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Cholera in Nepal: Examining the Role of Environmental Factors in Disease Incidence and Mortalit

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A B S T R A C T

In most cases, contaminated food and water sources are the cause of diarrheal disease, which is one of the world's most severe leading causes of child mortality and morbidity. The second most common cause of death for children under five is illness caused by diarrhea. It is curable and also preventable. Diarrhea, transmitted via fecal–oral route, is caused by various pathogens, including bacteria, viruses, protozoa, and helminthes. In developing countries with insufficient sanitation, cleanliness, and access to clean water, cholera is an epidemic that spreads from person to person. A cross-sectional secondary review and quantitative study was done to assess the ten years trend of cholera incidence and mortality as well as relationship between cholera cases and Environmental factors. For this study, secondary data was used. In addition, desk review was conducted to analyze previous study reports, articles and literatures to examine the association between the disease incidences and associated environmental factors in Nepal. The Government of Nepal plan and implement various programs for prevention and treatment, cholera incidence and deaths are still present in the country. Cholera outbreaks continue to occur at different times and places in Nepal, causing serious problems. This study shows that the water Scarcity, open defecation and hand washing practices are still prevalent in Nepal and cholera incidence and related deaths continue to occur

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INTRODUCTION

Rapid climate change has catastrophic effects on numerous aspects of human existence; including food security, clean air, safe drinking water, and food security. It also exposes vulnerable people to weather extremes and changes infectious disease patterns (Lancet, 2019).

Public health is under a serious and growing danger from climate change. Cholera and associated diarrheal illnesses have been recognized by the WHO as one of the main health the effects of changing climate. Water shortages or excesses can lead to the emergence of water-borne illnesses (Dhakal et al., 2016).

In most cases, contaminated food and water sources are the cause of diarrheal disease, which is one of the world's most severe leading causes of child mortality and morbidity. The second most common cause of death for children under five is illness caused by diarrhea. It is curable and also preventable (*Diarrhoeal Disease*, n.d.).

Diarrhea, transmitted via fecal–oral route, is caused by various pathogens, including bacteria, viruses, protozoa, and helminthes. In developing countries with insufficient sanitation, cleanliness, and access to clean water, cholera is an epidemic that spreads from person to person (Gp et al., 2009). Cholera is acute water born diarrheal disease cause by "*Vibrio cholera*". *It is* transmitted through the ingestion of contaminated food or water (Ali et al., 2015). A visiting physician from Nepal officially published the first report of cholera in Kathmandu between 1958 and 1960 (Gautam et al., 2012).

For prevention of cholera Nepal government conduct various activities that is Community Led Water Safe Planning (CLWSP) initiative, in collaboration with UNICEF, aims to establish Water Safe Communities. A key aspect of this initiative is achieving Water Safe Certification, which includes maintaining Open Defecation Free (ODF) status, ensuring that Water User Committees are inclusive based on government criteria (considering gender, caste/ethnicity, and the location of taps), and fully implementing Water Safety Plans (WSP) with functional water supply schemes. The community is also educated on household water treatment practices. Regular water quality monitoring, supported by a database system, is conducted to ensure ongoing water safety. This includes water quality surveillance by third parties, with the community's satisfaction scored at a minimum of 80%. Additionally, the existence of a Sustainability Compact is required to maintain these standards. Water Quality Surveillance involves municipal-level committees conducting water quality testing to ensure compliance and safety(Paudel, n.d.).

LITERATURE RIVIEW

For the cholera cases identification the Nepal government conducted various activities that are surveillance system in Nepal encompasses both Indicator Based Surveillance (IBS) and Event Based Surveillance (EBS). Under IBS, hospitals monitor cases of Acute Gastro Enteritis. EBS includes the operation of a call center established in 2021, media monitoring through the Epidemic Intelligence from Open Sources (EIOS), and targeted surveillance in select districts as part of the Enhancing Cholera Control (ECHO) Project. Additionally, efforts are ongoing to strengthen laboratory capacity for cholera detection down

to the district level, ensuring a robust and responsive surveillance infrastructure(Paudel, n.d.).

Rationale of Study

Cholera is a diarrheal illness and a leading cause of mortality and morbidity in developing countries like Nepal. This communicable disease is easily preventable and curable, but due to a lack of knowledge or lack of access to healthcare and sanitation services, many people, especially children, still die in Nepal.

