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The epidemiology of travel-associated shigellosis—regional risks, seasonality and serogroups

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Abstract *Objectives*: To give a detailed risk estimate of contracting travel-associated shigellosis in various regions of the world.
Methods: Data on notifications of travel-associated shigellosis in Sweden 1997–2003 were compared with information on recent travel abroad from a comprehensive database based on telephone interviews with more than 160 000 Swedish travellers.
Results: From the national notification database 2678 patients with travel-associated shigellosis were retrieved. The highest risk of being notified with shigellosis was seen in returning travellers from India and neighbouring countries (318/100 000 travellers), East Africa (219/100 000), West Africa (120/100 000), and North Africa (76/100 000). Data on serogroup was available for 2529 isolates. *Shigella sonnei* was the most common serogroup (67%), followed by *Shigella flexneri* (26%), *Shigella boydii* (5%), and *Shigella dysenteriae* (3%). A higher risk was seen in children below the age of six, compared to older children and adults and in women compared to men. A distinct seasonal pattern was noted with the highest risk of shigellosis in July–October and the lowest in May.
Conclusions: Denominator based data on reported travel-associated infections are well suited to give risk estimates per region of infection, that could be used to target high-risk groups for pre-travel advice.

Introduction

With increasing international travel the panorama of gastrointestinal infections in western countries is to a large extent affected by imported infections. Between 25 and 50% of the approx. 80 million people that each year travel to destinations in Africa, Asia, Pacific Islands, Latin America and remote areas of Eastern Europe, experience travellers diarrhoea.[1] About 80% of all episodes of travellers' diarrhoea have a bacterial cause, and shigellosis belong to the top-five bacterial infections.[2,3]

Shigellosis (bacillary dysentery) is a bacterial enteric disease caused by the four serogroups of the

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genus *Shigella* (*Shigella dysenteriae*, *Shigella boydii*, *Shigella flexneri* or *Shigella sonnei*), with man as the only host.[4,5] The bacteria are excreted through faeces, and spread through contaminated food or water, often by vegetables watered by sewage. The critical infective dose is low (10–100 bacteria), and under poor hygienic condition person-to-person transmission is common.[6,7] The annual number of *Shigella* infections worldwide has been estimated to be 164.7 million, of which 163.2 million in developing countries.[6] No vaccine is available for common use.

Although shigellosis is an emerging disease of increasing importance,[7,8] risk data on travel-associated shigellosis are scarce. This report aims at using Swedish notification data and a comprehensive database on travel patterns to give a detailed risk estimate of contracting the diseases in various regions of the world.

Patients and methods

Notification data on travel-associated bacterial infections

Shigellosis is a notifiable disease in Sweden according to the Communicable Disease Act. Reports are made in parallel to the Swedish Institute for Infectious Disease Control (SMI) by the clinicians having seen the patient and the laboratory having diagnosed the infectious agent. The clinical notification shall include information of epidemiological relevance, e.g. route of infection, risk group, and likely place and country of infection. The reports are merged using a unique personal identification number (date of birth and additional four digits) issued to all Swedish residents and used in all contact with the health care. For this study all records of shigellosis for the period January 1997–December 2003 were retrieved.[9] Prior to the analysis we excluded patients with stated domestically acquired infection, patients for which information on likely country of infection was either missing or 'unknown', and recently arrived immigrants and refugees (identified through incomplete personal identification number).

Denominator data on travel patterns

A commercial database the Swedish Travel and Tourist Database (TDB)[10] was used as denominator on travel patterns. This database is based on telephone interviews with 2000 randomly selected Swedish residents each month. Questions are asked on recent overnight travel outside Sweden, and the data weighted and projected to give an estimate of the total number of Swedish travellers. The data is often given as regions, rather than countries to account for low numbers of respondents having visited countries outside the main travel destinations. No data on any illness is available from this dataset. The data are case-based with information on principal country/geographical area, age, sex, the length of the journey, and the purpose of the travel (business or leisure travel). For this study, we used the actual number of respondents with a travel history abroad in a logistic regression and the estimated total numbers were used.

Microbiology

The isolates were serogrouped at the SMI, according to the latest edition of the Kauffmann–White scheme.

Statistical methods

We used travel-associated cases from the notification database and the weighted and projected number of travellers to each region from the TDB for estimating risks per 100 000 travellers. The actual respondents from the TDB database were used as controls for the calculations of 95% confidence intervals (95% CI) for the estimates, using the formula:

$$e^{\ln \text{risk} \pm 1.96 * \sqrt{(1/\text{cases} + 1/\text{controls})}}$$

To adjust for possible confounding and test for effect modification (interaction), we also calculated odds ratios (OR) with corresponding 95% CI for the same risk factors using a logistic regression model, including the variables region of destination, age, sex, and month. The lowest incidence in each category was used as reference. All analyses were done using the Stata 6.0 software (Stata Corporation, College Station, Tx, U.S.A.).

Ethical considerations

Notification data is regulated by the Swedish Communicable Disease Act, and contain full personal identification. The data in the TDB are without any personal identification. The Medical Ethics Committee of the Karolinska Institute, Stockholm, Sweden, approved the study.