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Knowledge Level and Hygiene Practices for Cholera Outbreak Preparedness before and After Health Education Intervention in Low Developing Countiries: 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 –base regarding their effectiveness for preparedness for cholera is habitually missing. This paper presents a systematic literature review investigating the determinants of knowledge level, and, determinants of hygiene practices for cholera outbreak preparedness before health education and after health education. ***Results*:** The review yielded 40 studies, with 26 focusing on cholera knowledge level and 14 looked at hand hygiene preventive practices. These studies generally point to a knowledge –practice gap. While the reporting of cholera knowledge and prevention has become more common in recent publications, no study has focused on preparedness for cholera outbreaks. Hence, the reviewed studies indicate a less attention to cholera outbreak preparedness. The majority of papers 26(65%) reported on cholera knowledge, with a pattern of evidence about higher knowledge on virulence, signs and symptoms, preventive methods, modes of transmission, its ability to spread in areas with poor water, sanitation and hygiene conditions. Despite this high cholera knowledge attainment after health education, knowledge –practice gap is noticeable in 14 (35%) reviewed studies about hand hygiene preventive practices. Even when studies about cholera in all the 40 reviewed studies, none (0%) of them was focusing on cholera outbreaks preparedness. Hence, a lack of research in this particular area of specialty. Much as some studies 8 (20%) generalized their findings to health workers as compared to the general population 32 (80%), evidence these studies provided offer the truth confidence values of the results about cholera knowledge and hand hygiene preventive practices. ***Discussion and Recommendations*:** This review highlights a focus on cholera knowledge and hand hygiene preventive practices before and after health education interventions for preparedness of cholera outbreaks. There is a distinct gap in knowledge of which interventions are most appropriate for a given context and as such a clear need for more robust impact studies evaluating a wider array of Health education interventions with focus on cholera knowledge and hand hygiene preventive practices.

Keywords: Cholera, Cholera Outbreaks, Vibrio Cholera, Cholera Outbreak Preparedness Low Developing Countries (LDCs).

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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 (Ohene, Klenyuie & Sarpeh, 2016).

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, including meaning of cholera, signs and symptoms, if it is preventable or not, knowledge of routes of transmission, knowledge of risk factors, levels of knowledge attainment before health education and after health education.

Reported cholera outbreaks that occurred between January 2014 and February 2025

Were 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.

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 low developing countries, with events related to persistent occurrence of cholera outbreaks.

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 focused on the pattern of evidence and what it suggests, what gaps are there in the body of evidence. Methodologically, it focused on research designs that were dominant, what populations have been studied, what data collection methods have dominated. It also focused on the type of people and settings to whom findings applied. It will show the extent to which program of research has been devoted to the topic or area of discipline to portray research gap.

3.1. Search Results

In total, 84 records were identified through searches, most of whom from Google Scholar. After screening 44 were excluded due to irrelevance based on the title and abstract, language limitations, and review articles. This left 40 records for eligibility, ultimately amounting to the reviewed studies in this systematic literature review.

3.2. Risk of Bias

Of the 40 studies assessed, 37 (92.5%) were classified as having a low risk of bias, 3 (7.5%) were rated as moderate risk.

3.3. Study Characteristics

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

4. Knowledge Level about Cholera before and After Health Education Interventions

4.1 Cholera Knowledge about Virulence

Bankole *et al*., (2021) conducted a study about knowledge of health workers on cholera management in Oyo state, Nigeria. Focus was placed on outcomes of a training intervention. The main objective was to ascertain the level of improvement in the knowledge of health workers on cholera. Based on a pre-post study design, baseline data and end line data were collected at both intervention site and control site using a self – administered questionnaire with sections eliciting responses to questions on general knowledge of symptoms of cholera, prevention methods, knowledge and practice of safety procedures health workers. Results from the evaluation of the intervention show that the training significantly improved the overall knowledge of health workers because at baseline, only 35.2% of health workers in the intervention sites had good knowledge on cholera. This figure was increased to 52.7% after the intervention. This difference in proportions was also statistically significant (p=0.004). In the control sites, the opposite was observed as the proportion of health workers with good knowledge on cholera slightly reduced from 47.2% to 43.6%. This difference was however not statistically significant (p=0.563). Precisely therefore, a higher knowledge score of 52.7% at end line assessment determined a higher level of preparedness for cholera outbreaks among health workers of Nigeria after a health education intervention. This finding illustrates a population gap, hence, offering an insight into a new study that will focus on the population of household heads in a high risk cholera population.

4.2 Cholera Knowledge about Signs and Symptoms

Ali, Mohamed & Tawhari (2021) conducted a cross-sectional qualitative prospective study in Jazan city, Saudi Arabia. The study used a questionnaire to explore the level of knowledge towards cholera. It pointed to etiology and symptoms of cholera knowledge of participants by indicating that some participants (43.8%) knew the causative organism of cholera as bacteria, while others (9%) of the respondents held the idea that cholera was a parasitic infection. This study concluded to an overall low level of knowledge of cholera among the public of Saudi Arabia. This lower

knowledge illustrates knowledge gaps which potentially offer insight into a new study.