In Nepal, various curative health services and different preventive programs have been carried out over the past few decades. However, the incidence and prevalence of diseases are still high, making them one of the leading causes of mortality and morbidity in underdeveloped or developing countries like Nepal. This secondary study provides a current ten years snapshot of cholera cases and examining the relationship between cholera cases and environmental factors that are directly associated with the increase in cholera cases.

METHODOLOGY

A cross-sectional secondary review and quantitative study was done to assess the ten years trend of cholera incidence and mortality as well as relationship between cholera cases and Environmental factors. For this study, secondary data of EDCD Report 2022 availed by DOHS, DOHS annual report, WHO report and JMP global database (https://washdata.org/) was used. In addition, desk review was conducted to analyze previous study reports, articles and literatures to examine the association between the disease incidences and associated environmental factors in Nepal.

The dependent variables are Incidence and mortality of cholera disease and the independent variables are environmental factors like drinking water, Sanitation and Hygiene etc.

Ethical Considerations

While utilizing secondary data from the EDCD Report 2022 availed by DOHS, DOHS annual report, WHO report, and JMP global database, the study adhered to necessary ethical considerations.

RESULT

Findings

The graph shows that from 2013 to 2019, cholera incidence remained relatively low, with minimal fluctuations. There is a noticeable peak in 2016, where cases briefly increased before returning to low levels in the following years. However, in 2021, there is a dramatic spike in cholera incidence, reaching around 1,600 cases, followed by a sharp decline in 2022. This indicates a significant outbreak in 2021, after years of relatively stable and low incidence.

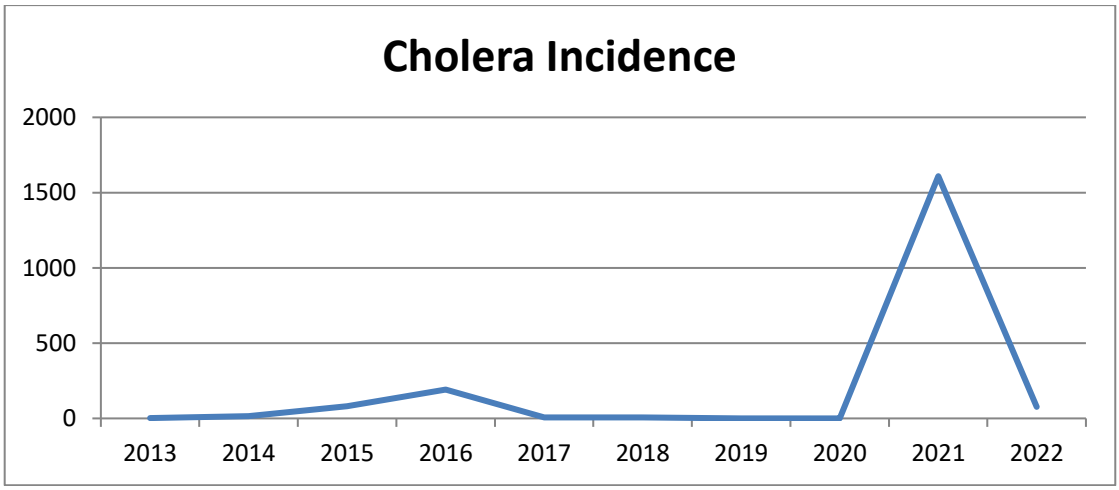

Figure 1. Cholera Incidence

From 2013 to 2015, the number of deaths remained relatively low, with a slight decrease from 2 deaths in 2013 and 2014 to zero deaths in 2015. From 2016 to 2020, there were no reported deaths due to cholera. However, in 2021, there is a sudden spike, with the number of deaths rising sharply to 7. This spike is followed by a drop back to zero deaths in 2022, indicating a significant but brief outbreak of cholera-related fatalities in 2021.

