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Level of Cholera Outbreak Preparedeness before and after Health Education and Factors Influencing Cholera Outbreak Preparedness: A Systematic Literature Review

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Abstract **Original Research Article**

Background and Methods: Cholera outbreaks remain a leading global health threat to public health particularly in Sub Saharan Africa with 1.4 million cases and 25.000 to 142.000 deaths occurring every year (CDC, 2022). A total of 692 cholera outbreaks have been reported in Sub Saharan Africa nearly every year in a span of 20 years from 2010 – 2025 contributing to 90% global burden of cholera (ECDE, 2024). Health educational interventions are often times applied to harness prevention and preparedness for cholera outbreaks (Child *et al*., 2016; Denue *et al*., 2017; Dan-Nwafor *et al*., 2019). Despite of this evidence, effective preparedness for cholera outbreak is habitually missing. This paper presents a systematic literature review of determinants of cholera outbreak preparedness, and, factors influencing preparedness for cholera outbreaks. ***Results:*** The review yielded 32 studies, with 16 focusing on determinants of preparedness for cholera outbreaks while 16 studies looked at factors influencing preparedness for cholera outbreaks. ***Discussion and Recommendations***: Most of papers reported on determinants 18 (56.25%) of levels of cholera outbreak preparedness. This is presented by demographic determinants 8 (23.5%) and behavioral determinants 6 (17.64%). This evidence base largely portrays that marginalized communities such as people with a lower education level, the politically marginalized, people living with disabilities did not have a diseases preparedness plan in the household, did not know what to do, were not willing to think about it, and lived in a household whose economic status was low. This body of evidence indicates a pattern of a lower level of infectious disease preparedness. Much as the reviewed studies focus on preparedness, with most looking at natural disasters, some diseases like COVID-19, it has been identifiable that very little attention was placed on cholera. This is a noticeable research gap indicating limited studies on cholera outbreak preparedness.

Keywords: Protective Behaviors, Emergency Preparedness Behaviors, Cholera, Cholera Factors, Cholera Outbreaks, Engagement in Protective Behaviors, Cholera Determinants.

1. INTRODUCTION

Cholera is an acute diarrheal infection caused by the ingestion of food and water contaminated with the bacterium (Al-sakkaf *et al*., 2020). The virulence of cholera is that it can kill within hours as it affects both children and adults. If left not prevented, it can jeopardize preparedness there by accelerate devastating effects such as death in the community (WHO, 2023). This explains why within its very short incubation period of two hours to five days, the disease can spread quickly through fecal contamination of water or food, resulting in an outbreak of cholera. People with cholera often times complain of passing watery diarrheal, headaque, vomiting (WHO & WASH cluster, 2017).

The spread and development of cholera outbreaks is largely attributable to missing health educational opportunities at community level of low developing countries (Iramiot *et al*., 2019) where focus on components of water, sanitation and hygiene is often low (Kanungo *et al*., 2022). These remain largely linked to open defecation (7%), low latrine coverage (79%), low hand wash practice at a critical time (35%) longer time

for the health surveillance system to contain the outbreak that id featured by a lack of robust to detect the outbreak early (source from factors).

Historically, cholera outbreaks have become frequent with a record of 692 outbreaks in a span of 20 years from 2010 to 2024 in sub-Saharan Africa, which accounts for 90% of the global burden of cholera (ECDE, 2024). At global level, 1.4 million to 4.4 cases and 25.000 to 142.000 deaths occur in countries such as Yemen, Bangladesh, Haiti (CDC, 2022). In Uganda alone, a total of 63 cholera outbreaks have been recorded in a span of 10 years from 2015 to 2024 (Kamukama *et al*., 2024).

It is known that increased education and awareness about cholera with focus on water, sanitation and hygiene can reduce cholera spread from the community by 41% (Ateudjeu *et al*., 2019), limited evidence on effectiveness of health educational interventions linked to preparedness for cholera outbreaks is still missing. To bridge this gap, we have conducted a systematic literature review on knowledge level and hygiene practices for cholera outbreak preparedness before health education and after health education.

2. MATERIALS AND METHODS

2.1. Search Strategy

A search strategy included the use of key words such as Cholera and western Uganda, cholera and Uganda, politics of cholera, cholera and preparedness, pandemic preparedness, cholera outbreaks, works on cholera. The search strategy also included the option known as ancestral approach that involved using references cited in recent relevant studies that helped to track down earlier research on the same topic, which further helped to discover new search terms such as cholera endemicity, cholera a disease of poverty for subsequent electronic searches. The search covered studies published in English between January 2014 and February 2025. We searched for electronic databases. This included Medical Literature on-line (MEDLINE) through Google scholar. This considered articles in journals from scholarly publishers in all disciplines as well as scholarly books. It also allowed to search by topic, by title, by author. It was also very helpful to use PubMed, Scopus, Web of Science. This provided relevant content with an expanded coverage of material focusing on relevant low developing countries. Screening the extracted information was coded. This was done by the use of paper based data extraction forms to record information about each reference. This was done by creating a two-dimensional data collection form known as matrices or evidence summary table. It served as a literature review summary table. It indicated the following: Tittle, authors, publication, study design, sample size characteristics, sampling method, data collection method, participants, intervention (independent variables) results, conclusion, recommendation.

2.2. Eligibility Criteria

2.2.1. Inclusion Criteria

Studies met the inclusion criteria if they:

Reported awareness data, effective response to cholera risks, minimizing morbidity and mortality due to cholera, preventing cholera, cholera readiness.

Reported cholera outbreaks preparedness information between January 2013 and February 2025.

ere original research articles with a focus on preparedness for cholera outbreak, outbreak epidemiology. Study designs could be cross-sectional, cohort, case–control, or surveillance-based outbreak reports, quasi- experimental designs, and many more.

