JOURNAL OF INTERNATIONAL CRISIS AND RISK COMMUNICATION RESEARCH
ISSN: 2576-0017
2024, VOL 7, NO S9

The Impact of The Epidemiological Investigation of The Cholera Microbe in Water

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Abstract:
Because of its high mortality and morbidity rates, cholera remains a serious danger to worldwide public health. Studies suggest that between 1.3 and 4.0 million cholera cases and 21,000 to 143,000 cholera-related fatalities occur year, an underestimation of the worldwide cholera burden due to variables like inadequate reporting, limited epidemiological surveillance, and a lack of laboratory capacity. Present study evaluates the conditions and scenario in terms of selected cities of Saudi Arabia. Mainly the components are related to secondary data and some of the related items were taken in terms of primary data; as the values are taken from ongoing studies and testing labs. The studies are considered from 1995 to 2019.
Keywords: Epidemiological Investigation, Cholera, Microbe, water born.

Introduction:

Consuming tainted food or water from Vibrio cholerae can induce cholera, an acute diarrheal illness that can cause fast dehydration and death. Cholera can kill a person within hours if treatment is not received, yet half of all cholera deaths occur in children under five. Most people can contract Vibrio cholerae by eating or drinking water or food infected with the bacteria, which can cause severe acute watery diarrhea within 12 hours to 5 days, according to scientific literature. **Aldová et al (2005); Kamal et al (1971)** Most infected persons do not exhibit symptoms, despite the fact that the majority of people can contract the infection. Ten to twenty percent of them will experience acute watery diarrhea, and only twenty percent will experience the signs and symptoms. **Rahaman et al (2015); Blake et al (1994)**

Because of its high mortality and morbidity rates, cholera remains a serious danger to worldwide public health. Studies suggest that between 1.3 and 4.0 million cholera cases and 21,000 to 143,000 cholera-related fatalities occur year, an underestimation of the worldwide cholera burden due to variables like inadequate reporting, limited epidemiological surveillance, and a lack of laboratory capacity. **Dziejman et al (2002)**

The implementation of focused prevention initiatives in Saudi Arabia depends on epidemiologic data on bacterial illnesses. Every year, millions of pilgrims from all around the world go to the nation to do the Hajj and Umrah, making this especially significant. The crowded environment during the Hajj and Umrah seasons make infectious illness outbreaks quite likely. **Eppinger et al (2014)** In the past few years, Saudi Arabia has made significant strides in lowering the prevalence of illness and enhancing the availability and caliber of medical care. Additionally, it has made investments to fortify its public health systems and increase its capacity for surveillance, laboratory

systems, epidemiology, and workforce development. Furthermore, it has implemented several control and preventative measures, such as screening programs, immunization campaigns, public awareness campaigns, and antimicrobial stewardship initiatives. **Langa et al (2015)**
Monitoring the incidence of infectious diseases and their epidemiology is crucial to maintaining public health because it helps control disease outbreaks and encourage illness prevention. Infectious illness surveillance is handled by the Field Epidemiology Program & Surveillance and Data Management division of the Ministry of Health in Saudi Arabia. **Nsagha et al (2015); Nair et al (2002)** Data from national monitoring programs are essential for tracking trends in the occurrence of illnesses and, more importantly, for determining how well control measures like vaccination campaigns work to eradicate specific infectious diseases. Knowing the incidence of bacterial communicable diseases is a crucial first step in public health. **Das et al (2007)**

Source: *https://www.nbcnews.com/slideshow/war-torn-yemen-suffers-world-s-largest-cholera-outbreak-n783541*

Figure 1: Cholera Outbreak in Saudi Arabia (2019)

Thus, the purpose of this study is to present the most recent Saudi epidemiology surveillance data on bacterial infectious diseases that were reported in the Kingdom of Saudi Arabia between 2018 and 2021.