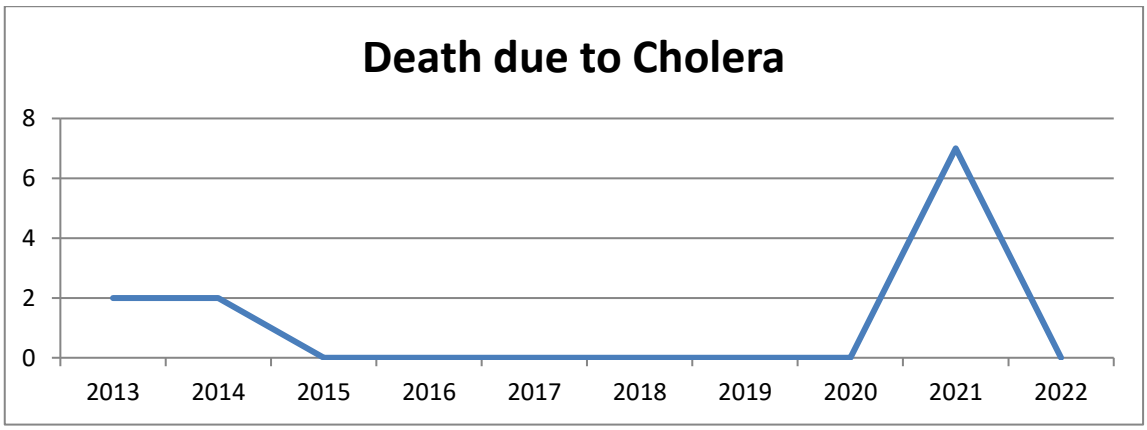

Figure 2. Death due to Cholera

The graph shows the trends in open defecation coverage in Nepal from 2013 to 2022, broken down by rural areas, urban areas, and the country as a whole. The y-axis represents the percentage of the population practicing open defecation, while the x-axis represents the years. The blue line represents rural areas, showing a significant decline from around 35% in 2013 to about 5% in 2022. The red line represents urban areas, which also show a decrease from around 10% in 2013 to just above 2% in 2022. The green line represents the national average, which mirrors the overall downward trend, decreasing from about 27% in 2013 to below 5% in 2022. This graph indicates substantial progress in reducing open defecation in both rural and urban areas across Nepal over the past decade.

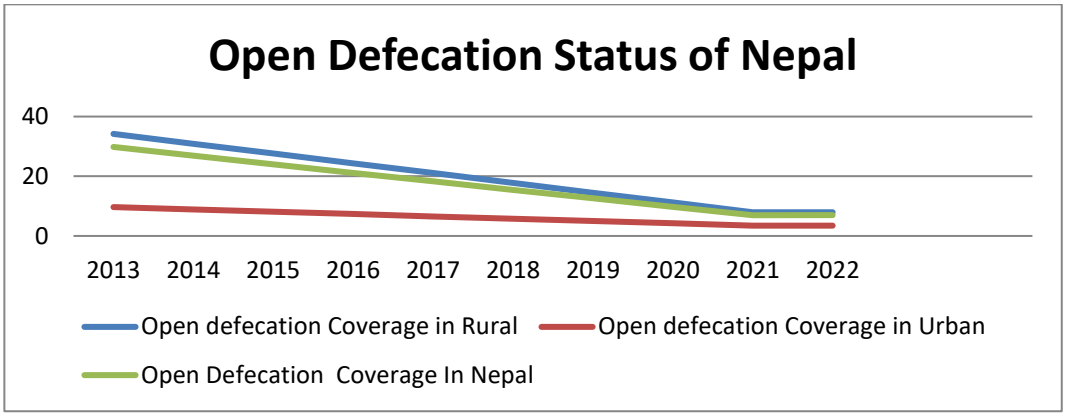

Figure 3. Open Defecation Status of Nepal

The graph shows the trend of limited drinking water services in Nepal from 2013 to 2022, indicating that the coverage of these services has increased from 3% to 4.5% over this period. This means that access to drinking water among people has either increased or become more difficult on a day-to-day basis.