2.2.2. Exclusion Criteria

Studies were excluded if they:

Focused only on sporadic, endemic cholera cases rather than outbreak settings.

Only presented data as conference abstracts without full-text availability;

Were reviews, editorials, commentaries, and discussion pieces without primary epidemiological findings;

Presented epidemiological models or simulations rather than empirical outbreak investigation results;

Considered high and low developing countries, with activities and actions related to effective response to cholera before occurring in the community.

2.3. Quality Assessment

The studies were evaluated by two reviewers using Box 5.3 Guide to a focused critical appraisal of evidence quality in quantitative research report (Polit & Beck, 2021, Page 102) This appraisal checklist focused on critical appraisal questions in the research design, population and sample, data collection and measurement, procedures, results in relation to data analysis and findings, discussion in relation to interpretation of the findings, and, summary assessment. In view of these criteria, each study was rated as bearing a high risk of bias, moderate risk of bias, and low risk of bias.

2.4. Data Extraction and Synthesis

Information that was extracted included key information from each reviewed study. Each study was put in one major file and was placed on the desktop of the laptop The information of choice that was important from each study included author, title, area of study, time frame of the outbreak, duration of containment, content of educational intervention massage, amount of knowledge attainment, acquired knowledge on meaning

of cholera, signs and symptoms, virulence, practices in hand wash.

Extracted information also focused on features such as methods (entailing design, research tradition, methods of bias control), participants (entailing number of participants, key characteristics of the sample such as age, sex, method of sample selection, number of groups), outcome /dependent variable (entailing time points for outcome data collection, method of data collection, specific instrument), results entailing summary of results capturing p values , effect sizes and confidence intervals) and, summary assessment (indicating that despite of any limitations, the study findings appear to be valid or convey confidence in the truth value of the results or shows the extent to which the report inspires confidence about the types of people and settings for whom the evidence is applicable.

The results will be organized as a written literature review. In so doing, an outline will first be made to help structure the narrative flow. This outline will list the main topics to be discussed in their order of presentation so that the review displays a coherent progression of ideas. The results will be thematically synthesized using the thematic possibilities for a literature review that focus on the nature of the theme/topic and questions for the thematic analysis.

The nature of the theme/topic will focus on the pattern of evidence and what this pattern suggests. It will also what gaps are there in the body of evidence.

3.1. Search Results

In total, 40 records were identified through searches, most of whom from Google Scholar. After screening 4 were excluded due to irrelevance based on the title and abstract, language limitations, and review articles. This left 34 records for eligibility, ultimately amounting to the reviewed studies in this systematic literature review.

3.2. Risk of Bias

Of the 32 studies assessed, 31 (90.625%) were classified as having a low risk of bias, 3 (9.375%) were rated as moderate risk.

3.3. Study Characteristics

Majority of the studies were primarily in developed and Low Developing countries, primarily from Africa, Europe and Asia.

4. Determining Level of Cholera Outbreak Preparedness Before and After Health Education

4.1 Behavioral Determinants of Levels of Cholera Outbreak Preparedness

Nurjanah & Rezza (2021) studied disaster preparedness and risk perception in Bandung city, Indonesia. It aimed to develop a model of urban community residents that reinforces their perceived behavior control and subjective norms for emergency preparedness behavior. This study used simple random sampling technique of participants to whom an on-line questionnaire was administered. It found that people with positive subjective norms had more intentions for disaster preparedness measures. Precisely therefore, people with higher subjective norms developed more preparedness intentions and behaviors against disease health risks in Bandung city of Indonesia.

Chen *et al.,* (2019) conducted a study about household preparedness for emergency events. It was a cross-sectional survey on residents in four regions of China. Objective: This study aimed to assess household preparedness for emergency events and its determinants in China. It was conducted on 3541 households. The participants were households that were selected using a stratified cluster sampling strategy. The questionnaires were administered through face-to-face interviews. It showed that much as (9.9%) of households were the only ones prepared for emergencies, (53.6%) of the households did not know what to do in relation to preparedness behaviors against disease threats, and (31.6%) did not want to think about it. These results illustrate a knowledge gap that warrantees undertaking the proposed study.

Armas, Cretu & Lonescu (2017) studied self-efficacy, stress and locus of control in Bucharest, Romania. It revealed that people who felt less prepared for disease outbreaks were those who only trusted various institutions that included government, media, and Non-governmental organizations. In addition, the study points to excessive trust in the responsible authorities and organizations made people feel less responsible in undertaking emergency preparedness behaviors, and, developed a false sense of security/ complacency of taking precautionary measures and preparedness behaviors.

Xu *et al.,* (2015) conducted community preparedness for emergency among residents in Heilongjiang, China. It indicates a lack of awareness and knowledge about health threats preparedness that was mentioned as having determined a lowered level of disease emergency preparedness in China. On the other hand, Heinkel *et al.,* (2022) studied disaster preparedness and resilience at household level in Yangon, Myanmar of south East Asia. The results point to people with a higher level of knowledge who had strong beliefs, intentions, and preparedness behaviors in Yangon city. In addition, the study indicates that increased household knowledge improved preparedness because the more substantial the disaster knowledge was, the better the disaster preparedness it became eventful in Yangon city.

Ning *et al.,* (2021) studied factors associated with emergency preparedness behaviors. This was a

cross-sectional survey among the public in three Chinese provinces. It points to only (6.7%) of respondents who reported having a 3 day supply of five essential items, (5.1%) of households were fully prepared for emergency events. It adds that (25.6%) of the participants were not having an emergency preparedness plan at all, and, (20.5%) of the participants were considering to take action, and, (25.8%) were planning to start later. Precisely therefore, the study points to a low level emergency preparedness with (25.6%) of the respondents not having an emergency preparedness plan at all, (20.5%), (20.5%) still considering to take an action of having one, and, (25.8% were still planning to start later. Therefore, this identifiable low level of emergency preparedness among the Chinese, illustrate a lack of research in the specialty of cholera outbreaks preparedness.

