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Typhoid Fever in Developing Nations

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Typhoid fever, caused by the bacterium *Salmonella Typhi*, affects approximately 21.5 million people per year according to the United States Centers for Disease Control and Prevention (“Typhoid Fever”, n.d.). Most of those affected with this disease live in developing nations in South America, Sub-Saharan Africa, and South-East Asia, as can be seen in figure 2. Typhoid fever is primarily contracted from contaminated food, especially if handled by a “person who is shedding *Salmonella Typhi* or if sewage contaminated with *Salmonella Typhi* bacteria gets into the water,” (“Typhoid Fever”, n.d.). Environment plays a major role in the transmission of typhoid fever, as it is most common in poor areas that lack proper sanitation. Because typhoid fever is a bacterial infection, it can be treated relatively easily and inexpensively with the use of antibiotics. However, as antibiotic resistance rises, typhoid fever is becoming more and more difficult to treat. In a study done in Nairobi, researchers found that 75% of children infected with typhoid bacteria were resistant to the antibiotics used to treat the infection (Maurice, 2012). As of right now, increasing antibiotic resistance remains a pressing issue in developed and developing nations alike. Vaccines for typhoid do exist, such as the Vi single injection vaccine and the Ty21a capsule vaccine, though they are primarily used by tourists and not by those most at risk for becoming infected with the bacteria (“Typhoid Fever-Vaccination”, n.d.).

Although there are an estimated 200,000 Typhoid-related deaths each year, typhoid fever still remains relatively low priority for governments and humanitarian organizations (Newton & Mintz, n.d.). There are a few reasons for this. Typhoid fever is a “disease of true poverty,”

(Maurice, 2012) according to Jeremy Farrar, who spoke on the issues revolving around typhoid fever. Only the poorest countries still suffer from the effects of typhoid fever. Because these countries often lack the diagnostic tools and resources to eradicate the disease, the disease still remains an issue. On top of this, diagnosing typhoid fever is difficult. Diagnosis is done by a blood, stool, or bone marrow culture test. Because typhoid is so prevalent in areas with little medical resources, such tests are difficult to perform and acquire. Typhoid fever symptoms are also similar to other diseases common in these areas, such as malaria, dengue fever, and pneumonia; this leads to misdiagnoses of typhoid fever (Maurice, 2012). Asymptomatic carriers of typhoid fever also pose a threat to those around them. Approximately 1-6% of people infected with the bacteria “become chronic, asymptomatic carriers,” (Goldman, 2013) according to the Stanford School of Medicine. These infected people can go their entire lives without knowing that they carry the disease, unknowingly infecting people along the way. Typhoid fever can be spread by an action as simple as failure to wash hands before preparing food, making asymptomatic carriers potentially dangerous to those around them. This poses a huge threat to communities, especially ones in endemic areas.

Like many other infectious diseases, the relationship between typhoid fever and poverty is quite clear. Because of this, the need for more comprehensive preventions and treatments of the disease continues to rise. In a case study done in Tanzania, researchers found that 23% of those ages 14 and above tested positive for *Salmonella Typhi* (Kaljee et al., 2013). These numbers, coupled with high poverty levels, make typhoid fever extremely dangerous to both

those who are infected and the people they come into contact with. In 2009, the gross national income in Tanzania was below 500 USD (Kaljee et al., 2013). Extreme poverty is linked with typhoid fever primarily due to poor sanitation and low access to proper medical care. In 2008, only 45% of people living in rural Tanzania had access to safe water (Kaljee et al., 2013). Areas with poor sanitation and high poverty levels are also burdened with diseases such as typhoid fever. Unfortunately, until safe water access is available, water-borne diseases can be expected to remain. Despite extreme poverty, the willingness to receive and even pay for a typhoid vaccine is relatively high. When surveyed, 66% of people said they would be willing to pay for a Vi typhoid vaccine, which costs about 1.5 USD (Kaljee et al., 2013). These numbers are even higher if the vaccine is offered for free. Of those surveyed, 98% expressed an interest in receiving the vaccine for themselves and 99% for their children if provided free of charge (Kaljee et al., 2013). The need for a typhoid vaccine in affected areas is great but unfortunately, providing accessibility to these vaccines remains a low priority for many governments and organizations.

In an attempt to prevent further spread of typhoid fever, some countries have opted to vaccinate children in partnership with the Diseases of the Most Impoverished (DOMI) program. The move to vaccinate against typhoid fever, especially in children, is an important step towards lessening the burden of the disease. Because children are most at risk (as seen in figure 1), vaccination efforts can be expected low lower under five mortality rates in these areas. In a study by DOMI, seven countries burdened with typhoid fever (Bangladesh, China, India, Indonesia,

Pakistan, Thailand, and Vietnam) were researched in an attempt to provide a broader understanding of typhoid fever, its vaccines, and the effects of vaccination on communities. This study, much like the Tanzania study, also found a willingness to pay for typhoid vaccinations. After studying the effectiveness of the single-dose Vi vaccine, researchers found that the Vi vaccine had a 64% effectiveness rate after 21 months in Nepal and a 74% effectiveness rate after 17 months in South Africa (Ochlai et al., 2007). After three years, the Vi vaccine was, on average, 55% effective (Ochlai et al., 2007). These numbers give important insight as to why vaccination is not as widespread as it should be. In endemic areas, some governments still do not provide vaccinations because they are waiting for a more effective vaccine to be released (Maurice, 2012). Currently, the single dose Vi vaccine is the most effective vaccine on the market. Other typhoid vaccines, such as the Ty21a vaccine, are less effective. Even more importantly, the Vi vaccine is given in a single injection, as opposed to multiple treatments like the other typhoid vaccines. Single dose vaccines are incredibly important to their effectiveness, especially in areas where medical clinics or dispensaries may be difficult to get to. Despite these governmental and scientific hardships, DOMI attempts to provide updated information on typhoid fever in effort to provide a more comprehensive look at the disease burden of typhoid fever. This information can aid in the fight against typhoid fever, especially in the areas that most need it.