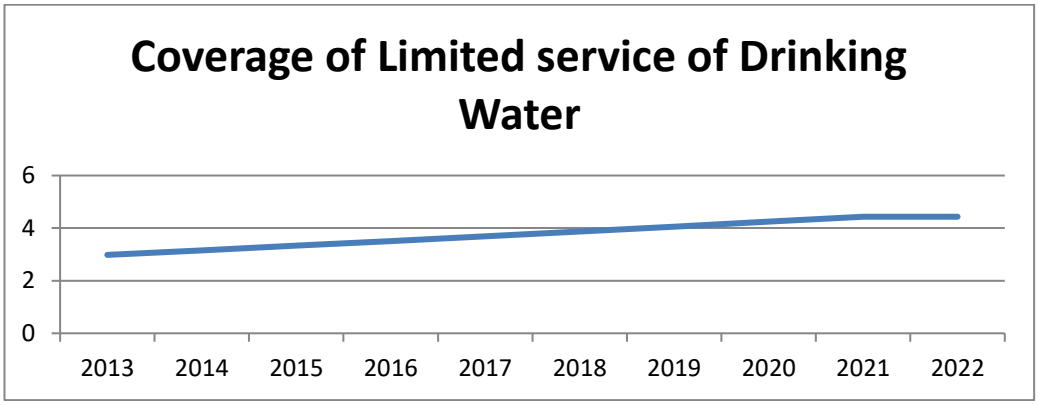

Figure 4. Coverage of Limited Service of Drinking Water

The graph shows the trend of the population lacking basic sanitation in hand washing facilities from 2013 to 2022, indicating an increase from 0.9% to 1.5% over this period. This means that 1.5% of people in Nepal do not have access to hand washing practices.

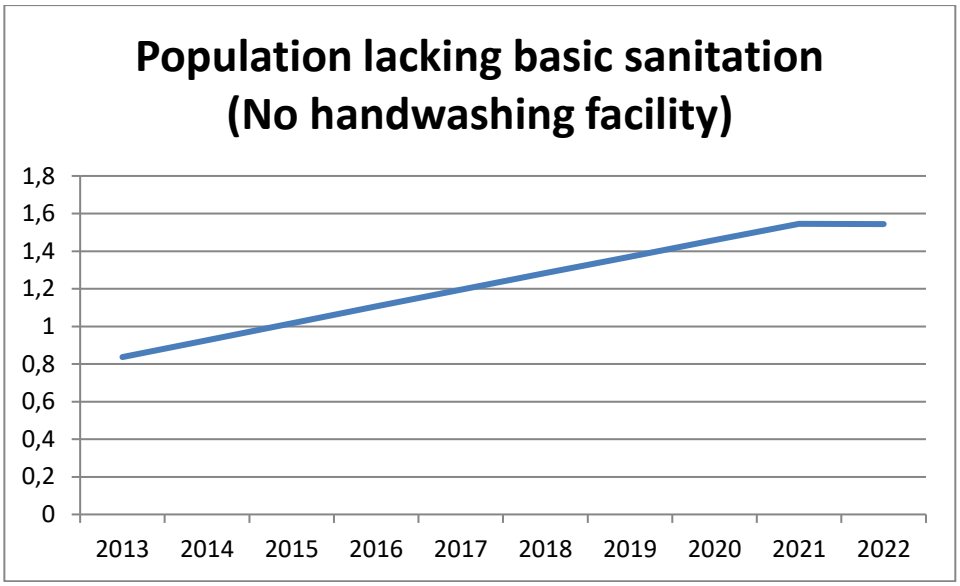

Figure 5. Coverage of Limited service of Drinking Water

DISCUSSION

This is a cross-sectional secondary review study aimed at identifying the relationship between cholera incidence and death in Nepal and environmental factors such as water availability, open defecation, and basic personal sanitation services. Cholera is still a major public health problem in developing countries like Nepal(*Diarrhoeal Disease*, n.d.) (*Cholera in Nepal – CIWEC Hospital*, n.d.) Despite the Government of Nepal plan and implement various programs for prevention and treatment, cholera incidence and deaths are still present in the country. Cholera outbreaks continue to occur at different times and places in Nepal, causing serious problems (*Epidemiology and Disease Control Division: Cholera Outbreak in Kathmandu Valley (15th August 2022) - Nepal | ReliefWeb*, n.d.) (Gautam et al., 2012). Cholera is transmitted through the fecal-oral route, meaning that pathogens are spread through contaminated water and food, highlighting the importance of basic environmental sanitation services and personal hygiene (D'Mello-Guyett et al., 2020).

This study shows that the water Scarcity, open defecation and hand washing practices are still prevalent in Nepal and cholera incidence and related deaths continue to occur. Many studies show that the lack of water availability, poor personal sanitation, and open defecation accelerate the occurrence of fecal-oral diseases like cholera (D'Mello-Guyett et al., 2020)(Chowdhury et al., 2023).

CONCLUSION AND RECOMMENDATION

Cholera is a waterborne diarrheal illness caused by *Vibrio cholerae*, but it is an easily preventable and curable problem. To manage this issue, the Government of Nepal is undertaking various activities in prevention and treatment. However, cholera remains a major communicable disease in Nepal. The country still faces challenges with safe drinking water, basic sanitation, and open defecation, which contribute to the persistence of cholera. As a result, a large number of people, especially children, suffer from this preventable and curable disease, and some even die from it.

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