4.2 Social Economic Determinants of Levels of Cholera Outbreak Preparedness

Brakefield *et al*., (2021) studied an urban population health observatory system to support pandemic preparedness, response and management. The study highlights marginalized population disparities that determined a low level preparedness of anticipating and mitigating disease risks. The preparedness frameworks usually describe a variety of equity considerations that determine preparedness such as monitoring baseline population characteristics; need to foster community trust, planning for material and financial support for their marginalized communities that are inequitably impacted.

Tan *et al.,* (2021) assessed the role of qualitative factors in pandemic reposes. It points to the role of governance and leadership in determining the level of infectious disease preparedness. It highlights attention to public health regulation as one of the key elements in the roadmap to prepare for the next health threat among high, middle, and low income countries. This road map highlighted a high strength that can reduce the risk of zoonotic diseases crossing over to humans.

As a result of the COVID-19 experience, Sheikhtaheri, Jabali & Kabir (2022) unfold how the health information system that was developed during the pandemic era has continually been adopted for the next health threat in Iran. It points to an electronic health record based surveillance system. The outcomes of the developed system is currently able to monitor confirmed and suspected cases over a wide spectrum of disease conditions, particularly the highly infectious disease conditions in the population, and automatically notifies stakeholders. This system is able to allocate resources for hospitals, manage bed allocations, setting up isolation centers, effective tool allocation, and, increased ability of policy makers in making better decisions as well as epidemiologists in being able to conduct improved analyses regarding the highly infectious diseases. This study point to COVID-19 upsurge reduction. It is therefore illustrating less attention to infectious diseases such as cholera. Hence, an identifiable research gap highlighting a lack of research about cholera outbreaks preparedness.

Martins *et al.,* (2019) studied household preparedness in an imminent disaster threat scenario: The case of super storm sandy in New York City. It points to the fact that on average, each household engaged in 7 out of 14 preparedness activities on the date of the storm in New york city. It also reveals how social and socio-psychological factors influenced the preparedness behavior of New York City households. It further indicates that households engaged more in the acquisition of preparedness supplies than in developing or planning mitigation capabilities. Social capital was an enabler, particularly, households that were more politically active and were more integrated in community networks that engaged in all types of preparedness efforts. Risk perception also had a positive impact on the preparedness efforts developed by New York City households. Also, single mother households, low-income households, and households with seniors were less likely to be proactive regarding preparedness efforts, while households with one or more members with functional and access needs and households located within the Sandy inundation areas were more likely to prepare for a disaster or an emergency. Precisely therefore, the levels of household preparedness for disaster risks in New York were modest. This was presented by each household engaged in 7 out of 14 preparedness activities, particularly, single mother households whose social capital was marked by community networks and being politically active. These findings of social determinants of a modest level of preparedness are aligned to disaster risks such as storms, suggesting a lack of attention to cholera. This identifiable research gap illustrates a lack of research in the specialty of cholera outbreak preparedness.

Zaremohzzbieh *et al.,* (2021) studied household preparedness for future earthquake disaster risk. It aimed to predict household earthquake preparedness in Malaysia. Their study point to a higher preparedness. This study particularly point to a higher collective efficacy in which people who participated more in social events reported more preparedness for disasters where higher collective efficacy and greater community participation were reported.

4.3 Demographic Determinants of Levels of Cholera Outbreak Preparedness

Ximiao *et al.,* (2025) studied determinants of preparedness in family caregivers of patients with heart failure. This cross-sectional study used self-reported questionnaire that was conducted in tertiary hospitals of China. It points to a finding that uncertainty in illness had an indirect negative effect on preparedness (indirect effect: -0.020; 95% confidence interval (CI) -0.050 to -

0.002). Precisely therefore, the study highlights that diminishing un certainty in illness indirectly improved caregivers preparedness through the enhancement of positive aspects of care giving. Much as raising family relational quality and social support improved caregiver preparedness both directly and indirectly by enhancing health education about positive aspects of caregiving, findings of this study applied to caregivers of patients with heart failure. This type of people to whom findings applied illustrates a research gap not only about the people but also the type of health problem. Hence, an identifiable gap providing insightful implications for a new interventional study to ameliorate preparedness at community level.

Taylor, Rutkow & Barnett (2018) studied local preparedness for infectious diseases outbreaks. This qualitative explorative study focused on willingness and ability to respond in the United states. It points to a gap in the local health department workers willingness and ability to prepare for emergent infectious disease risks. This gap presents that the local health department workers with training and having no family members to care for in their households had a higher level of willingness to respond to a variety of health risks disasters than those who had family members to care for in their households. Further, local health department workers in rural areas had higher levels of self-reported willingness to respond to health risks disasters than their counterparts living in urban areas. Precisely therefore, local health department workers who lived in rural areas and did not have family members to care for in their households presented a higher level of emergency preparedness behaviors. While a higher level of emergency disease preparedness among local department health workers who did not have family obligations is noticeable, this finding illustrate a lack of attention to cholera outbreaks since it only specifies a variety of health risks disasters. Hence, a noticeable knowledge gap that can be addressed in the proposed study.

Adams, Eisenman & Glik (2019) studied community advantage and individual self-efficacy in promoting disaster preparedness among people with disability in Los Angeles County, United States. The findings indicate that people with physical disabilities, ethnic, racial and political minority groups had lower intentions and a reduced health risks preparedness behavior. Precisely therefore, marginalized communities that included the disabled, the politically marginalized by race and ethnicity were found not engaging in protective behaviors related to disease risk preparedness. Much as the evidence is persuasive, powerful and inspires confidence about the type of people to whom the results were generalizable, the study was limited by a perspective of all hazards. This illustrates a noticeable gap indicating a lack of attention to cholera-specific emergency preparedness behaviors.

