Journal of BTHA, Volume XVI, 2011

Cholera - the disease and its prevention

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Introduction

Cholera is an acute gastrointestinal infection caused by the organism Vibrio cholerae.[1] The majority of cholera infections are asymptomatic or cause mild ill-ness that cannot be distinguished clinically from other infective causes of diarrhoea.[2] The incubation period ranges from a few hours to six days.[3] Cholera infection is characterised by the sudden onset of profuse watery diarrhoea which is normally painless.[3] In around 80% of cases vomiting is also seen.[4] Transmission of the organism is via the faecal-oral route. The main cause of transmission is through contaminated water but contaminated food such as shellfish also has a role as does close contact with a person carrying the bacteria.[3]

V.cholerae is sensitive to hydrochloric acid in the stomach therefore large quantities of bacilli are need-ed in order to cause the disease.[4] As a result, a reduced volume of acid in the stomach due to medication, disease or genetics can promote the passage of the bacilli into the small intestine where it binds to the intestinal epithelial cells.[3]
With cholera, the fluid loss can be greater than 20 litres per day and consequently, the electrolyte imbalance results in marked dehydration, metabolic acidosis (due to the loss of bicarbonate), hypo-kalaemia and hypovolemic shock leading to cardiac failure. Untreated the mortality rate for cholera is 40-60%.[4]

The primary aim in the treatment of cholera is rehydration. Normally oral rehydration is adequate but in the most severe cases, intravenous therapy is required.[3] With the introduction of appropriate rehy-dration strategies, the mortality rate for the disease plunges to less than 1%. Oral Rehydration Therapies (ORT) are recommended by both the World Health Organization (WHO) and UNICEF.[2]

Epidemiology

Cholera is mainly a disease of Africa and Asia. It is a notifiable disease and therefore all cases must be reported to the Consultant of Communicable Disease Control (CCDC).[2] The World Health Organization states that there are around 140'000 cases reported annually and of these, 95% of cases are from Africa.[5] However, they estimate that this number is likely to show only a fraction of the actual cases (5-10%) due to under-reporting which may be due to a fear of loss of trade or tourism; and limitations in the recording system.[6]

The disease usually occurs in large endemics or pandemics. The 7th and current pandemic originated in Indonesia in 1961 and spread rapidly throughout
Asia. It was due to the El Tor serotype, which is now also endemic in many African countries.[5] The recent outbreak in Zimbabwe was one of the largest reported in recent history and accounted for 98,591 cases including 4288 deaths between August 2008 and July 2009.[8]
Cases of cholera can increase dramatically in poor countries due to the monsoon period, which may wash pathogens from faeces into water supplies, or in war zones where lots of people may be living in close proximity with no access to clean water or adequate sewage disposal.[5] According to TRAVAX™, in September 2010 alone, there has been cases of cholera reported in China, Cameroon, Afghanistan, Pakistan and Somalia.[4]
The risk for travellers is very low and there have been less that 21 reports per year in the UK since 1990.[8] The last indigenous case of cholera in England and Wales was reported in 1893.[1]

However, countries in which there is no cholera cannot become complacent as the disease can re-emerge in areas which are described as cholera-free. For example, cholera appeared in South America for the first time in nearly 100 years in 1991. It was first identified in Peru but then quickly spread to Ecuador and Columbia. In less than a year it had spread throughout Central America including Mexico and several Caribbean countries.[2] This was due to the O139 Bengal strain and demon-strated how quickly the disease can spread.

Prevention Strategies

There are many strategies which are implemented by less economically developed countries to prevent the spread of cholera. It is very important that cholera outbreaks are controlled efficiently as it is a major cause of death in many developing countries, especially among children. About 17% of child deaths worldwide each year are due to diarrhoea and it is estimated that 88% of these cases are due to inadequate availability of water for hygiene and the lack of access to sanitation such as a toilet or a latrine.[9]

Current responses to cholera outbreaks tend to be reactive, such as issuing ORT, rather that prioritising preventative measures and although this does prevent deaths, it does not prevent the occurrence of cases.[7] To try and tackle this issue, the WHO established the 'Global Task Force on Cholera Control' which pro-vides support and co-ordinates cholera control activities in cholera-endemic regions. It consists of UN agencies, nongovernmental organizations and scientific institutions. The group's main goal is to reduce the number of cases and deaths caused by cholera.[10]

Health Education

Health education about cholera must also include information on disease transmission and ways to prevent it such as avoiding raw food and water treatment. Schools are an invaluable resource, which needs to be used to inform people of these measures, and community leaders should be encouraged to ensure an appropriate provision of health education. The Centers for Disease Control and Prevention (CDC) produce lessons for communities based on four main teaching points. These are cook your food, drink safe water, wash your hands and use a toilet or latrine.[11] Families should also be taught how to recognize the symptoms of cholera, and how it can be treated at home with ORT.

Improve sanitation and the disposal of sewage

One recent study in Zambia showed a significant association between the lack of latrine and drainage systems and a high incidence of cholera. Sharing a latrine with other households also significantly increased the risk of cholera infection.[12] These findings are echoed by UNICEF who emphasize that cholera outbreaks can be prevented by disposing of human waste properly, using latrines and using soap when hand-washing.[13] A massive decline in the rate of cholera in Somalia was observed after UNICEF helped to dig latrines, organize clean up programs and ensure regular water chlorination.[13] This shows the impor-tance of implementing these measures in the fight against cholera.