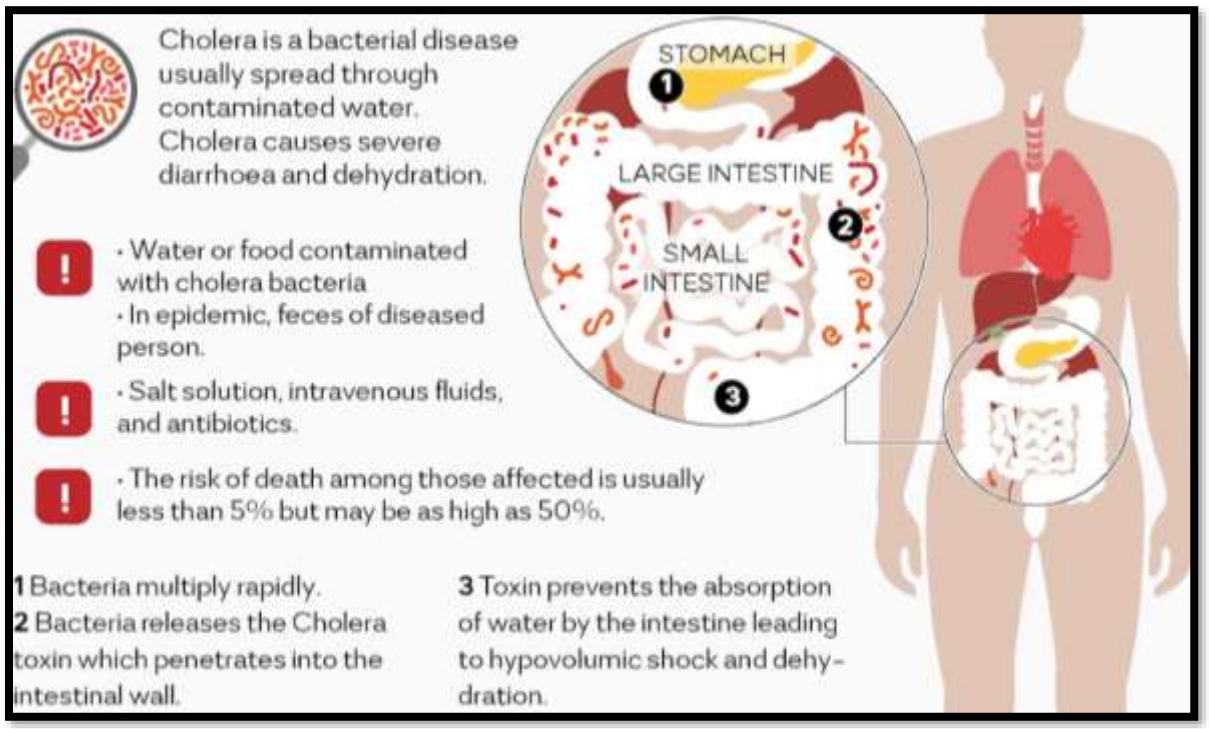
Research Process:

A public health solution for disease surveillance and management, the "HESN" program is used by the Saudi epidemiology surveillance system to gather and compile data at the national level. The data sources include hospitals, primary healthcare facilities, laboratories, and particular health initiatives. **Faruque et al (2007); Barua et al (1992)** The surveillance data's case definitions are divided into three categories: verified by laboratory confirmation, probable by epidemiological link, clinical criteria, and presumptive laboratory criteria, and potential by clinical criteria. While brucellosis, meningococcal infections, pertussis, syphilis, and tetanus can be reported as probable, tuberculosis can be recorded as possible among bacterial disorders. For diagnosis coding, the Saudi Ministry of Health uses the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM). **Bwire et al (2017); Jutla et al (2015); Nelson et al (2014)**
Along with a thorough graphical analysis of the cases throughout that time, this study used Saudi surveillance data to illustrate the shifting epidemiology of bacterial infectious illnesses in Saudi Arabia between 2018 and 2021. **Kachwamba et al (2017); Dalusi et al (2015)** We computed and reported the total number of cases as well as demographics (age, sex, and nationality). Males and females are classed by sex; Saudi and non-Saudi nationalities are classified; age categories are divided into 0–4 years, 5–14 years, 15–29 years, 30–59 years, and elderly (60 years and above)

age groups. Incidence rates per 100,000 people were computed for each disease, using population data from 2018–2021, along with a 95% confidence interval. **Moore et al (2015); Kumar et al (2014)**

Since the data were normally distributed, the student's t test was used to compare the mean values of sex and nationality, two examples of categorical variables. We tested for differences in the mean values between the various age groups (normally distributed) using a one-way ANOVA analysis. Using Bonferroni correction, post hoc analysis was carried out if the findings showed statistical significance between the age groups. **Parker et al (2017); Bwire et al (2016)**

Microsoft Excel program (version 16.75.2) was used to analyze the data. A p value of less than 0.05 was considered statistically significant. These figures show how common bacterial infectious diseases have become over time, as well as how each characteristic varies by group. This study is predicated on data that has already been gathered; none of the authors have conducted any new research with humans or animals. **Masoumi et al (2016)**



https://www.timeslive.co.za/sunday-times-daily/news/2023-05-25-the-journey-of-the-cholera-bacteria-and-how-to-protect-yourself/

Figure 1: Invasion of Cholera Bacteria in Human Body

Major Findings:

- All impacted Woredas of the city administration and surrounding areas reported 8,083 cases (attack rate (AR) of 0.24 percent) and 15 deaths (case fatality rate (CFR) of 0.18 percent) during the five-month cholera outbreak.
- Approximately 4,908 (60.7%) of the cases that were reported were male, and 3,155 (39.3%) of the cases involved males aged 15–44. 2,198 (27.2%) of the reported cases were unskilled manual laborers, whereas 1,195 (14.8%) were housewives, according to the occupational classifications.