Typhoid fever continues to affect millions of people, despite the presence of multiple vaccines and its near-eradication in developed nations. Though typhoid fever is often thrown under the bus, so to speak, it still remains an important global issue. Increasing vaccination-rates

and education measures, such as stressing hand washing, are important measures that need to be taken in the fight against typhoid fever. This is especially important in endemic areas.

Unfortunately, of the 16 most endemic countries, “only three have used a typhoid vaccine to protect their child populations,” (Maurice, 2012). A rise in vaccination measures, sanitation conditions, and education available, the incidence of typhoid fever, as well as numerous other infectious diseases, should decline over time. At the moment, however, typhoid fever still remains a pressing issue around the world.

Fig. 1. Distribution of typhoid fever, by age group, at various incidences

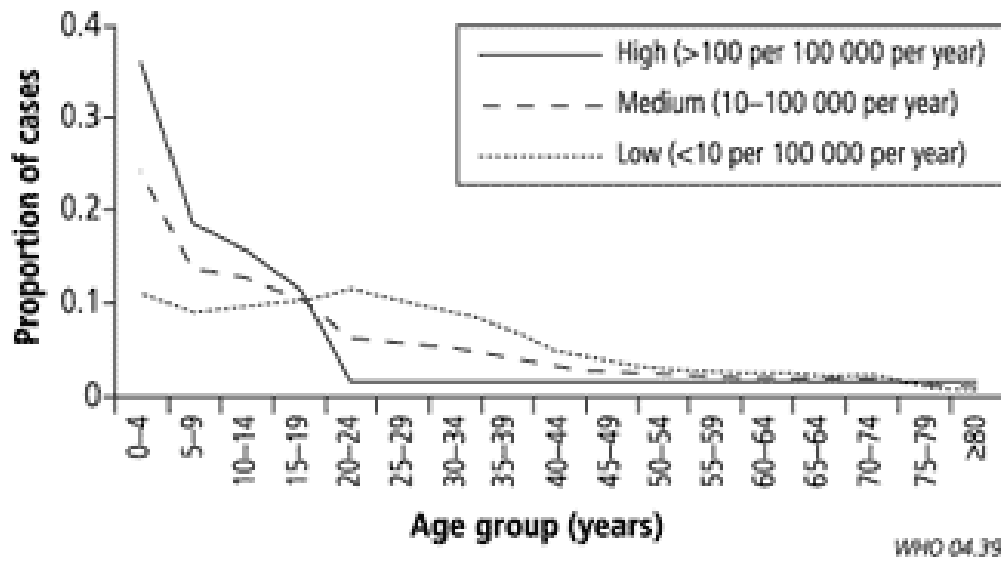


Figure #1. Distribution of typhoid fever by age. Reprinted from “The Global Burden of Typhoid Fever,” by J. A. Crump, S.P. Luby, & E.D. Mintz, 2004, *Bulletin of the World Health Organization*, 82. Copyright 2004 by the World Health Organization.

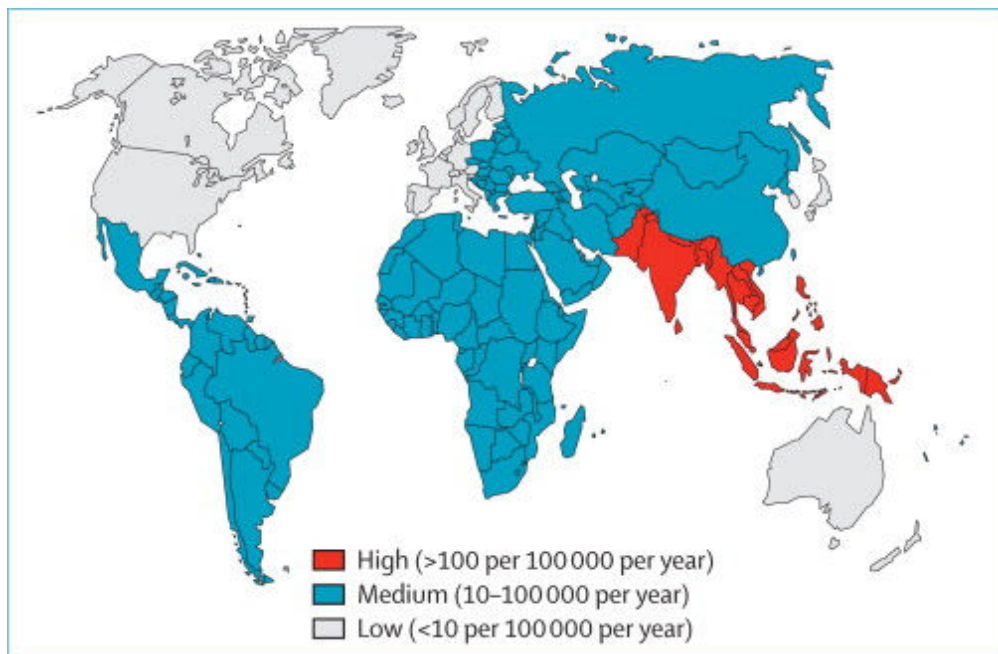


Figure #2. Distribution of typhoid fever by geographical location. Reprinted from “A First Step in Bringing Typhoid Fever Out of the Closet,” by J. Maurice, 2012, *The Lancet*, 379. Copyright 2004 by the World Health Organization.

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