Thomas, Leander & Cioffi (2015) studied influences of preparedness knowledge and beliefs on household disaster preparedness. This USA study found that people with higher levels of education and incomes were more prepared for health risks or disease threats as they were found having assembled an emergency kit (44% versus 17%), developed a written household disaster plan (9% versus 4%), and received county emergency alert notifications (63% versus 41%). Similarly, differences in household preparedness behaviors were correlated with beliefs about preparedness. Persons identified as having strong beliefs in the effectiveness of disaster preparedness engaged in preparedness behaviors at levels 7%–30% higher than those with weaker preparedness beliefs. Precisely therefore, people with higher levels of education and incomes were more prepared for health risks presented by having assembled an emergency kit (44%), written household disaster plan (9%), effectively received health alert massage notifications (63%) and strong intentional beliefs in engaging in emergency preparedness behaviors (30%). With this substantive evidence of people with higher levels of education demonstrating higher engagement in emergency preparedness behaviors in their households, a population gap is noticeable in these findings, which recognize that local populations have not been adequately represented in the evidence base of this prior research. Therefore, a proposed study will address this population gap.

Wang, Ham, Liu & Yu (2021) investigated the mediating role of self-efficacy between place attachment and disaster preparedness based on data from the 2018 Shandong General Social Survey (N = 2181) in China. They categorized the preparedness behaviors into three specific clusters: material, behavioral and awareness preparedness. Multiple linear regressions and the Sobel Goodman tests were employed to estimate the correlations with the control of necessary confounding variables such as disaster experience, socioeconomic and demographic characteristics. The results indicate that men reported better belief, better intent and better behaviors in their encounter with disease threats than women. The study explains the implicit justification of these differences between men and women that these were due to being the head of the household with more responsibility than other family members. Therefore, a higher disease risk preparedness level was determined by male gender justified by being the household head with more responsibilities than other members in the household. These findings highlight the importance of promoting self-efficacy in health promotion interventions for emergency preparedness behaviors specific to disease threats such as cholera outbreaks preparedness.

Kelly & Ronan (2018) studied preparedness for natural hazards: testing an expanded education

engagement in Australia and New Zealand. The participants were university students who used an on-line questionnaire. These participants were chosen using snow ball sampling method. The results point to older people and young people who had more reasonable intentions and reasonable disaster preparedness behaviors, particularly the Australian participants than the New Zealand participants. Furthermore, this study point to older people who reported more preparedness intentions due to experience, better risk perception and responsibility towards younger people. Therefore, these disparities in levels of reasonable preparedness behaviors by region such as higher preparedness in Australia than New Zealand illustrate less attention on preparedness knowledge such as cholera.

5. Identification of Factors Influencing Cholera Outbreak Preparedness

5.1 Public Health Infrastructure and Its Influence to Cholera Outbreak Preparedness

The global Task force on cholera control (2017) about cholera preparedness and long –term actions highlight inadequate assessment, weakened surveillance systems that influenced compounded by a a lack periodic training can increase the spread and development of cholera outbreaks. In addition, a retrospective evaluation of the past cholera outbreaks are rarely conducted to help find information that can be usable in cholera outbreak preparedness education. Therefore, poor quality public health structures marked by a weak surveillance systems, and lack of routine training of health work force in effective prevention of cholera is an identifiable potential factor influencing preparedness of cholera outbreaks.

The study by Ohene, Klenyuie & Sarpeh (2016) highlight the extent to which a robust health surveillance system was very useful in detecting cholera cases early and in trucking cholera outbreaks. This retrospective assessment of the response to cholera outbreaks in two districts in Ghana pointed that the district health officials swiftly followed up their cholera discharged patients upon improvement. They found that one person had got re-infected with cholera after consuming contaminated river water from River Tordzi. Therefore, a robust district surveillance system in India made the district officials to follow up their successfully discharged cholera patients that enabled them to identify how one of the people had got re-infected after consuming contaminated river water from Tordzi river. Hence, an identifiable quality public health structural factor that influenced preparedness for cholera outbreaks in India.

Berhe *et al.,* (2024) on existence of cholera outbreak, challenges and way forward on public health interventions to control cholera outbreak in Ethiopia. It was a descriptive epidemiological analysis. The study identified the absence of laboratory rapid diagnostics test and a lack of trained personnel both at the community and institutional levels that influenced underpreparedness for cholera in Ethiopia. The reason is that a total of 244 cholera cases that were lately detected were attributable to a delay in early diagnosis of cholera patients for v. cholerae in Gurashe Zone and other causative pathogens associated with diarrheal diseases. The lack of trained personnel compromised the investigation and prevention process. Much as Ethiopia had a national cholera plan targeting to eradicate cholera by 2030, a total of 244 cholera cases were attributed to inadequate laboratory capacity that delayed early diagnosis of cholera patients coupled with inadequate trained health staff on how to conduct investigations and preventive measures. These findings indicate a noticeable gap linked to limited research about cholera preparedness. The methodology section points to a lack of variables to which to compare results as there was comparison group. It further highlights a lack of a sample size that made generalization of results very difficult. These are potential methodological research gaps that will be strengthened in a new study.

Dan-Nwafor *et al.,* (2019) point to a week surveillance system that did not proactively respond to cholera before it occurred in Nigeria. This unmatched case-control study narrates that on November 8, 2014, the head of the Primary Health Care Department (PHCD) through the Disease Surveillance and Notification Officer (DSNO) reported an increase in the number of reported cases of vomiting and diarrhea in Gomani village, Kwali Area Council, Federal Capital Territory (FCT) Abuja. The Nigeria Field Epidemiology and Laboratory Training Programme (NFELTP) was notified of the outbreak. An outbreak response team was immediately mobilized and deployed to Gomani settlement. The team investigated the outbreak with the objectives of verifying the diagnosis, identifying risk factors and instituting appropriate control measures to control the outbreak. Precisely therefore, a lack of proactive approach before the occurrence of cholera in Gomani village, Abuja that necessitated dispatching a health team to identify risk factors indicate underpreparedness for cholera outbreaks in Abuja, Nigeria.