Nasr, Zumair, Al-Mahbash & Dureab (2024) conducted an analytical cross-sectional study about factors associated with the cholera outbreak in Al-Mahweet, Yemen. This study that included a total of 352 household caregivers pointed to cholera knowledge about signs and symptoms. The participants demonstrated knowledge of a watery diarrheal disease (98.9%) that is characterized by vomiting (93.1%), dehydration (28%) and abdominal pains (21.7%) The higher prior knowledge about signs and symptoms of cholera among the Yemen people.

4.3 Cholera Knowledge about Prevention

Dureab *et al*., (2021) found that the people of Yemen had a higher prior knowledge about cholera (99.4%) as a dangerous disease. Further was the acknowledgement of higher knowledge about preventing cholera that included cholera vaccine (99.72%), using water purified with chlorine (88.35%), proper human waste disposal (58.8%). Much as majority reported higher knowledge of regular hand washing (75%) that was manifested in after using the toilet (75.3%), evidence of open defecation was observed in 25% of households. This finding points to knowledge- practice gap. Further is the study limitation linked to the absence of baseline data. Despite this limitation, there is confidence in the truth value of the results. The identifiable knowledge-practice gap will be addressed with two groups of participants as a methodological strength of the new study. Hence, offering insight into the need to conduct a new study.

Anetor & Abraham (2020) conducted a study about knowledge of cholera and its prevention amongst urban residents of a district in Abuja, Nigeria. This descriptive cross sectional study indicated a prior knowledge about cholera preventive measures as insufficient among adult urban residents of Durumi town in Abuja that were aged 50 years or so. The recommendation considered targeted health education of residents of 50 years or so to provide sufficient knowledge about cholera prevention and preparedness. Therefore, a lower knowledge about cholera preventive measures among adult residents aged 50 years determined the low level of preparedness for cholera outbreaks in Nigeria. This finding illustrate a knowledge gap among a specific population group in the community, hence the need to conduct a new study that will focus on adult household heads in a high risk cholera area.

Nasr, Al-zumair, Al-mahbashi, & Dureab (2024) conducted a study about factors associated with the cholera outbreaks in Yemen. It was an analytical study. It highlighted that all households had nearly sub-optimal knowledge about cholera prevention. Further to this, the discussion section points to cholera educational interventions of awareness campaigns and information dissemination to improve community knowledge as an essential to prevent the spread and development of cholera outbreaks. The study results pointing to sub-optimal knowledge of cholera prevention and the recommendation thereof provide an insight into a new study.

Solhi *et al.*, (2020) studied the effect of educational intervention on health-promoting life styles in Iran University of medical sciences. It was a quasi-experimental control study in which two groups were invited to participate. These two groups were evaluated with the same questionnaire and the intervention consisted on five training sessions for the intervention group. The discussion section points to an argument that results of independent t-test showed that no significant difference was found between the two groups in terms of mean scores of constructs of attitude and perceived self-efficacy before the educational intervention. Precisely therefore, before the intervention, no significant difference was observed between the mean scores of health promoting behaviors in the two groups, that portrayed a lowered knowledge level of students about disease prevention in the Iranian university of medical sciences. The noticeable gap is that this study pays no attention to cholera because it only generalizes health promoting styles in relation to disease prevention. Another noticeable gap illustrates a weakness in shorter period of follow up as there was a lack of full research control over participants. Another gap demonstrates the lack of a detailed account of an intervention as it only mentions a training of five sessions. If put together, this study largely indicates a lack of attention to cholera, hence, limited research about cholera outbreak preparedness.

Gennaro *et al.*, (2022) conducted a cross-sectional survey that aimed to examine water, sanitation and hygiene attitudes, hand hygiene attitudes, and cholera knowledge among people living in resettlement sites in Gabo Delgado, Mozambique. It points to knowledge that cholera can be transmitted by mosquito bites, prevented by cooking food (89%), boiling water for drinking (90%), and proper disposal of human feaces (90.8%). Majority of the participants (71.6%) strongly agreed that cholera cannot be prevented. Precisely therefore, a lowered knowledge of cholera was determined by the idea that mosquito bites spread cholera and cholera cannot be prevented (71.6%). These findings are contradicting each other where participants have good knowledge of reasons for boiling water, cook food and deposited human fecal matter that sharply contradicts with their knowledge that mosquito bites can spread cholera and that cholera cannot be prevented. These kinds of contradiction illustrate a lack of clarity, hence, a lack of research in the area of preparedness for cholera outbreaks.

