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Knowledge, practice, and attitude towards cholera management among university students in Greater Accra Region, Ghana

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ABSTRACT

Cholera's high mortality rate in developing tropical regions, especially in Africa with 90% of cases, underscores the vital importance of comprehensive knowledge for its management and prevention. This study assessed university students' knowledge, practices, and attitudes towards cholera management in the Greater Accra Region, Ghana. The research utilized a descriptive cross-sectional approach with questionnaires to collect data. Findings show that proper sanitation, use of safe water, and health education are recognized as key preventive measures. A significant majority expressed willingness to seek hospital treatment for cholera and to receive vaccinations. It reveals that while most are aware of cholera and engage in good hygiene practices, gaps exist in their knowledge of the cholera vaccine and its dosages. The study concludes that increasing awareness about the cholera vaccine could further enhance disease management and prevention efforts among students, highlighting the need for health programs that improve knowledge and practices.

Keywords: cholera, knowledge, vaccination, hygiene practices, health education

INTRODUCTION

Cholera, an acute intestinal infection caused by the gram-negative bacterium *vibrio cholera* of the Vibrionaceae family, results in severe secretory diarrhea that can lead to hypovolemia, rapid fluid loss, and mortality if untreated [1]. The infection is often severe and highly virulent, commonly emerging in areas with contaminated water or food due to poor sanitation practices [2, 3]. The bacteria spread through contaminated food or water and produces cholera toxin, causing clinical symptoms [4]. Apart from watery diarrhea, symptoms include vomiting and abdominal colic, affecting all age groups [5]. Globally, cholera poses a public health issue and reflects underdevelopment, impacting 1.3-4 million people annually with 21,000-143,000 deaths [6, 7]. Approximately 2.8 million cases and 91,000 deaths occur in Africa yearly [5]. Countries like Ghana, in sub-Saharan Africa, have significant populations in cholera-prone areas [2]. The 2016 cholera epidemic announced by the Ghana health service affected many regions, especially coastal ones, indicating a high-risk region [8]. Factors like improper waste disposal, poor water access, open defecation, and unsatisfactory hygiene contribute to cholera outbreaks [2]. Poor understanding of transmission modes and early diagnosis worsens the situation [9]. An effective outbreak response necessitates timely coordination, preparation, and a robust plan [10]. Having a robust cholera preparedness plan and program is essential for countries at risk of cholera outbreaks, regardless of whether they have experienced one before or are in regions prone to seasonal recurrences [11]. Cholera preparedness programs help control outbreaks, focusing on hygiene, sanitation, and vaccination [12, 13]. Effective management of future cholera outbreaks necessitates thorough planning and the implementation of preparedness activities, and it's essential to build on a foundation of effective response action [11]. Implementing targeted interventions among high-risk groups with limited knowledge and favorable attitudes towards cholera can be challenging. Therefore, it's crucial to first assess the existing knowledge, behaviors, and attitudes within a community. This assessment provides essential insights for planning vaccination campaigns, awareness programs, and other preventive measures [14]. Therefore, it is imperative to assess the knowledge, practices, and attitudes regarding cholera management among university students in the Greater Accra Region. This assessment will provide valuable insights for decision-making related to this topic.

RESEARCH METHODOLOGY

Study Design

The research was conducted in Accra, which is the capital of the Greater Accra Region and that of the entire country, Ghana [15]. This study adopted a quantitative methodology approach and used a cross-sectional study design to gather information on the subject [16]. The target group of the study were university students in Accra, Ghana. The main data source

Table 1. Population of university students

No	School	Total number of students	Number of students sampled on proportion
1	University of Ghana	53,643	263
2	University of Professional Studies, Accra	17,526	86
3	Ghana Institute of Management and Public Administration	10,000	49
Total		81,169	398

was a questionnaire completed by university students on knowledge, practice and attitude towards cholera management in the Greater Accra Region. The study's participating schools were chosen based on proximity to the researchers. The research used probability sampling method; simple random. Random sampling, outlined by Polit and Beck, ensures that each participant of an audience or populace has a distinct and equal likelihood of being chosen. Data was analyzed using both descriptive and inferential statistical tests [17]. The data was displayed using frequency tables so that it may be readily and clearly visualized.

Study Population and Sampling

A specific group of humans or objects that have a lot in common are referred to as a population. Typically, a population as a whole shares common distinguishing traits or qualities [17]. The study was carried out in three universities namely; University of Ghana, University of Professional Studies, Accra, and Ghana Institute of Management and Public Administration. The research used convenience sampling to select the schools and simple random sampling to select the participants. Inclusion criteria for the study included university students who have been admitted to offer a program in the selected schools and the exclusion criteria included unwillingness to partake in the research or refusal to partake in the study, alumni, lecturers and non-teaching staff of the school.