Improve water supplies and access

The 'WHO/UNICEF Joint Monitoring Programme
for Water Supply and Sanitation 2010 update', indi-cates that 884 million people still lack access to an 'improved drinking-water source' and 40% of these are in Sub-Saharan Africa.[14] This reflects the same pop-ulation that suffer the most from cholera. This is expected because Vibrio cholerae is a waterborne organism and therefore improving the supply of water and its availability will improve the situation. This strategy can be demonstrated by looking at China where access to piped water increased from 30% of the population in 1985 to 77% in 2007 (94% in urban areas).[15] Because of the increase in access to piped water, the incidence of

water-related infections including cholera has decreased steadily over the past 20 years.[15] In 2008, the incidence of cholera, dysentery, typhoid, and paratyphoid was 25 per 100 000 population, with 63 deaths reported, down from 319 per 100 000 with 2610 deaths in 1985.[15]

Vaccination

Mass vaccination is one more strategy that could be considered by less economically developed countries to prevent cholera outbreaks. The WHO recommends that vaccination should be used as an additional measure in conjunction with the control measures already mentioned in areas where cholera is endemic but also in areas where there is a risk of out-break.[1] They state that vaccines should provide a short term answer while longer term activities such as improving water and sanitation are put in place.[2]

Vaccination programmes should target vulnerable populations living in high risk areas such as places of overcrowding, poor sanitation and inadequate water supplies as they are most at risk of serious illness or death from the disease.[1]

Dukoral™ is a killed vaccine which is WHO pre-qualified and available in over 60 countries including the UK. It is a whole-cell vaccine with a recombinant B-subunit and is given orally in 150ml of clean water.[2] It was evaluated for protective efficacy in Bangladesh and Peru and it was shown to provide more than 85% protection against V.cholerae O1 for 6 months after the second dose, and protection was still above 60% three years later in people over the age of 5 years.[1] However, in children aged 2-5 years the protection waned rap-idly so that after 36months the protective efficacy was only 26%. Due to this data it is been shown that young children require three doses of the vaccine in order to establish effective immunity. There are no serious adverse reactions to have been reported with the vac-cine and as it is administered orally and is inactivated, it is safe to be used in pregnancy.[1]

Travellers

The risk of cholera for travellers is not significant as long as simple precautions are taken to avoid potentially contaminated food and water.[2] A general estimate of a traveller's risk of cholera is in the order of 2-3 per million travellers. This figure is based on imported cases into Europe and North America.[4] In order to reduce the number of travellers who suffer from cholera; some basic advice should be given to all people travelling to an at-risk area before they leave. This would include ensuring that they cook food thor-oughly and eat it when it is hot. They should also be advised to avoid shellfish and dairy products and ensure that they peel all fruit and vegetables.[2] When buying bottled water, the seal should be checked to ensure that it has not been tampered with and ice in drinks should be avoided. If the traveller is not using bottled water, then the water should always be puri-fied by boiling, filtering or using chemicals such as chlorine-releasing tablets.[4]

Travellers should also be reminded of the importance of washing their hands after using the toilet as this reduces the infection risk for others and reduces personal risk as hands may pick up infection from others using the same facilities. Hands should also be washed before eating or preparing food. It is also advisable for people going to cholera-endemic areas to take ready-made sachets of ORT with them to ensure that they are prepared if they do get travellers'

diarrhoea.[4]

Due to the low risk, vaccination is not seen to provide any major benefit to tourists and no country reports a requirement for a certificate of vaccination against cholera as a condition for entry.[2] The Department of Health do recommend vaccination for those at a slightly higher risk of infection including emergency relief workers and people with remote itin-eraries in areas where cholera epidemics are occurring and there is limited access to medical care.[1] When vac-cinating travellers the second dose should be given at least a week after the first and 3 weeks before arriving in a cholera-region.[2] The vaccine is also recommended for laboratory workers who may regularly be exposed to cholera such as those attached to infectious disease units.

Conclusion

Therefore, from looking at some of the above case studies and statistics it is obvious that strategies can be implemented and make a big difference to the rates of cholera within a region or country. The best pre-ventative measures against cholera infection are good hygiene and improved sanitation.[3] These methods need to be emphasised at a national level as well as in local developing communities. The people should be educated about the disease, its transmission and sim-ple ways that it can be prevented but the government and aid agencies should also make a massive effort to improve access to clean water and to encourage good hygiene practices. Countries at risk of an outbreak should be well prepared as the quicker the outbreak is identified, the better the outcome. There should be adequate supplies of rehydration therapies and stocks of vaccines should also be considered. As there is no animal reservoir, it should in theory be possible to eradicate the disease. However, this is made more difficult as 1-20% of previously infected patients will become carriers of the disease for a few weeks after infection.[4] There is still a lot of work needing to be done to ensure that cholera is a disease of the past but through implementing these strategies hopefully this can become a reality.

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