Bekhit *et al*., (2025) conducted their study on knowledge, attitudes and self-reported practices regarding cholera in six MENA countries following cholera outbreak in the region. It was a cross-sectional one line survey study that used an online questionnaire with participants owning computers and smart phones in a setting of 6 countries namely Egypt, Sudan, Jordan, Syria, Lebanon and Yemen. The study points to cholera knowledge that cholera is a severe health disease (89.2%) that can be prevented using cholera vaccine (70.8%), deciding to live in a country where no cholera disease risks (14.6%) exist, and, the idea that community members cannot play a significant role of preventing cholera outbreaks in their community (39.7%). Precisely therefore, a higher cholera knowledge was acknowledged in knowing that cholera is an acute disease (89.2%) preventable by cholera vaccine (70.8%), deciding to stay in a country with no risks of cholera (14.6%) and the idea that community members cannot manage to stop its spread in their own areas of residence (39.7%). These findings depict a limited knowledge about aspects of water, sanitation and hygiene that remain crucial to prevent cholera outbreaks. Further, the study points to limitations such as response bias in the cross-sectional research approach to the study. Hence, a methodological gap as well as a knowledge gap that warrantees insight into a new study.

A lack of robust cholera preventive education largely among village health teams accounted for cholera endemicity as well as COVID-19 (MacGregor *et al*., 2022) in the rural areas that share the international borders with Uganda and the Democratic Republic of Congo. This evidence illustrates a lack of knowledge about cholera not only among community members but also the community health volunteers. It is therefore suffice to assert that the reviewed body of literature illustrates a noticeable knowledge gap about particularities of cholera outbreak preparedness.

4.4 Cholera Knowledge about Transmission (Modes) Routes

Melariri *et al*., (2024) conducted a quasi-experimental study that looked at impact of an educational intervention on water, sanitation and hygiene knowledge attitudes and practices in early childhood development centers in low-socioeconomic areas in the Nelson Mandela Bay, South Africa. The baseline assessment before the educational intervention indicated a lowered knowledge attainment from the pretest. This was illustrated by the understanding that un safe water use cannot spread diarrhea (11.7%), there is no way the consumption of contaminated water can spread diarrheal diseases (13.73%) and solid waste cannot be breeding grounds for houseflies and have no potential to spread diarrheal diseases (17.65%).Precisely, a lowered knowledge assessed before a health education intervention was marked by consumption of un safe water cannot spread diarrhea and solid waste cannot breed houseflies that spread diarrhea. This lower knowledge did not determine a higher preparedness for diarrheal diseases outbreaks in early childhood development centers of South Africa. This finding illustrates a knowledge gap that needs to be filled with health education knowledge specific to cholera outbreaks preparedness, hence, offering a potential insight into a new study.

Nsagha *et al*., (2015) conducted a study assessing the risk factors of cholera epidemic in the Buea health district of Cameroon. It was a case-control study with cases identified from health facility records and controls as neighbors of the cases in the same community. The study points to cholera knowledge about the modes of transmission. The results specifically indicate that they had heard about cholera before (95.6 %) with the mode of transmission being poor hand hygiene practices (59.2%), contaminated water sources (41.5%), poor food preservation method ($p<0.0001$) where most of such information was obtained from the local population (45.2 %). Much as the study was weakened by cases and controls identified in the same area coupled with a lack of reliability assessment of participants response, the findings from this two groups of participants provided the highest possible level of evidence with sufficient information needed for evidence based practice. Furthermore, the recommendation that this gives points to a further study to focus on increasing cholera knowledge about proper hand hygiene practices, hence an insight into the new study.

Quaserah *et al*., (2021) conducted their study about risk factors of cholera transmission in Al-Hudaylah, Yemen. It was a case-control study that used semi-structured questionnaire. It pointed to low cholera knowledge about modes of transmission that was marked by drinking water from public wells without purification, and, used water collecting containers that were contaminated with a high level of cholera bacterial contamination. This identifiable low cholera knowledge about modes of transmission illustrates a knowledge gap that offers insight into a new study.

4.5 Cholera Knowledge about Its Ability to Spread In Areas with Poor Water, Sanitation and Hygiene

Across sectional study of Oscares *et al*., (2024) in their study about cholera in Ilailo city, in the Philippines. The participants were household heads considered as adult males or females with the responsibility for the organization and care of the household. It is in this city where cholera outbreak was recorded. The study highlights a moderate knowledge level (31.7%) about cholera and its prevention, low level knowledge (9.9%) about cholera and its prevention. For example, it points to (7.5%) of participants who disagreed with the statement that cholera can be spread by poor sanitation and, (9.9%) of the participants who

disagreed with the statement that drinking un safe water can lead to cholera.

Anetor, O.G (2020) studied knowledge of cholera and its prevention amongst urban residents in Abuja, Nigeria. Considering a pivotal role of health education, this descriptive cross-sectional survey used mult-stage sampling to select participants. A validated questionnaire was used to collect data. It highlighted the knowledge and awareness of preventive measures of cholera among residents of Durimi district, Nigeria. This high light only points to 67% of participants on the question of the occurrence of cholera in the community, which denoted a poor knowledge of cholera. The multistage sampling as an approach that was used to select participants was an appropriate strategy for a community based- study and the inferential statistics of Chi-square to test the hypotheses at 0.05 significant levels, make the study findings trustworthy.