5.2 Water and Sanitation Infrastructure and Its Influence to Cholera Outbreak Preparedness

Gallandat *et al.,* (2021) conducted a randomized control trial of water supply infrastructure in Uvira, Democratic Republic of Congo. The trial was a large scale safe water supply improvement project that led to the installation of 1000 new community tabs which connected 3000 households in cholera hot spot areas of Uvira. Precisely therefore, the establishment of a large scale water supply that included an installation of 1000 new community water taps connecting 3000 households influenced safe water supply that significantly reduced risk of cholera transmission influenced preparedness for cholera outbreaks in Uvira, DRC.

In view of inadequate water and sanitation infrastructure in Addis Ababa, Ethiopia that was marked by the use of holy water at source, consumption of street vended food that significantly increased rates of contracting cholera infection, the conclusion section points to a recommendation which (Edris *et al.,* 2016) considers as an influencing factor that can drive preparedness for cholera outbreaks. As such, their case control study recommends that an increased intensity of social mobilization, improved awareness of the community on safe water use, proper hygienic practice, proper waste disposal, latrine facility construction and utilization, and effective assessment of the quality of water points as well as food handlers. This point to an increased access to proper sanitation facilities that is vital in containing further spread of cholera, which can influence preparedness for cholera outbreaks.

Saute *et al.,* (2020) point to inequalities in terms of social and technological issues as factors that influence preparedness for infectious disease outbreaks. This can be due to differences in understandings the social, built and natural environments in which disease outbreaks occur that heighten inequalities. This kind of understanding can weaken or strengthen preparedness efforts. Countries may choose to prioritize tackling inequalities that are embedded in societies while others can be slow at it, hence, a low level of disease preparedness. During the COVID-19 era, many countries considered enacting financial measures such as income support, debt relief, and waving off bank loans to protect individuals and families from effects of the health crisis.

Ateudjiew *et al.,* (2019) studied health facility preparedness for cholera outbreak response in Cameroon. Their cross-sectional study focused on four cholera prone districts. The study points to a finding that a 4 (30%) health facilities in the far north region did not have a toilet, 7 (5.1%) did not have any source of drinking water as they relied on un protected lake water source, less than a half of the health facilities did not have a hand washing protocol, and, 8 (31%) of the health facilities with Oral rehydration salts for case management was available, and 13 (50%) were having a cholera-case management guide. Precisely, a weak Health facility water and sanitation infrastructural factors influenced the spread and development of cholera outbreaks in Cameroon.

Niederberger, Tanner & Karam (2023) studied social behavioral insight for community-centered cholera preparedness and response in Mozambique. It highlights inadequate access to water, sanitation and hygiene as an identifiable influence of cholera outbreaks in Mozambique. It identifies that much as the people have a higher knowledge about cholera; their preparedness response knowledge is not translated into practice. This is common in Chemba district whose natives practice open defecation, have limited access to safe water, despite knowing that bad hygiene practices are associated with cholera transmission. Precisely, a lack of transfer of learnt knowledge about cholera manifested by practices of open defecation and a lack of access to safe water is a wash factor that influences the spread and development of cholera outbreaks in Mozambique.

5.3 Community Engagement, Education and Its Influence to Cholera Outbreak Preparedness

Han *et al*., (2020) point to Pre-existing community engagement structures as a factor that influences preparedness for health threats. They consider that a functioning community engagement structure is critical for an effective response to disease outbreaks. Countries with health systems featured by strong ties to communities can respond quickly and effectively to outbreaks. Embedding community level healthcare in the response strategy depends on longstanding engagement with the communities involved. To strengthen community engagement, it is important to build and maintain trust, improve confidence in the government, and a high sense of self-responsibility. Most settings with high levels of trust in government have had positive outcomes in as far as pandemic preparedness is concerned. Conversely, a lack of trust in the government can lead the community members' to undertake self-imposed measures that are stricter than those proposed by the government authorities.

Health Policies, Governance and Its Influence to Cholera Outbreaks Preparedness

Buliva *et al.,* (2023) conducted a narrative review on cholera. The review points to the failure to combat persistent political instability, conflict, insecurity and large population movements within the Eastern Mediterranean. The political insecurity points to a weaker inter-country collaboration and shared learning about cholera prevention, overcrowded environments such as camps for refugees and internally displaced people, that deprived the water and sanitation systems, weakened the health system and promoted cholera spread, hence an identifiable factor influencing under preparedness for cholera outbreaks in the region. Precisely therefore, a protracted political conflict was a key driver to endemicity of cholera outbreaks or increased risk of emerging and remerging cholera infections, hence, an identifiable factor that influenced cholera outbreaks preparedness in the Eastern Mediterranean region.

Wieler, Rexroth & Gottschalk (2021) point to political factors that shape preparedness for infectious disease outbreaks. The manner in which political structures and governmental services are organized, determines the extent to which organizations and individuals can bring into line their preparedness actions and behaviors. Countries with federal governments or decentralized structure such as Germany and Sweden

had to manage the COVID-19 pandemic outbreak by ensuring an effective communication channels and agreeing on restriction measures. In addition, a challenge may occur in which achieving consensus among scientists and politicians about an emergency preparedness action where different views and perceptions can derail a preparedness response. This was eventful in countries such as Uruguay, Thailand, and Germany whose groups of scientific experts and political leadership offered to dedicate themselves towards guiding policy directions.