- The pandemic had varied degrees of impact on several cities. There were 1,076 (19.0 percent), 1,541 (14.4 percent), and 972 (9.7 percent) cholera cases, which accounted for the majority of the cases.
- Of all cholera cases documented, 513 (6.8%) were from nearby areas.The majority of cholera cases—3,211, or 76.22 percent—seek medical attention within two days of the commencement of the disease, according to the distribution of cholera cases by the number of days between the date of disease onset and the date seen at the medical facility. A total of 2,381 (26.44 percent) and 3,563 (52.31 percent) cases seek medical attention on the day of onset and one day later, respectively. 1,651 instances (13.61%) of all cases treated at the medical facilities arrived three days or later after the commencement of the illness.
- There is no discernible difference between the sexes in the number of days that pass between the onset date and the time when patients seek medical facilities to receive treatment. **Ngwa et al (2016)**

  A4,361 (79.8%) of the cholera cases treated at medical facilities during this outbreak also experienced vomiting, and all of the cases had watery diarrhea. Of the cholera cases treated at medical facilities, 4,219 (58.8%), 982 (14.0%), and 1,943 (22.8%) underwent rehydration therapy using treatment plans A, B, and C. 6,921 (83.6%) of the cholera patients had their dwellings cleaned during the outbreak.
- Of the total number of cholera cases during the outbreak period, 18 cases (0.37 percent) died, according to the final status of the cases.
- There were numerous possible sources of exposure for the outbreak that were identified based on the history taken from the patients upon admission to CTCs and ORPs. Travel to previously impacted locations with comparable outbreaks and contact with previously documented cholera cases were factors in 151 (1.8%) and 302 (2.9%) of all cases, respectively. In 7,521 cases (94.6 percent), people reported that they typically drank and washed their utensils using tap water. Additionally, our data analysis indicates that the identified potential sources of infection during the outbreak do not significantly differ by gender.

Response Preparation Activities:

At different levels of the health system, a number of emergency coordination platforms were set up to direct and oversee the management of the cholera outbreak. The creation of an emergency command post at the Federal Ministry of Health, under the leadership of the Saudia MoH, was one of them. The command post meets daily to discuss completed operations and give guidance on future readiness and preventative measures in the city government. Additionally, a regional task group headed by the mayor and the head of the health bureau was established by the city administration office. Additionally, there was an emergency response committee at the health bureau's regional laboratory, which was chaired by the core process owner of the regional health committee and several municipal administration and health bureau directors.

The development and standardization of cholera treatment centers (CTCs) and oral rehydration stations (ORPs) were two measures implemented to increase the accessibility of case management services. In order to prevent the provision of health services for other health issues that may arise during disease outbreaks due to panic and an unplanned mobilization of human and other resources for emergency response, CTCs and ORP sites were made and activated in three phases based on the number of cases received in each sampled city and health facility. The case management team was also successful in standardizing CTCs and altering the health facilities' referral linkage.

Each CTC has a designated CTC coordinator, clinical and preventative services focal points, and other senior professionals as accountable individuals. Additionally, all CTCs were assigned field epidemiology residents and WHO surveillance officers from all over the nation to oversee clinical case management and other clinical services, standardize CTCs, support surveillance-related activities, and provide on-site coaching and training. Additionally, CTCs were connected to local catchment hospitals to handle comorbid and severe patients. Cholera and the current outbreak were explained to the community through a variety of health education programs that used a variety of modalities.

Every employee in the municipal administration sector bureau was trained during the outbreak and given the duty of informing their neighbors and family members about the ways to prevent cholera and how it spreads. By means of loudspeakers, media conferences, house-to-house visits by urban health professionals and leaders, as well as other community and religious organizations, such as mosques, health education was also provided to street dwellers and other community members. To help the municipal administration identify and report suspected cholera cases from their catchment regions, over 20,000 community-level associations were involved. Overall, community-based surveillance had a 41.23 percent effectiveness rate during the outbreak. Several WASH-related actions were taken during the outbreak period.

Testing potential sources of water contamination for the outbreak was the team's primary goal. Out of the 120 water site samples that were analyzed, five came back positive. Since they were considered to be among the potential infecting sites for more holly water drinkers, two positive water sites were closed. In addition, every holly water site was chlorinated. A total of 125 public restrooms and 1550 private restrooms were built as part of the preventative and control initiative. Additionally, 100 communal latrines and 500 overflowing toilets were maintained. The distribution included over 125,400 household water treatment chemicals.

In addition, some 75 water tankers were transported and positioned at different spots in the community where there was a water scarcity. Water quality was also checked at different locations, including sources, pipelines, and end lines.

Conclusion:

Significant morbidity and mortality were caused by a municipal cholera outbreak in 2019. The city administration's most densely populated areas, those with rivers running through them, and heavily influenced areas—like market areas with significant in- and out-of-town population movement—are more likely to be negatively impacted than others. The results of the epidemic investigation showed a connection between cholera and eating and drinking from restaurants and street sellers. Moreover, it was discovered that patients were more likely to void in an open vicinity, while using a latrine and washing your hands properly were proven to be protective. One of the main causes of the outbreak's extended duration and emergence has been the administration's problems with water, sanitation, and hygiene development infrastructures.

Additionally, the aforementioned developmental difficulties may be crucial to the outbreak's quick spread and the quick accumulation of case numbers in a shorter amount of time due to the local health system's inadequate capacity to identify the causative agent before it spreads without notice. It may be the missing surveillance method to identify cholera before it spreads across the municipal government if other and additional risk factor monitoring techniques are not used for the early detection of cholera-causing organisms from environmental samples.

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