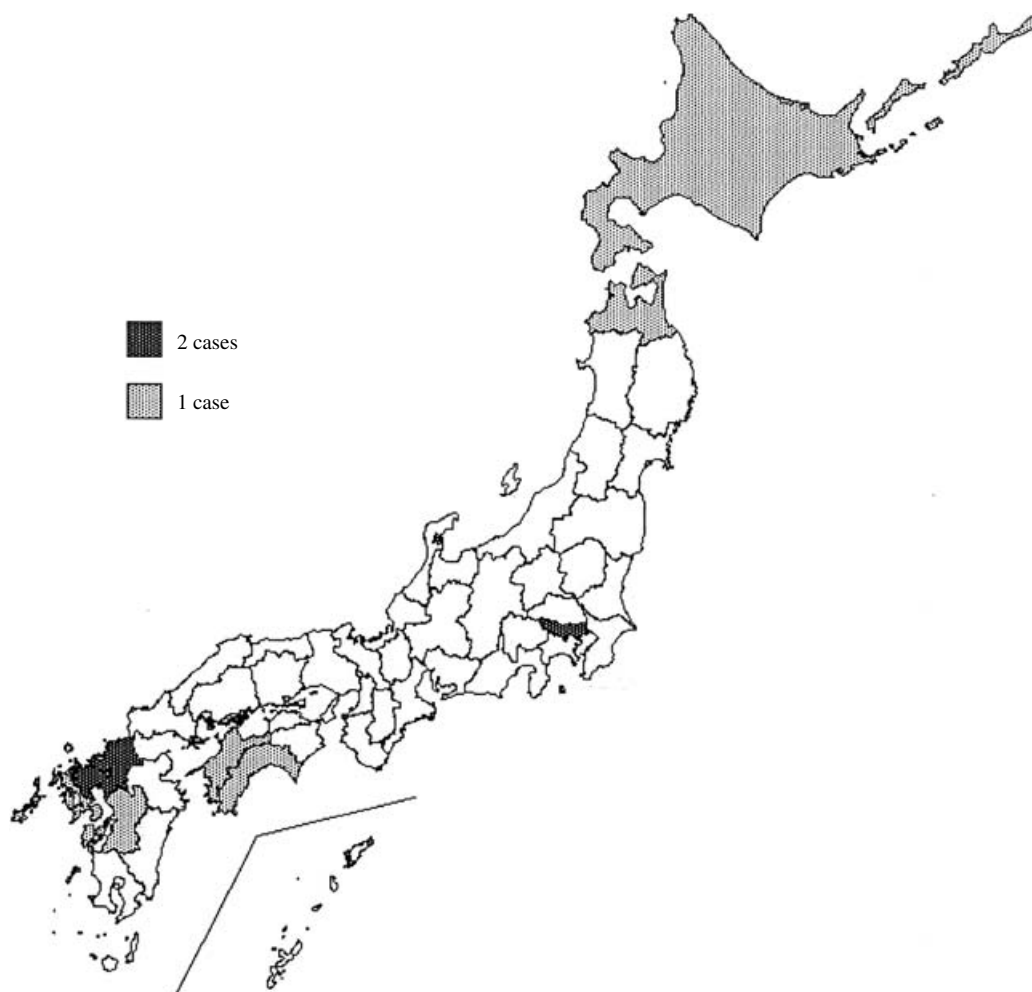


Fig. Map of Japan showing the number and distribution of *V. vulnificus* septicaemia cases reported in each prefecture.

As a result of risk behaviour and host factors, seven cases of *V. vulnificus* infection with three fatalities were identified in Kumamoto prefecture during the summer season (29 June to 18 July). Most cases were associated with consumption of uncooked Japanese mantis shrimp (*Oratosquilla oratoria*) [11].

However, the overall public-health impact of *V. vulnificus* infections has not been evaluated in Japan. The infection is not widely recognized and it is not included in the national notifiable diseases list. From 1978 to the end of 1999, only 93 *V. vulnificus* infections were reported in Japanese scientific journals [12]. To assess the public-health impact of *V. vulnificus* infections, we estimated its annual number of septicaemias and examined the knowledge of physicians of the disease by means of a questionnaire survey.

