Cholera in zambia 2017 pdf

Open Access Peer-reviewed The global burden of cholera is increasing, with the majority (60%) of the cases occurring in sub-Saharan Africa. In Zambia, widespread cholera outbreaks have occurred since 1977, predominantly in the capital city of Lusaka. During both the 2016 and 2018 outbreaks, the Ministry of Health implemented cholera vaccination in addition to other preventative and control measures, to stop the spread and control the outbreak. Given the limitations in vaccine availability and the logistical support required for vaccination, oral cholera vaccine (OCV) is now recommended for use in the high risk areas (“hotspots”) for cholera. Hence, the aim of this study was to identify areas with an increased risk of cholera in Zambia. Retrospective cholera case data from 2008 to 2017 was obtained from the Ministry of Health, Department of Public Health and Disease Surveillance. The Zambian Central Statistical Office provided district-level population data, socioeconomic and water, sanitation and hygiene (WaSH) indicators. To identify districts at high risk, we performed a discrete Poisson-based space-time scan statistic to account for variations in cholera risk across both space and time over a 10-year study period. A zero-inflated negative binomial regression model was employed to identify the district level risk factors for cholera. The risk map was generated by classifying the relative risk of cholera in each district, as obtained from the space-scan test statistic. In total, 34,950 cases of cholera were reported in Zambia between 2008 and 2017. Cholera cases varied spatially by year. During the study period, Lusaka District had the highest burden of cholera, with 29,080 reported cases. The space-time scan statistic identified 16 districts to be at a significantly higher risk of having cholera. The relative risk of having cholera in these districts was significantly higher and ranged from 1.25 to 78.87 times higher when compared to elsewhere in the country. Proximity to waterbodies was the only factor associated with the increased risk for cholera (P5. A major hotspot identified was the city of Lusaka; 89% of the cases in this analysis were reported from Lusaka. Interestingly, only 3 of 33 wards in Lusaka district were identified as high risk areas. The sub-district (constituency) level data analysis of Lusaka found that only three of seven constituencies, with about 20% of the population (600,000 people), experienced high rates of cholera. This suggests that control efforts should focus in these constituencies. Lusaka has several densely populated peri-urban settlement areas with inadequate water and sanitation infrastructure which compromises sanitation and hygiene, facilitating cholera transmission [3]. Lusaka has experienced prolonged rainfall that results in flooding, and this likely further increases cholera risk [2]. The city is also a center for an international cross-borders trading, with many people traveling between countries which may also increase risk of transmission to the city. The hotspot areas outside Lusaka were near the borders with DRC, Tanzania, Mozambique, and Zimbabwe. Given the geographical distance between these border area hotspots, control efforts will be challenging. More localized analysis may likely reveal that the hotspot areas in these districts only encompass a select few wards, as was the case in Lusaka. The hotspots near the borders suggest that cholera in Zambia is linked to cross-border movement between countries where cholera is also endemic. This was observed in Uganda [18]. Further, this suggests that a collaborative intervention program with the neighboring countries could be an effective strategy to eliminate cholera in Zambia and a step toward reduction and elimination in the region. The peak of cholera in Zambia was observed between 2009 and 2010, at beginning of the study period. Subsequently, the number of cases declined. Some have hypothesized that the large number of cases in Lusaka in 2009 and 2010 might be due to prolonged rainfall and flooding (, however, this time period was also a peak time for cholera in other African countries suggesting that the factors responsible for the high numbers may have occurred more generally in Africa. As depicted in Fig 2, cholera occurred sporadically in Zambia; thus, it was difficult to ascertain which risk factors would be the best predictors for its occurrence, rendering it difficult to identify any district level predictors for the increased risk of cholera in Zambia. Interestingly, Chiengi and Mpulungu districts were identified as the areas of highest risk after Lusaka; however, neighboring Kaputa reported only 2 cases over the 10-year period. Of the highest risk districts after Lusaka (Chiengi, Mpulungu, and Sinazongwe), none reported cases in more than 5 out of the 10 years studied. In contrast, Solwezi district, a hotspot of lesser risk, reported cases in 8 of the 10 years. Since we did not identify any risk factors for cholera from our district level data except distance to the waterbodies, it is difficult to determine the underlying cause(s) of cholera. Note that increasing risk among people living proximate to water bodies has already been documented in a number of studies [18–20]. Since the best fit model in our study, i.e. SEM, explained only 16% of the total variations in the outcome, it is reasonable to believe that other risk factor(s) play a role at a spatial scale in Zambia. Since cholera is transmitted by fecal oral route through water, one expects a relationship between cholera and WaSH conditions [21–24]. It is assumed that a well-managed, improved WaSH infrastructure, as has proven effective in industrialized countries, would be an optimal strategy for the cholera elimination program in Zambia. This study did not find an association between cholera and WaSH at the district level, the data available may not have been enough discriminating to find such an association. With the limitation of resources for major improvements in infrastructure, household level WaSH programs have been conducted in the past and might be effective [25–26]. While large-scale WASH interventions may ultimately eliminate cholera, cholera vaccination can be used in the interim as an effective control measure targeting the identified hotspots. This study has limitations. By conducting the analysis based on the 72 districts with the available census population data, rather than the current 115 districts, there was a loss of spatial resolution in the identification of hotspots. Secondly, we did not include acute watery diarrhea cases less than 5 years old from areas where cholera was not known to have occurred or acute watery diarrhea cases less than 2 years old from areas where cholera was known to have occurred. Therefore, we could have missed some cholera cases in our study. Cholera can occur in these age groups and the decision to not include these may have led to an underestimation of cholera cases. Thirdly, the data was obtained from routine surveillance system and there could be differences in the reporting of cases from different parts of the county leading to reporting bias. The data on water and sanitation (WASH) were available only by urban and rural areas; thus there was limitation in the ability to calculate association of cholera with WASH. Also, the WASH data was only for a single time point, precluding an ability to perform time-series analysis with the data. Further, there was limited risk factor data available at the district level that could be used in our analysis, thus, we were unable to identify key risk factors for cholera as well as in predicting future outbreaks. While accepting these limitations, this analysis has identified the districts with elevated risk of cholera which will facilitate the selection of sites for more intensive control strategies. By targeting the highest risk districts, as identified in our analysis, further investigation and data collection at the sub-district level are needed to identify the specific areas to be targeted for the interventions within each district. This would facilitate the planning of interventions in the highest risk wards in a more cost-effective manner. For this, local participation and knowledge are needed to identify data and refine the analyses to highlight ward level high-risk areas within the districts. In the future, if very sensitive and specific surveillance methods allow for real-time case detection with GIS coordinates of cases, improved maps can be created, allowing for even better targeting of interventions. The WHO announced the cholera elimination by 2030 program by partnering with priority countries. Zambia hopes to achieve this goal by 2025 and interventions based on the identified hotspots should assist in this effort. We are grateful to the staff of the Ministry of Health, Zambia for allowing us to access data from their surveillance system database. Support rendered during data collection by colleagues at Centre for Infectious Diseases Research in Zambia -Enteric Diseases and Vaccine Research Unit. 1. 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