

Shigella dysentery and shigella infections

M. Lichnevski¹

الزحار الشيفيلي وعدوى الشيفيلات
ميخائيل ليشنيفسكي

خلاصة يعتبر الزحار من أهم أسباب الإسهال وسوء التغذية في إقليم شرق المتوسط . وتصل أحدث التقديرات إلى ما يقرب من مليون إصابة بالشيغيلة سنويا ، تسبب حوالي أربعين ألفاً من الوفيات (أي أن معدل الإماتة يبلغ ٤٪ في المتوسط) . وتناقش هذه المقالة دور الغذاء والماء في هذه المشكلة الصحية الكبيرة ، فضلا عن معالجة الزحار الشيفيلي بمضادات الميكروبات ، والاستعداد لمواجهة أوبئة الشيغيلات ومكافحتها .

ABSTRACT In the Eastern Mediterranean Region, dysentery is recognized as one of the major causes of persistent diarrhoea and malnutrition. The latest estimates amount to about a million total shigella cases annually with approximately 40 000 deaths (an average of 4% case fatality rate). This paper discusses the role of food and water in this major health problem as well as antimicrobial treatment of shigella dysentery; preparedness; and control of epidemics due to shigella.

La dysenterie bacillaire et les infections dues à *Shigella*

Dans la Région de la Méditerranée orientale, la dysenterie est reconnue comme étant l'une des causes majeures de diarrhée persistante et de malnutrition. Les dernières estimations s'élèvent, au total, à environ un million de cas de shigelloses chaque année, avec environ 40 000 décès (soit en moyenne un taux de létalité de 4%). Le présent article examine le rôle de l'alimentation et de l'eau dans ce problème de santé majeur ainsi que le traitement antimicrobien de la dysenterie bacillaire due à *Shigella*, l'état de préparation et les mesures visant à juguler les épidémies causées par *Shigella*.

¹ Regional Adviser, Control of Diarrhoeal Diseases, World Health Organization, Regional Office for the Eastern Mediterranean, Alexandria, Egypt.

Regional importance

Bacillary dysentery is becoming one of the leading causes of diarrhoea morbidity and mortality in children under five years of age. In some settings, up to 50% of all diarrhoea deaths can be attributed to bacillary dysentery. In addition, dysentery is recognized as one of the major causes of persistent diarrhoea and malnutrition in the Eastern Mediterranean Region. The latest regional estimates are a million total shigella cases annually with approximately 40 000 deaths (an average 4% case fatality rate).

In most countries in the Eastern Mediterranean Region shigellosis is most prevalent in densely populated areas with unsafe or insufficient water supplies and inadequate sanitation. In addition to endemic shigellosis, some countries (such as the Republic of Yemen) have reported in recent years large epidemics of dysentery caused by *Shigella dysenteriae* type 1 (Sd1), which is characterized by a particularly high case fatality rate, extreme debility in survivors and an increasing number of multiple drug-resistant strains.

According to current estimates, over two thirds of all episodes of shigellosis and four fifths of all deaths from shigellosis occur in children under five years old. Among children, the risk of death from shigellosis is greatest in infants and those who are severely malnourished [1,2].

High case fatality rates (5% and above) may be associated with any of the four species of shigella (*S. dysenteriae* type 1, *S. flexneri*, *S. boydii* and *S. sonnei*) present in the Region, but very high case fatality rates (over 10%) have been observed only in Sd1 epidemics. The majority of deaths from shigellosis are known, however, to result from endemic disease, especially that caused by *S. flexneri* [3].

The role of food and water

Shigella infection is spread usually by contaminated food and, less frequently, by water. It is also transmitted from person to person through faecal contamination of hands. The incidence of shigellosis is highest, therefore, in densely populated areas with unsafe or insufficient water supplies and inadequate sanitation.

Food safety

Since food can be an important vehicle for disease organisms, adequate control for the handling and processing of food through a national programme on food safety should be ensured. Health education activities should stress the importance of specific messages concerning preparing and eating food, while environmental health workers need to be vigilant in inspecting food-handling practices.

Because in children the incidence of shigellosis is greatest at the time of weaning, with the introduction of solid foods and increased mobility of the child, special care must be taken to motivate mothers to adopt good weaning practices. Breast-feeding gives substantial protection against shigellosis and should be actively promoted.

Safe water

The availability of large volumes of safe water is important for the prevention and control of shigella infection. When piped water is available, an adequate and properly chlorinated supply should be assured. Where a single exposed water source is used for drinking water, it should be protected from contamination. Disinfection of water in the home through chlorination or boiling should be encouraged.

WHO estimates that only half of the rural population in the Region has access to safe drinking water. The poor quality of

home water storage in low-income communities is also a common problem. Several studies have shown that, in such communities, the mean coliform levels are substantially higher in household water containers than in water sources. On the other hand, households who used effective techniques of improving the bacterial quality of drinking water were shown to have lower risk of diarrhoeal diseases.

