

Cholera in Papua New Guinea and the importance of safe water sources and sanitation

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Until recently cholera had never been reported in Papua New Guinea despite the close proximity of cholera-endemic countries and the presence of environmental and social characteristics that are considered risk factors for cholera outbreaks. The current outbreak began in July 2009¹ and rapidly spread throughout the coastal regions of the country. Initial characterization studies using variable-number tandem repeat analysis indicate that the outbreak was a recent clonal incursion from South-East Asia. By mid-2011 the outbreak had resulted in the reporting of more than 15 500 cases of cholera and over 500 deaths: a case fatality ratio (CFR) of approximately 3.2%.² Following an outbreak of cholera, interventions such as the introduction of oral rehydration therapy aim to reduce the CFR to below 1%. This elevated CFR is likely a reflection of the inaccessibility of much of the country, the lack of health care services available in remote regions and the general unpreparedness for an outbreak of this kind. This premise is supported by the differences in CFRs between the relatively well-serviced National Capital District (0.1%) and more remote regions such as the Western Province (8.8%).

When cholera spreads to a non-endemic area, or a new epidemic emerges within an endemic country, it is often preceded by a natural or human-induced disaster.³ This was not the case here, with no notable disaster impeding health care delivery or access to safe drinking-water. It seems that in parts of the country, the combination of an increasing population, reduced access to health care and lack of safe drinking-water has reached a critical point, thereby facilitating the spread of cholera once it was introduced. The worst affected are people living in settlements where crowding and unsanitary conditions are the norm. However, rural

villages have also been affected where service delivery is poor. The presence of cholera in Papua New Guinea is a timely reminder of the declining standard of service delivery in much of the country, which is exemplified by the poor epidemiological data that were collected during the outbreak and the lack of ongoing active surveillance for cholera cases.

The concern now is that cholera will persist in the environment and Papua New Guinea will officially become a cholera-endemic country with periodic outbreaks of variable severity. Factors such as the large, slow moving, saline river systems and the lack of adequate sanitation and hygiene in many communities increase the potential for endemicity. *Vibrio cholerae* is highly adapted to the aquatic environment, and lives naturally in riverine and estuarine ecosystems.⁴ With the sustained and widespread transmission of cholera for over two years in Papua New Guinea, it is likely that an environmental reservoir will be, or already has been, established. Cholera endemicity has broad implications beyond the health risk to its citizens, including the possibility of temporary trade barriers, reduction in tourist numbers and an increased burden on the health care systems.

Access to safe drinking-water and adequate sanitation are widely recognized as the key factors to preventing cholera outbreaks. In Papua New Guinea, only approximately 40% of people have access to a safe water supply and adequate sanitation, one of the lowest rates in the Western Pacific Region.^{5,6} Moreover, there has been no significant improvement in recent years. The importance of improved drinking-water was highlighted by the outbreak in the Central Province where communities with access to reticulated water

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supplies were largely untouched by the outbreak. Yet similar villages in the same region without access to safe water supplies were severely affected by cholera cases. Cholera vaccination is increasingly being used in endemic regions as an adjunct to improving water supplies and sanitation. However, vaccination for cholera in an outbreak setting has not been trialled on a large scale and questions remain as to the logistical and financial challenges of using multidose vaccines in an epidemic situation where people displacement and civil unrest may hinder access.⁷

Poor access to safe drinking-water and sanitation is no doubt a major driving factor behind the spread of cholera in Papua New Guinea – a significant event in itself. However, the implications of inadequate safe water sources and poor sanitation and hygiene are much broader. Enteric diseases remain an important cause of morbidity and mortality in Papua New Guinea and in other low-income countries. In Papua New Guinea, diarrhoea is the fifth most common reason for presenting to health clinics and contributes to over 15% of deaths in children under five years of age.^{5,8} Other enteric diseases such as shigellosis and typhoid fever are also important causes of morbidity and mortality in Papua New Guinea, but their exact burden is unknown due to the lack of in-country diagnostic capacity. Poor access to safe water and poor hygiene contribute to other disease burdens, such as enteric parasites, which may contribute to poor nutritional status,⁹ skin infections, which are the leading cause of outpatient visits,⁵ and increased spread of respiratory infections.¹⁰ Moreover, improving sanitation and hygiene and safe water can improve educational outcomes, particularly for girls.¹¹ Clearly, improving access to safe water and improved sanitation and hygiene would reduce the risk of future outbreaks of cholera, and, if widely implemented, these measures could greatly improve health and social outcomes in Papua New Guinea.

The current lull in cholera cases throughout most of the country should not be regarded with complacency. Health authorities need to be aware that cholera presents as a seasonal disease in areas where it is endemic. Factors such as rainfall, salinity, temperature and copepod (zooplankton) blooms have all been linked to periodic outbreaks in countries such as Bangladesh and India.⁴ Papua New Guinea is likely to face further challenges from cholera outbreaks and the extent of

preparations to assist affected communities and limit the spread of the disease will determine the impact that the next outbreak has on the people and economy of Papua New Guinea.

A strategy needs to be planned and implemented to limit and contain cases in the likely event of a further regional outbreak of cholera. Environmental and syndromic surveillance, backed up by rapid and appropriate response, need to be conducted to mitigate the impact of another nationwide outbreak. Safe, clean water supplies and associated educational campaigns need to be provided to at-risk communities to limit transmission. A clear strategy to deal with subsequent outbreaks will save lives and limit the extent of the outbreaks. Moreover, any measures taken to prevent further outbreaks of cholera are likely to have a positive impact on the burden of other infectious diseases.

Conflicts of interest

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