We developed a self-administered survey that included questions about place of work (i.e. prefecture),

clinical specialities, years since medical school graduation, number of patients diagnosed with *V. vulnificus* infections during the year 2000, and basic knowledge of *V. vulnificus* infections (i.e. mode of transmission and clinical symptoms). Physicians in emergency rooms and intensive care units were specifically targeted to find emergency cases. The Japanese Association for Acute Medicine (JAAM) is the largest medical association for emergency medicine in Japan with a membership of 8324 physicians, 3.3% of all physicians in Japan. In addition to the emergency room, JAAM members serve in other specialities such as internal medicine and surgery. After implementing a pilot study, 386 member physicians from 323 facilities were selected by prefecture-stratified random sampling using the JAAM membership directory for the year 2000. Questionnaires were mailed to the physicians' work-places in February 2001, and responders were requested to reply anonymously

by the end of March 2001. A follow-up letter was sent to all targeted physicians. For statistical analyses, the χ^2 test was used with Epi-Info version 6.04b software.

Of 386 JAAM members selected, 235 (61%) responded to the questionnaire. Twelve *V. vulnificus* septicaemia cases were reported from 10 respondents. Two cases were reported from each of three prefectures (Tokyo, Fukuoka and Saga); the other six cases were from Hokkaido, Aomori, Ehime, Kochi, Nagasaki and Kumamoto (Fig.). Except for the Hokkaido case, the other 11 cases were from locations where *V. vulnificus* infections had been previously reported. The total annual number of cases was estimated by the following equation:

$$N = \text{reported no. of cases from the survey} \\ \times \frac{\text{total no. JAAM members}}{\text{no. of responding physicians}}$$

Using the above survey data, the annual number of *V. vulnificus* septicaemia cases in Japan was estimated as 425 (95% CI 238–752).

Among the 235 respondents, 198 (85.3%) stated that they had no knowledge of *V. vulnificus* infections. The percentage of respondents who had appropriate knowledge of the infection was significantly higher in the western region [23.9% (95% CI 15.6–33.9)] than the eastern region [10.1% (95% CI 5.7–16.4)] ($P < 0.05$), and it was higher in emergency physicians (28.6%) than surgeons (3.2%) ($P < 0.05$). On the other hand, knowledge was not associated with number of years since medical school graduation ($P > 0.44$).

This was the first epidemiological survey to estimate the disease burden of *V. vulnificus* infections in Japan. In this study, we targeted only registered JAAM members and there was, therefore, a possibility of underestimating the number of patients. Patients may have failed to see a doctor and they might have been treated in departments other than those of emergency physicians. Furthermore, emergency-room physicians might have treated affected patients without confirming the causative pathogen.

When we compared our estimated number with other countries (South Korea and the United States), our estimate was the highest of the three. Although the United States has 2.5 times more people than Japan, the frequency of eating raw or undercooked seafood is relatively low in the United States: oysters are the main seafood consumed raw. South Korea

has approximately one third the population of Japan but is located in a colder climate. The frequency and degree of contamination of seafood with *V. vulnificus* may be higher in Japan, because the seawater temperature influences the proliferation of the bacteria. Considering the Korean data is also based on a passive reporting system, it seems reasonable that Japan has the highest incidence of *V. vulnificus* septicaemia.

This study also demonstrated that the awareness of *V. vulnificus* infections among Japanese physicians was low. Emergency-room physicians and those who work in the western region of the country had more knowledge of the problem, but the length of a physician's career did not appear to improve knowledge of this infection. These results indicate that those who are aware of *V. vulnificus* infections probably gained their knowledge through clinical experience or other sources rather than medical school education. Education about *V. vulnificus* infections should be addressed, not only to emergency-room physicians, but also to general physicians who can urge high-risk patients (e.g. those suffering from chronic liver disease or the immunocompromised) to avoid eating raw seafood. This study is the first step to estimate the public-health impact of *V. vulnificus* infections in Japan. Inter-disciplinary interventions involving physicians, microbiologists, public-health professionals, and high-risk populations and their families are needed.

ACKNOWLEDGEMENTS

We gratefully acknowledge Dr John Kobayashi and Dr Michael Kramer for advice on the study. This study was planned and developed with the support of the Japanese Ministry of Health, Labour and Welfare Scientific Research grant on Emerging and Re-emerging Infectious Diseases.

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