Resource Mobilization and Its Influence to Cholera Outbreak Preparedness

A review by Berjau *et al.,* (2023) point to a preparedness plan to fight off cholera in Lebanon. The plan highlights the Lebanese government support for victims of the outbreak. It indicates the mobilization of 900,000 dozes of oral cholera vaccine from France that were funded by the United Nations central emergency response fund and the contingency fund for emergencies, increased adherence to diagnosis and management guidelines by major government hospitals, and, establishment of 20 bed hospital for future cholera patients. This kind of government support that included availability of partnerships and collaborations with external actors enhanced the Lebanese local capacity of cholera preparedness efforts. Precisely therefore, the full government in terms of increased mobilization of 900,000 dozes of cholera vaccine from France with funding from the United Nations central emergence response fund indicate an identifiable factor that influenced cholera outbreak preparedness in Lebanon.

Naveed *et al.,* (2022) studied cholera outbreaks in Lahore, Pakistan. Their study point to poor resource mobilization that influenced underpreparedness for cholera outbreaks and led to a declaration of 2000 cholera patients in Lahore city of Pakistan. The study highlights a lack of effort by the Lahore city authorities in allocating resources. This was marked by a large proportion of the population living in slums using open field make-shift toilets (10%), toilets with no flush system (55%), lack of awareness about preventing cholera, heavy dependence on the only available river water that is contaminated by poor sewage system, and a dense population of over 7 million inhabitants. Precisely therefore, a lack of effort and resource allocation in terms of funds and materials resources by the Lahore city authorities influenced a declaration of 2000 cholera patients and cholera outbreak in May 2022 in Pakistan. These identifiable factors that link a lack of resource allocation and, a lack of awareness on cholera prevention in Pakistan provide an insight into a new study.

Haldane *et al.,* (2021) point to cross border cooperation as an influential factor in preparedness for infectious diseases. Considering that cross border cooperation is crucial in creating and developing an effective response at national, regional and international level, this can lead to the establishment of an inherent interconnectedness of preparedness strategies between governments. This kind of interconnectedness can yield collective action, gather scientific experts, high level policy makers and working groups. Global cooperation in form of international partnerships can foster rapid resource mobilization before and during global health emergencies such as COVID-19, cholera outbreaks. This kind of resource mobilization can serve as a motivator of donations, clinical trials to accelerate curative services, effective sharing of epidemiological information.

Training, Capacity Building and Its Influence to Cholera Outbreak Preparedness

Several studies point to the urgent action needed for pandemic preparedness. Significant progress involving the birth of climate change adaptations and health workers training as a focus of priority has necessitated for changes in health training curricular and policy frameworks for climate change that are aligned at strengthening disease surveillance systems. These readiness initiatives are noticeable in south Africa, Ghana, Nigeria, Namibia, Ethiopia and Kenya. This identifiable factor related to training of health workers force that is continuous to improve readiness for pandemic preparedness point to a factor influencing preparedness for infectious disease outbreaks in some African countries (Opuku *et al.,* 2021).

Research, Innovation and Its Influence to Cholera Outbreaks Preparedness

Aziz *et al* (2022) conducted an analysis of the demand for cholera vaccine in the slum areas of Bangladesh. This study pointed to most household participants who preferred curative services in which they were willing to pay as much as $1.50 at the hospital as treatment for cholera other than accepting the cholera vaccine. Precisely, the slum residents in Bangladesh preferred curative services for treating their cholera patients to taking the cholera vaccine that determined a low level of preparedness for cholera outbreaks. Therefore, this cholera vaccine hesitancy influenced the sustained spread of cholera in Bangladesh. The investment option in terms of money resources and forfeiting cholera vaccine uptake illustrates a knowledge gap in the preventive – innovative work for cholera outbreak preparedness.

Wahed *et al.,* (2013) conducted a cross-sectional study about Knowledge of, attitudes toward, and preventive practices relating to cholera and oral cholera vaccine among urban high-risk groups in Dhaka, Bangladesh. Only 16% of 2,830 surveyed household members acknowledged that they have ever heard that oral cholera vaccine can prevent cholera infections in human beings. Precisely therefore, the lack of knowledge about the existence of oral cholera vaccine as an innovative work in among majority people in

Bangladesh explain the factor that influenced cholera outbreak preparedness among the people of Bangladesh. This gap illustrating a lack of knowledge about the availability of a cholera vaccine, inadequate access and distribution of the cholera vaccine to household members in high risk areas amounts to a knowledge gap factor.

Wierzba (2019) studied oral cholera vaccines and their impact on the global burden of disease. With one-third of nations at risk of cholera, prolonged cholera outbreaks are expected to occur as many years may come to pass by still working towards universal global access to Water, sanitation and hygiene. As such, the study specifically points to a wide availability of licensed and WHO prequalified cholera vaccines that are important tools for cholera prevention. Oral inactivated whole-cell vaccines such as Shanchol and Euvichol-plus provide well-documented direct benefits to vaccine recipients and to the unimmunized through herd protection. Manufacturers have now increased the cholera vaccine supply, and since 2013 vaccine doses have been available for emergency and endemic control through a global stockpile. Advances in packaging and vaccine temperature control, reduced vaccine costs, the inclusion of pregnant women in vaccine campaigns, and a targeted approach to high incidence endemic areas are further increasing the usefulness of these vaccines for reducing the global cholera burden. Precisely therefore, research and innovation related to the availability of oral cholera vaccines from licensed WHO prequalified manufacturers beneficial to create herd immunity to recipients including pregnant women is an identifiable factor that influence preparedness for cholera outbreaks.