5. Hygiene Practices before Health Education and After Health Education

5.1 Training for Hand Hygiene Practice

Hamad r & Kibusi (2023) conducted a study about effectiveness of web based training system on knowledge and skills for pandemic preparedness and response among frontline nurses in Zanzibar. This was a pre-posttest single group quasi-experimental study aimed at comparing change in knowledge and skills followed by a web based educational intervention. The training was virtually implemented through the developed e-learning platform named Zanibar Nurses continuing education professional development system (ZNCPPS). It was a 2weeks program divided into 5 lessons where each lesson required 2 hours per day. The results indicated an overall statistical prediction of the demographic characteristics (largest proportion working in primary health care units aged 20-30 years 44.6% to knowledge gain for pandemic preparedness particularly COVID-19. Precisely therefore, a higher significant change in knowledge attainment indicated by ($P < 0.001$) and mean difference between pretest and posttest of 0.93 after a 2 weeks e-learning program determined a higher preparedness level for pandemics for COVID-19 response among frontline nurses working in primary health care units of Zanzibar. This finding illustrate a noticeable research gap that is indicating less attention to cholera outbreaks, hence, offering an insight into a new study that will specifically look at health education and preparedness for cholera outbreaks.

Hang *et al*., (2018) conducted a study an educational intervention to improve hand hygiene compliance in Vietnam. The aim of this study was to determine hand hygiene compliance following an educational program in an obstetric and gynecological of Hung Vuong Hospital in Vietnam. Following a 4-hour educational program targeting hand hygiene, hand hygiene knowledge was assessed six months after an intervention. Findings point to a significant improvement in knowledge scores about hand hygiene ($p < 0.001$). Precisely therefore, a higher knowledge attainment about hand wash led to a higher preparedness for diarrheal infections among staff working in Hung Vuong hospital in Vietnam. The recommendation made in this study highlighting the need for developing countries to adopt a hand hygiene health education model that is tailored to its local needs. This recommendation offers a potential insight into a new study that will focus on health education including an attention to hand hygiene.

Orimbo *et al*., (2020) conducted their study on knowledge, attitudes and practices on cholera in an arid county of Kenya. Their study point to low practice of good defecation (48.8%) as well as poor practice of treating water for drinking (51.3%) no matter how much they knew cholera (99.3%) as a communicable disease (73.2%). Therefore, poor hygiene practice of open defecation and not purifying water for drinking in the household determined the kind of hygiene practices among household members in Kenya. The conclusion that much as their prior knowledge about cholera as a highly infectious disease was high (99.3%), evidence in practicing hygiene largely exists in underutilization of latrine to dispose human excreta, and, underutilization of treated water for drinking, which illustrate a knowledge practice gap.

Hamad *et al*., (2022) conducted a randomized control trial about the effects of hand washing education on knowledge and practice among primary school children in Makkah city. Evaluated by the use of a self-administered questionnaire for knowledge and an observation checklist for practice, the findings point to a higher knowledge attainment about hand washing ($p<0.001$) in the post test assessment among participants in the implementation group, which was considered as an indication of a higher level of preparedness for diarrheal diseases. Precisely therefore, a higher knowledge attainment on how to wash hands led to a higher level of preparedness for diarrheal disease prevention among school children in Makkah city. These findings illustrate a population gap, which offer an insight into a new study focusing on a population living in a high risk cholera area such as Kasese District.

Akel *et al*., (2022) conducted a study on knowledge, attitude and practices of the general population towards the old-new outbreak of cholera in Lebanon. This cross-sectional study point to a higher knowledge score about how to prevent cholera (70.54%) that was significant among household heads that were married females with a university education level. But their practices towards hygiene were distorted by cholera information that they obtained from social media. Precisely therefore, married Lebanese females had a higher knowledge about preventing cholera outbreaks but this information was often distorted by social media,

that amounts to an underutilization of hygiene knowledge which led to a low preparedness for cholera outbreaks in Lebanon. This is an identifiable knowledge gap that will be addressed in the proposed study in which a face to face health education will be implemented. Hence, an insight into the new study that will be conducted in the cholera endemic area of Kasese district.

Mushota, Mathur & Pathak (2021) conducted their study about of school-based educational water, sanitation and hygiene intervention on students' knowledge in a resource-limited setting of Ujjan district, India. The intervention comprised an educational training session using WASH training module among 1,781 higher secondary school students. The pre-intervention assessment pointed to a lower proportions of incorrect answers on questions regarding the use of toilets (25%), washing hands after use of toilet (37%) and benefits of regularly cleaning the toilet (30%). Therefore, underutilization of proper hand hygiene practices marked by pretest score of inadequate hand wash after using toilet (37%) and irregular cleaning of the toilet (30%) did not increase preparedness for diarrheal diseases in limited resource secondary school settings of India.