The WHO Regional Office for the Eastern Mediterranean Region in Alexandria recently conducted an expert meeting in which traditional methods for domestic water disinfection were reviewed. Several promising methods were identified for field-testing to assess their impact on quality of water, diarrhoea incidence, acceptability to community people and cost-effectiveness [4].

Two of these methods—solar disinfection by sunlight and use of a water decontamination bag called a *musaffa*—are already known to be effective against *S. dysenteriae*.

Surveillance

The WHO case definition of dysentery recommended for surveillance and reporting purposes is diarrhoea with visible blood in the stool ("bloody diarrhoea"). This definition is practical, because it uses a single sign to rapidly identify patients with severe invasive diarrhoea requiring antibiotic therapy [5]. This definition applies also to shigellosis, since a history of blood in the stool is highly predictive of a positive stool culture for shigella, and shigella is known to be responsible for nearly all clinically severe cases of bloody diarrhoea. To detect outbreaks of shigellosis, recording, reporting and analysis of all cases of bloody diarrhoea need to be done at health facilities (see below).

In this connection, it should be noted that stool culture, which is the only definitive etiological diagnosis of shigellosis, is frequently unavailable or too costly at peripheral health facilities in most countries of the Region. It is also considered to have limited practical value, because results become available long after the treatment has started, and false negative cultures are common.

Antimicrobial treatment of shigella dysentery

Although most patients recover spontaneously from shigella infections, applying antimicrobial therapy reduces the severity and risk of serious complications and death from the disease. Current WHO recommendations say that an oral antibiotic to which shigella organisms in the area are sensitive should be given to any case presenting visible blood in a loose or watery stool. This assumption seems reasonable since dysentery due to other organisms is known to be less frequent and less severe than shigellosis.

Practical empirical therapy for shigellosis starts with the administration of either co-trimoxazole or ampicillin irrespective of the probable serotype of shigella causing dysentery. If there is no clinical improvement within 48 hours (less frequent stools and pain, less blood in the stools, reduced fever, improved appetite), a second antibiotic that is effective against shigella in the area should be given (e.g. nalidixic acid or piv-mecillinam). If after two days there is worsening of the clinical picture or presence of complications, the patient should be treated for amoebiasis and other causes of dysentery.

Nalidixic acid, which until recently was used as a backup drug to treat resistant shigellosis, has now become the drug of choice, although resistance to it has been re-

ported in the Region to be growing fast. The fluoroquinolones and pivmecillinam (amdinocillin pivoxil), although effective against Sd1 infection, are costly and usually not readily available in the countries where epidemic shigella dysentery occurs. The drugs that are not recommended by WHO for treatment of Sd1 are those to which shigella strains are usually resistant *in vitro* (metronidazole, streptomycin, tetracycline, chloramphenicol, sulfonamides), or those to which shigella are sensitive *in vitro*, but which penetrate poorly the intestinal mucosa where invasive Sd1 must be killed (furazolidone, gentamicin, kanamycin, sephalexin, amoxicillin).

Because of the growing proportion of shigella strains resistant to standard low-cost antibiotics (ampicillin, nalidixic acid, co-trimoxazole, tetracycline, chloramphenicol), effective treatment is becoming increasingly difficult. WHO is developing studies to determine the efficacy and safety of ciprofloxacin, a fluoroquinolone, and azithromycin, a new oral macrolide antibiotic, against shigella.

Preparedness and control of epidemics due to *Shigella dysenteriae* type 1

Each country aiming to ensure preparedness for an Sd1 epidemic should have effective disease surveillance systems, trained health professionals, reliably supplied health facilities and ongoing health education activities. All this can be achieved through a strong

national control of diarrhoeal disease programme acting in collaboration with other national departments.

Specific preparedness and emergency measures recommended by WHO [6]

- Establishing an interministerial committee to plan and coordinate response to epidemics, including dysentery.
- Ensuring that treatment facilities record systematically and review regularly all cases of bloody diarrhoea, to detect unusual increases in the weekly number of patients with bloody diarrhoea or in deaths from bloody diarrhoea, which might be indicative of a dysentery outbreak. Any such increase should be immediately notified to both local and national health authorities, and bacteriological studies be promptly done to confirm the etiology of the suspected epidemic.
- Preparing at least one laboratory for isolation of shigella and making provision for cold transport (at 4 °C) of stool specimens.
- Establishing a national treatment policy for epidemic dysentery and training of all front-line health staff in case management.
- Establishing emergency stocks of essential supplies, including appropriate antibiotics, oral rehydration salts and intravenous fluids.

In the long run, effective protection can be achieved through improved water supply, sanitation and food safety practices.

References

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