Oppenheim *et al* (2019) points to an innovation in which they developed an epidemic index (EPI) to assess national –level preparedness. It specifically developed robust metrices that were useful in assessing global resilience to epidemic and pandemic outbreaks relating to influenza pandemic. The essence was to innovate an additional assessment that does not only focus on legislative frameworks but also measures other essential capacities that support public health preparedness and response. The developed Epidemic Preparedness index consisted of 188 countries about five specific sub-indices measuring each country's economic resources, public health communications, infrastructure, public health systems and institutional capacity. These included proxy measures for preparedness and response capacity such as timeliness of outbreak detection and reporting, vaccination rates during the 2009 H1N1 influenza pandemic. Using the developed epidemic preparedness index, results indicated that the most prepared countries were concentrated in Europe and North America, while the least prepared countries clustered in Central and West Africa and Southeast Asia. Better prepared countries were found to report infectious disease outbreaks more quickly and to have vaccinated a larger proportion of their population during the 2009 pandemic. Precisely therefore, the development of an epidemic preparedness index was indicative of the research and innovative factor that influenced the preparedness for infectious diseases outbreak particularly the HINI influenza pandemic , that singled out Europe and North American countries more prepared than the central African countries, West African countries and South Asian countries. This identifiable factor that points to innovative work where African and South Asian countries were less prepared for pandemics illustrate a research gap where less attention has been paid to cholera. Hence, offers insight into a new study about health education and cholera outbreaks preparedness.

Baiyewu (2023) point to effective investment in data analysis to help identify disease risk and tailored interventions. The study clarifies that Data analytics is crucial in health services, supporting healthcare delivery, research, and decision-making. The data analytics's benefits include an improvement in health service outcomes by identifying risk factors, enabling early disease detection, and creating personalized treatment plans. It aids in predicting disease progression, identifying potential drug interactions, and tracking disease spread, empowering informed decision-making and service quality improvement. Data analytics also enhances public health surveillance and outbreak detection, targeted interventions, resource allocation, proactively responds to public health threats, safeguarding population health and preventing infectious disease spread. Precisely, effective investment in data analysis that helps to identify disease risk such as cholera and inform decisions of interventions is an identifiable factor that can influence preparedness for cholera outbreaks.

Culture and Cholera Outbreak Preparedness

Mcateer *et al*., (2018) point to the 79 year old woman who died complaining of watery diarrhea and severe dehydration. It further points to 3 patients who died within hours on their hospital admission beds. The investigations of the response team gathered that these deaths were attributable to the traditional practice in which the body of the 79 was flushed water through the body to clean it and subsequently discarded into the municipal water system. It was further attributed to one person involved in food preparation at the funeral who developed the disease 6 days after the funeral. With improved surveillance later, the Zambian health ministry, conducted microbial testing from a shallow well near the funeral and found it positive for V. cholerae. This was followed by training on dead body management and safe funeral practices. Hence, a factor that influence preparedness for cholera outbreaks in Chegutu District.

Stowell & Garfield (2021) point to the role of social norms and cohesion in influencing preparedness

for cholera outbreaks. Cohesion is also an important aspect of ensuring the community complies with measures. Furthermore, social connectedness and a sense of unity can be observable in countries where leaders pay attention to experts and shaped a culture of emergency health risk preparedness. In countries that have succeeded in containing outbreaks of infectious diseases, there is usually a sense of collectivism to act responsibly to protect their community; by contrast those that have relied on individual responsibility have struggled. Countries with a more cohesive society and with a cultural norm of complying with authority performed better in disease prevention than countries with a more individualistic social outlook.

6. DISCUSSION

6.1 Determining Level of Cholera Outbreak Preparedness Before and After Health Education

A total of eighteen (18) reveal the determinants of levels of preparedness for infectious diseases. Of these, demographic determinants were eight studies (8) followed by six (6) studies on behavioral determinants, and, four (4) social –economic determinants. Overall, a low level of preparedness is largely reflected across the body of reviewed studies as most household members did not know what to do, did not have emergency preparedness plans in their households, and were not willing to think of about it. Given that majority of studies focused on preparedness for natural disasters with very little focus on communicable diseases like COVID-19, this review illustrate less attention to cholera outbreaks preparedness. Hence, a noticeable research gap in the area of preparedness levels for cholera outbreak preparedness.

The pattern of evidence suggests that behavior determined the low level of preparedness. Unsatisfactory disease preparedness intentions and behaviors were presented by a lack of awareness and knowledge about health threats preparedness (Xu *et al*., 2015), not having an emergency plan at all in the household (Ning *et al*., 2022), false sense of security and complacency in trusting the government systems (Armas, Cretu & Lonescu, 2017) and, not wanting to think about the preparedness plan (Chen *et al*., 2019). Contrary, some studies depict a pattern of higher level of preparedness due to behavioral determinants. This is presented by increased up-take of subjective norms that determined a higher intention for disease preparedness measures (Nurjanah & Rezza, 2021), having strong beliefs in disease preparedness behaviours in Yangon city (Heinkel *et al*., 2022).

A consistency in evidence about demographic determinants point to low level of preparedness. This is indicative of local health department workers that were not married and lived in rural areas paid less attention to emergency preparedness behaviours (Taylor, Rutkow & Barnett, 2018), marginalized communities by race, ethnicity, physical disability and political minority groups were less engaged in disease risk protective behaviours (Adams, Eisenman & Glik, 2019), people not having a developed household preparedness plan (Thomas, Leander & Cioff, 2015). On the other hands, higher levels of preparedness were attributable to older people and young people due to experiences of older people in better risk perception as well as their responsibility towards the young (Kelly & Ronan, 2018), higher preparedness in men who reported better beliefs and intend than women due to being the head of the family with more responsibilities than other family members (Wang, Ham, Liu & Yu, 2021), and, diminishing uncertainty in illness due to raising family relational quality and social support that is most significant among caregivers preparedness (Ximiao *et al*., 2025)

The social-economic determinants of preparedness point to a low level as depicted in disparities in marginalized communities that lack social health amenities (Brakefield *et al*., 2021), preparedness road map that entailed a decisive focus on reducing the risk of zoonotic diseases crossing over to humans (Tan *et al*., 2021), a maintained electronic health record based surveillance system in the aftermath of the COVID-19 pandemic to truck future infectious disease outbreaks (Sheikhtaheri, Jabal & Kabir (2022). The pattern of a higher determinant of preparedness point to a modest level of household preparedness among single mothers who engaged in 7 out of 14 preparedness activities (Martins *et al*., 2019) due to their high social collective tendencies, higher participation social events, and being politically active (Zaremohzzabieh *et al*., 2021).