5.2 Observing Critical Times in Hand Washing Practice

Endalew *et al*., (2022) studied limited hand washing facility and their associated factors in Sub-Saharan Africa. Their study used the Demographic and Health survey data. Results point to hand washing as a fundamentally expensive means of reducing the spread of communicable diseases. It thus highlights that the pooled prevalence of limited hand washing facility was found to be (66.16%) commonly among household heads with age group between 35 and 60, whose households were characterized by unimproved sanitation facility, and access more than 30 min round trip belonging to a low income level. Precisely, the pooled coverage of limited hand washing facility was high in sub-Saharan Africa. The study recommends raising awareness of the community and promoting access to hand washing materials particularly in poorer and rural areas will reduce its coverage. These findings about limited hand washing facility illustrate a knowledge-practice gap. Also is the recommendation that this study makes which potentially provide an insight into a new study l.

Lange, Benard & Naicker (2022) studied effect of a hand hygiene intervention on the behavior, practices and health of parents of a pre-school children in South Africa. It was a hand hygiene intervention with two groups, the implementation group consisting of 8 participants and control group consisting of 9 participants. The participants administered a questionnaire at both pre-intervention and post-intervention. Results point to parents in the intervention group showing a significant difference pre-post intervention in hand hygiene practices that highlighted hand washing after coughing and sneezing, and after using the toilet. Also, parents in control group indicated significant differences in hand hygiene practices of washing hands after coughing and sneezing, and after wiping children's noses. The conclusion was that there was a 90 % improvement of all hand hygiene practices in both intervention group and control group of parents of a pre-school in South Africa before and after health education intervention about hand hygiene. The study lacked blinding of participants, but, the multivariate analysis that provided for confidence interval indicate the powerfulness of evidence. Hence, providing the truth value in the confidence of the results.

Across-sectional study by Muramatsu-Noguchi *et al*., (2022) investigated the association between social –economic status and the presence of soap at household facilities in Laos people's Democratic Republic. It points to the finding that many households do not use soap for hand washing to effectively prevent diarrhea. The discussion section of this study also point to the idea that much as soap did not seem to be expensive in Lao people Democratic Republic, soap was not affordable to poor (86.3%) households particularly among household heads with lower education (43.6%). These findings suggesting unaffordability of soap and limited knowledge on hand hygiene as barrier to performing hand wash at a critical time with soap ownership, illustrate limited research, hence knowledge gap.

Dureab *et al*., (2021) conducted an analytical cross-sectional study among household caregivers in a mountainous setting. Their multivariate analysis point to practices in hand wash. The participants reported regular hand washing (75%) and having a basic hygiene facility (78.9%). The regular hand wash practice (75%) was manifested in after toilet use (75.3%), before eating (91.5%), after cleaning baby diapers (19.9%) and after cleaning the home (59.4%). Precisely, there was a regular hand washing practice (75%) among household caregivers in Yemen that reflected the critical times of hand wash, which were linked to a reduction of cholera outbreaks in Yemen. Despite the weakness of this study that points to response bias in which some participants claimed better practice of hand wash, the study findings appear to be trustworthy, and, there is confidence in the truth value of the results due to the analytical cross – sectional approach that this study used. This study limitation is a potential research gap that will be addressed by adopting a powerful methodological approach in which an observation checklist as a data collection tool will offer a methodological powerfulness in the proposed study.

Studies of Allegranzi *et al*., (2013) conducted a quasi-experiment study by assessing the effect of WHOs strategy for improvement of hand hygiene in 43 hospitals in five countries of Costa Rica, Italy, Mali, Pakistan, and Saudi Arabia. Results point to an overall compliance

increased from 51•0% before the intervention (95% CI 45•1-56•9) to 67•2% after (61•8-72•2). Implementation had a major effect on compliance of health-care workers across all sites after adjustment for main confounders (OR 2•15, 1•99-2•32). Health-care-workers' knowledge improved at all sites with an increase in the average score from 18•7 (95% CI 17•8-19•7) to 24•7 (23•7-25•6) after educational sessions. 2 years after the intervention, all sites reported ongoing hand-hygiene activities with sustained or further improvement. Precisely therefore, the distinctive characteristics typically the improvement of health workers knowledge in hand hygiene from 18.7% to 24.7%, is sensed as major changes that resulted from the educational sessions and further yielded an – ongoing hand hygiene activities with sustained further improvement among the health care workers across all the study sites.

5.3 Hand Washing Choices /Alternatives

Muleba *et al*., (2022) conducted an assessment of Anti-Bacterial effectiveness of hand sanitizers commonly used in South Africa. The study points to hand washing alternatives highlighting the use of alcohol-based hand rub (99.99%) as an effective hand washing alternative that reduced the number of viable microorganisms then soap and water are not available. This finding illustrates a lack of attention to the particularities of cholera in relation to hand hygiene alternatives. Hence, offers a potential insight into a new study.

Yang *et al.*, (2019) studied associations between hand hygiene and self-reported hand-washing behaviors among Korean Adults. This community survey study engaged 222,591 individuals who were older than 20 years of age. It points to individuals who received hand-washing education or saw promotion materials related to hand washing had significantly higher score for self-reported use of soap or sanitizer ($p<.0001$) and increased frequency of hand washing ($p<.0001$) than those who did have such an experience of health education among individuals who were older than 20 years of age in Korea during the year of the Middle East Respiratory syndrome outbreak. This result indicates a population gap, and less attention to cholera, hence, in sighting the need to conduct a new study.

Odonoghue, Ng, & Boost (2019) conducted a quasi-experimental to determine the effects of a multi-faceted educational intervention on hand hygiene compliance among health care workers in a radiography unit at a large district hospital. It was a 2 months intervention consisting of health talks about importance of hand hygiene and benefits of alcohol based hand rub. Observation of hand hygiene practice 3 weeks after the intervention as a post-intervention assessment indicated an increase in the level of knowledge attainment (51.4%) about using alcohol based hand rub. Precisely, a 51.4% increase in knowledge attainment about how to hand wash using alcohol indicated a higher level of preparedness for diarrheal diseases among health care workers in the hospital setting. This noticeable finding illustrates a knowledge gap that is specific on cholera outbreaks, hence, offering an insight into a new study.

6. DISCUSSION

6.1 Cholera Knowledge Levels Before and After Health Education Interventions for Preparedness of Cholera Outbreaks

Twenty six studies are reporting on cholera knowledge. Of these studies about cholera knowledge, 7 out of 26 used health education as an intervention, with 5 of whom methodologically used two groups of participants. Much as the focus of these studies was not placed on preparedness for cholera, the pattern of evidence about the cholera knowledge in terms of virulence, signs and symptoms, prevention, modes of transmission and, its ability to spread to areas with inadequate water, sanitation and hygiene largely suggest consistence in the body of evidence about cholera knowledge.

Getting cases and controls in the same village, response bias, shorter follow-up time period, the lack of full research control over participants, absence of a baseline data , and the lack of a detailed account of the nature of the health education intervention (Nsaghara *et al*., 2015; Solhi *et al*., 2020; Dureab *et al*., 2021; Bekhit *et al*., 2025) are the noticeable methodological weakness of the reviewed studies about cholera knowledge, though, the research approaches used provided a high level of evidence in the reviewed studies about cholera knowledge.

Further, the type of people to whom the results applied were community members such as household heads or caregivers 23 out of 26 than health workers 3 out of 26 studies about cholera knowledge. This largely indicates that household heads are a type of people that were predominant. The type of research design that was predominantly cross-sectional (19 out of 26) followed by quasi-experimental (4 out of 26) case –control (2 out of 26) and finally analytical (1 out of 26). Precisely, cross – sectional study designs were the predominant research approaches of the reviewed studies about cholera knowledge.

Majority (15 out of 26) of the studies evolved around low knowledge level than higher knowledge level (4 out of 26) about cholera. The lowered cholera knowledge pointed to sub optimal knowledge about how to prevent its spread, cholera is not a preventable disease, lack of knowledge about cholera among people with 50 years and above, drinking water from public wells is not a risk factor of cholera, poor solid waste cannot be

breeding ground of houseflies, and not aware that cholera does occur in the community where we live.

6.2 Hand Hygiene Preventive Practices Before and After Health Education for Preparedness of Cholera Outbreaks

A total of 14 studies are reporting on hand hygiene preventive practices, with 6 studies focusing on training for hand hygiene practice, 5 looking at critical times in hand wash practice, and 3 looking at hand washing alternatives.

The type of people to whom results were generalizable were mainly (9 out of 14 studies) community members/ general population. This general population included household heads, community members, and, student community, while the minority (5 out of 14) were health workers that primarily included Nurses. This largely indicates that household heads were the type of study participants to whom results applied in as far as hand hygiene preventive practices are concerned.

The approaches to the study were primarily pre-test posttest designs of quasi-experimental designs (7 out of 14), followed by cross –sectional studies (5 out of 14), then (community survey (1 out of 14) and Randomized Control Trial (1 out of 14). Precisely therefore, quasi-experimental designs were the predominant research approaches of majority studies about hand hygiene preventive practices for cholera before and after health education.

The common aspects of hand hygiene practice across studies highlight expensiveness of soap that derailed effective hand washing practice at a critical time, limited availability of a hand washing facility in the household, a lowered proportion of people washing hands after visiting a latrine, and, open defecation where hand washing was impracticable.

Much as a higher knowledge score on hand hygiene is noticeable across studies (Hamad & Kibusi, 2023; Hang *et al*., 2018; Orimbo *et al.*, 2020; Akel *et al*., 2022), these studies focused on knowledge enhancement but did not necessarily translate them into safe practices. Therefore, a noticeable knowledge-practice gap in the body of this evidence.

Overall, the pattern of evidence suggests knowledge-practice gap across majority studies illustrating a higher knowledge attainment after health education intervention but with gaps at practice. This kind of consistency in findings indicates a powerfulness of observed effects of health education intervention. It further indicates that there is not much research on the application of acquired hand hygiene knowledge to practice at community level or household level.