Most of the reviewed studies highlight preparedness for natural disasters. Very few focus on communicable diseases such as COVID-19. This illustrates a less attention to infectious diseases such as cholera. Therefore, this is an identifiable research gap highlighting a lack of research on the area of cholera outbreak preparedness. Despite the efforts to reduce disease health threats or risks, global disease preparedness intentions and behaviors largely indicate that they are not satisfactory in most cited studies, hence, a manifestation of a low level of preparedness for disease outbreaks such as cholera.

6 .2 Factors that Influence Cholera Outbreak Preparedness

A total of twenty one (21) studies highlight the factors that influence cholera outbreak preparedness, with seven (7) studies providing a pattern of evidence illustrating training and capacity building as a n influential factor of preparedness for cholera outbreaks. This is followed by water and sanitation infrastructural factors with five (5) studies cited, then public health infrastructure as well as community participation factor

with four (4) studies. The least influential factor is culture.

Studies (4) high light public health infrastructural factors notably weak surveillance system, inadequate retrospective evaluation of past cholera outbreaks (GTFCC, 2017), absence of a rapid laboratory diagnostic tests (Berhe *et al*., 2024), as well as a lack of reactiveness to detect cases early (Dan-Nwafor *et al*., 2019) can increase the risk of spread and development of cholera outbreak. Conversely, a robust surveillance system involving follow up of discharged cholera patients (Ohene, Klenyule & Srpeh, 2016) reduced the spread of cholera in Ghana. Conversely, one study highlight community engagement in which community participation involving pre-existing local communities in preparedness initiatives can reduce the risk of cholera and enhance preparedness for cholera outbreaks.

A total of five (5) water and sanitation infrastructural factors were identifiable factors that can influence cholera outbreaks preparedness. Some of these factors point to establishment of a safe water supply reduced the risk of cholera in the DRC (Gallandatt *et al*., 2021), but indeqaute safe water supply (Edris *et al*., 2016, Saute *et al*., 2020), poor sanitation infrastructure (Ateudjiew *et al*., 2019) and inability of people to translate leant cholera preventive knowledge into preparedness practice (Niederberger, Tanner & Karam, 2023) can account for an increased risk of the spread and development of cholera, hence, underpreparedness for cholera outbreaks.

One study (Han *et al*., 2020), highlight community participation involving local communities in preparedness activities. It points to pre-existing community engagement that can yield self-sense of responsibility towards preparedness for cholera. Also is the factor of health policy and governance was cited in four studies in which political instability accelerated the risk of cholera in the East Mediterranean region, but the decentralization of effective communication channels increased the spread of COVID-19 in Germany and Thailand. (Wieler, Rexroth & Gottschalk, 2021). Resource mobilization factor entails a sustained government support to victims of cholera in Lebanon (Berjau *et al*., 2023) enhanced cholera outbreak preparedness, but the poor mobilization for cholera preventive services in Lebanon influenced a high risk for cholera outbreaks (Noveed *et al*., 2022). Strengthened cross-border cooperation reduced incidents of cholera across countries (Haldane *et al*., 2021).

Training and capacity building factor can influence preparedness because health worker training promoted readiness for cholera in countries of South Africa, Ghana, Nigeria, Namibia, Ethiopia, and, Kenya (Opuku *et al*, 2021). Research and innovation factors can influence preparedness for cholera outbreaks. In Bangladesh, cholera vaccine anxiety increased the risk of cholera (Waheed *et al*., 2013; Aziz *et al*., 2022). Conversely, the increased number of Cholera oral vaccine manufacturing companies amount to a higher influence of cholera preparedness (Wierzba, 2019), and, the development of a robust matrices to assess global resilience to pandemics (Oppenheim *et al*., 2019) as well as effective investment in data analytics (Baiyewu, 2023) can reduce the risk of cholera and enhance the preparedness for cholera outbreaks. Cultural factors such as funeral practices of flushing water through the dead body heightened the spread and development of cholera in Zambia, and, influenced under preparedness for cholera in the country (Mcateer *et al*., 2018).

7. CONCLUSIONS

Overall, a low level of preparedness is largely reflected across the body of reviewed studies as most household members did not know what to do, did not have emergency preparedness plans in their households, and were not willing to think of about it. Given that majority of studies focused on preparedness for natural disasters with very little focus on communicable diseases like COVID-19, this review illustrate less attention to cholera outbreaks preparedness. Hence, a noticeable research gap in the area of preparedness levels for cholera outbreak preparedness. A total of twenty one (21) studies highlight the factors that influence cholera outbreak preparedness, with seven (7) studies providing a pattern of evidence illustrating training and capacity building as an influential factor of preparedness for cholera outbreaks. This is followed by water and sanitation infrastructural factors with five (5) studies cited, then public health infrastructure as well as community participation factor with four (4) studies. The least influential factor is culture. Despite the existence of studies about factors influencing cholera outbreaks, most of the reviewed studies indicate a continued increase in the risk of cholera that is influencing under preparedness for cholera outbreaks. This is noticeable in weak public health infrastructure such as weak surveillance systems, weak water and sanitation infrastructure indicated by inadequate access to safe water, community participation that is deficient of involving local communities in cholera preparedness initiatives, health policies and governance that is jeopardized by political instabilities, difficulty in financial and material mobilization for an effective and sustainable preparedness for cholera, incidents of cholera vaccine hesitancy despite the existence of the Oral cholera vaccine, and bad cultural funeral practices in handling the dead.

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