7. CONCLUSIONS

Much as studies on knowledge level depict a pattern of low knowledge before health education and changed to higher knowledge level about cholera signs and symptoms including its preventive knowledge, a pattern of evidence further indicates limited practice of hygiene practices particularly hand hygiene. This largely suggests a pattern of knowledge practice gap in preparedness for cholera outbreaks. There is need for more robust impact studies evaluating a wider array of Health education interventions with focus on cholera knowledge and hand hygiene preventive practices.

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REFERENCES

- Akel, M.; Sakr, F.; Haddad, C.; Hajj, A.; Sacre, H.; Zeenny, R.M.; Safwan, J.; Salameh, P. (2023). Knowledge, Attitude, and Practices of the General Population toward the Old-New Outbreak of Cholera in a Developing Country. Trop. Med. Infect. Dis. 2023, 8, 236. https://doi.org/10.3390/tropicalmed8040236
- Ali EM, Mohamed MB, Tawhari M. Knowledge, attitude, and practice study regarding cholera among the people in Jazan city, KSA. J Family Med Prim Care. 2021 Feb;10(2):712-717. doi: 10.4103/jfmpc.jfmpc_965_20. Epub 2021 Feb 27. PMID: 34041066; PMCID: PMC8138396.
- Al-Sakkaf, K., Bahattab, A & Basaleem, H (2020). Cholera knowledge, socioeconomic and wash characteristics in Aden – Yemen, 2017: a community-based comparative surveyJournal of Preventive Medicine and Hygiene. DOI: 10.15167/2421-4248/jpmh2020.61.3.1529
- Anetor, G. O. and Abraham, F. (2020) 'Knowledge of cholera and its prevention amongst urban residents of a district in Abuja: The pivotal role of health education', Research Journal of Health Sciences, 8(2), pp. 102–112. doi: 10.4314/rejhs.v8i2.6.
- Ateudjieu, J., Yakum, M.N., Goura, A.P. et al. (2019). Health facility preparedness for cholera outbreak response in four cholera-prone districts in Cameroon: a cross sectional study. BMC Health Services Research 19, 458 (2019). https://doi.org/10.1186/s12913-019-4315-7
- CDC (2022). Center for Disease Control and Prevention. CDC's Core infection prevention and control practices for safe Healthcare delivery in all settings. Center for Disease Control and prevention. Available at: https://www.cdc.gov.guidelines

- Dureab, F., Qadasi,Y., Al-Zumair,M., Nasr,H., Almahbashi,T. (2021). Knowledge on and preventive practices of cholera in Al-Mahweet – Yemen, 2018: a cross-sectional study. Health. J Water Health (2021) 19 (6): 1002–1013. https://doi.org/10.2166/wh.2021.139
- ECDC (2024) European Center for Disease Prevention and Control. Cholera world wide overview. Monthly updates as at 2nd September 2024.
- Endalew, M., Belay, D.G., Tsega, N.T., Aragaw, F.M., Gashaw, M., Asratie, M.H (2022). Limited handwashing facility and associated factors in sub-Saharan Africa: pooled prevalence and multilevel analysis of 29 sub-Saharan Africa countries from demographic health survey data. BMC Public Health. 2022 Oct 27;22(1):1969. doi: 10.1186/s12889-022-14390-4. PMID: 36303201; PMCID: PMC9610344.
- Hamad, H., Nadwi, A., Alzahrani, A.A., Bari, O., Kalo,B.B & Alhajaji, R (2022). The effects of handwashing education on knowledge and practice among primary school children in Makkah city. European journal of preventive medicine. DOI: 10.11648/j.ejpm.20221001.19
- Hang,T.P.; Hang,T.T.T., Tran,M., Ann,P.D., Ngo,T.H., Haglow,T.J & Gordon,J.C (2018). An educational Intervention to improve hand hygiene compliance in Vietnam. BMC Infectious Diseases. DOI: 10.1186/s12879-018-3029-5
- Iramiot,S.J., Rwego,I., Kansiime, C., & Asiimwe,B. (2019). Epidemiological and antibiotic susceptibility of vibrio cholera associated with the 2017 outbreak in Kasese District, Uganda. BMC Public Health. DOI: 10.1186/s/12889-019-7798-6.PMID:31664972;PMC6819361
- Kamukama,A., Namulonde, E., Nuwamanya, Y., Baliruno, N.L., Kyamwine,I., Nansikombi,T.H & Bulage, H (2024). Cholera outbreak associated with drinking contaminated river water in Kayunga District, Uganda. Public Health Bulletin
- Kanungo S , Azman AS , Ramamurthy T , et al . Cholera. The Lancet 2022;399:1429–40.doi:10.1016/S0140-6736(22)00330-0 Google Scholar
- Lange, S., Barnard, T.G., Naicker, N (2022). The effect of a hand hygiene intervention on the behaviour, practices and health of parents of preschool children in South Africa. Perspect Public Health. 2022 Nov;142(6):338-346. doi: 10.1177/17579139221123404. Epub 2022 Sep 21. PMID: 36128937; PMCID: PMC9720708. Available at: https://pubmed.ncbi.nlm.nih.gov/36128937/
- MacGregor, H., Melissa Leach, Grace Akello, Lawrence Sao Babawo, Moses Baluku, Alice Desclaux, Catherine Grant, Foday Kamara, Fred Martineau, Esther Yei Mokuwa, Melissa Parker, Paul Richards, Kelley Sams, Khoudia Sow & Annie Wilkinson (2022) Negotiating Intersecting Precarities: COVID-19, Pandemic Preparedness and Response in Africa, Medical Anthropology, 41:1, 19-33, DOI: 10.1080/01459740.2021.2015591
- Melariri, P.E., Teare, J., Oyedele, O., Eastwood, K., Ten Ham-Baloyi,. W. (2024). Impact of an educational intervention on water, sanitation and hygiene knowledge, attitudes, and practices in early childhood development centres in low-socio-economic areas in the Nelson Mandela Bay, South Africa. PLoS One. 2024 May 29;19(5):e0303077. doi: 10.1371/journal.pone.0303077. PMID: 38809834; PMCID: PMC11135736
- Muleba, L., Van, W. R., Pienaar, J., Ratshikhopha, E., Singh, T (2022). Assessment of Anti-Bacterial Effectiveness of Hand Sanitizers Commonly Used in South Africa. Int J Environ Res Public Health. 2022 Jul 28;19(15):9245. doi: 10.3390/ijerph19159245. PMID: 35954594; PMCID: PMC9367797.
- Muramatsu-Noguchi, Y., Nonaka, D., Kounnavong, S., Kobayashi, J (2022). Association Between Socio-Economic Status and the Presence of Soap at Handwashing Facilities in Lao People's Democratic Republic: A Cross-Sectional Study. Asia Pac J Public Health. 2022 May;34(4):423-426. doi: 10.1177/10105395211072478. Epub 2022 Jan 18. PMID: 35040349; PMCID: PMC9131397. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC9131397/
- Mushota, O., Mathur, A. & Pathak, A. (2021) Effect of school-based educational water, sanitation, and hygiene intervention on student's knowledge in a resource-limited setting. BMC Public Health 21, 2258 (2021). https://doi.org/10.1186/s12889-021-12279-2
- Nasr,H.,Al-Zumair, M., Al-Mahbashi, T., & Dureab (2024). Factors associated with the cholera outbreaks in Al-Mahweet, Yemen: Analytical study. The Journal of Infection in Developing Countries. 18(1):66-74. doi:10.3855/jidc.17571
- Nsagha, D.S., Atashili, J., Fon, P.N. et al. Assessing the risk factors of cholera epidemic in the Buea Health District of Cameroon. BMC Public Health 15, 1128 (2015). https://doi.org/10.1186/s12889-015-2485-8 Available at: https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-015-2485-8#citeas
- Odonoghue, M., Ng,K.L., & Boost, M (2016). A quasi-experimental study to determine the effects of a multifaceted educational intervention on hand hygiene compliance in a radiography unit. Antiimicrob resistance infection control DOI: 10.1186/s13756-016-0133-4
- Orimbo, E.O., Oyugi, E., Dulacha, D., Obonyo, M., Hussein, A., Githuku, J., Owiny, M., Gura, Z. (2020). Knowledge, attitude and practices on cholera in an arid county, Kenya, 2018: A mixed-

methods approach. PLoS One. 2020 Feb 26;15(2):e0229437. doi: 10.1371/journal.pone.0229437. PMID: 32101587; PMCID: PMC7043758.

- Qaserah , M.A., Al-Mad, A.M., Al-serouri, A.A., Khader, S.Y (2021). Risk factors of cholera transmission in AL Hudaydah, Yemen: case-control study. JMIR public Health and Surveillance. DOI:10.2196/27627. Available at:publichealth.mjir.org/2021/7/e2727
- Solhi, M., Fard, A. F.E., Abolghasemi, J., Maheri, M., Irandoost, S.F., Khalili, S. (2020) The effect of educational intervention on health-promoting lifestyle: Intervention mapping approach. J Educ Health Promot. 2020 Aug 31;9:196. doi: 10.4103/jehp.jehp_768_19. PMID: 33062729; PMCID: PMC7530417. Available at : https://pmc.ncbi.nlm.nih.gov/articles/PMC7530417/
- WHO & WASH Cluster (2017)Yemen: Joint Cholera Response Plan – July 2017:Avialable from: https://reliefweb.int/report/yemen/joint-cholera-response-plan-yemen-july-2017.
- WHO (2023). World Health Organisation Africa. Weekly Regional cholera Bulletin 2023. Cholera in the WHO African region, 18 December 2023. Available at; https://www.afro.who.int/countries/democratic-republic-of-congo/publication/cholera-who-african-region-weekly-regional-cholera-bulletin-18-december-2023
- Yang, J., Park, E., Lee, A.S & Lee, G.S (2019). Associations and self-reported hand washing behaviors among Korean adults during MERS-COV outbreak. Health education and Behaviour. DOI: 10.1177/1090198118783829.