Sample Size

The sample size for this investigation was calculated using the Yamane 1967 formula (Eq. [1]), which offered a more straightforward technique for doing so using population proportions:

$$n = \frac{N}{1+N(e)^2}, \quad (1)$$

where *n* is the sample size, *N* is the targeted population size, and *e* is the level of precision with 5% confidence interval (CI) (95% CI assumed for most studies).

The formula for selecting the sample size was utilized in order to reduce bias in selection.

In determining the sample size for this study, the researcher used the Yamane 1967 formula:

$$n = \frac{81{,}169}{1+81{,}169(0.05)^2} = 398.03. \quad (2)$$

Thus, the sample size is 398. **Table 1** shows population of university students.

Data Collection Instrument and Procedures

Data were primarily gathered through questionnaires. Individuals sampled were required to fill out the survey forms. The questionnaire was divided into four main sections. Section one comprised of demographic data with six items, section two had eleven items on the topic knowledge on cholera, section 3 was on practices relating to the prevention of cholera with 12 items and section four comprised of six items under attitude towards cholera management. Pre-testing of the questionnaire was conducted with 10 respondents with similar characteristics. Pre-testing was employed to verify how a survey's content corresponded to the words and phrases of the target demographic, unclear phrases were altered in a manner that they were capable of being understood particularly by people from the various survey categories, and inquiries that appeared unclear to individuals could be modified and clarified. The reliability of face validity, which defines the degree to which a questionnaire's answers are reliable, was also tested. Five hundred and fifty questionnaires were distributed in total. However, 495 of them were completed and returned, yielding a response percentage of 90.0%. A bigger sample size provides greater precision, and the results are more accurate than those from smaller studies due to their lower expectations of deviation and smaller error margins [18].

Data Analysis

The different survey components and answers in the current study were categorized as well as examined with SPSS version 20. Descriptive as well as inferential stats were utilized for displaying the outcomes of the research. Large volumes of numerical information are summarized and described using descriptive statistics [17]. Percentages and frequency distributions were used to characterize information obtained through statistical methods. Tables and graphs were used to display the findings from the data analysis. To establish the relations between the variables, Chi-square testing, correlation, and regression analysis were employed [17]. The sensitivity threshold for all tests was set at 0.05 (5%) for all hypotheses.

Ethical Consideration

Volunteers for the study were apprised regarding the research's goal as well as how the data that was collected would only be utilized for studies, and their expressed agreement were acquired. They were also informed that the study was voluntary and could opt out anytime. The responses of the participants were kept purposely for the study and not shared or disclosed to any party outside the study. Their identities were not publicized to avoid being associated with their responses. The right to privacy of all participants in the study were highly respected and preserved throughout the study and beyond.

Ethical approval for the study was obtained from the Office of the Research Ethics Review Committee of the Metropolitan Research and Education Bureau (MREB/RERC/13/23).

RESULTS

This section describes the output obtained after data analysis. The results were displayed in tables and graphs for easy understanding.

Table 2. Demographic characteristics of respondents

Variable	F (n)	P (%)
Gender		
Female	261	52.7
Male	234	47.3
Residence		
Rural	72	14.5
Urban	423	85.5
Age group		
Below 20 years	171	34.5
21 to 30 years	171	34.5
31 to 40 years	93	18.8
Above 40 years	60	12.1
Marital status		
Single	366	73.9
Married	129	26.1
Level of study		
Diploma	9	1.8
Undergraduate	300	60.6
Postgraduate	186	37.6
Program of study		
Health sciences	333	67.3
Business	18	3.6
Arts/Social sciences	24	4.8
Environmental/agricultural sciences	105	21.2
Engineering	9	1.8
Others	6	1.2

Note. n = 495; F: Frequency; & P: Percentage

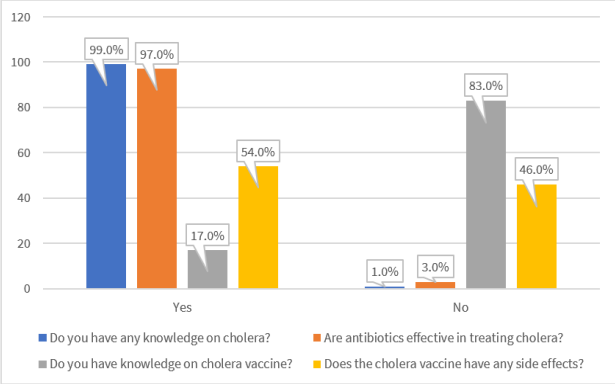

Figure 1. Knowledge of cholera (Source: Authors' own elaboration)

Socio-Demographic Characteristics of Respondents

Table 2 shows the demographic characteristics of respondents. The research reveals that majority of the respondents 261 (52.7%) were females while 234 (47.3%) were males. More than half of the respondents 423 (85.5%) were urban residents and 72 (14.5%) were rural residents. About 342 (69%) of them were 30 years and below, 93 (18.8%) were 31 to 40 years and 60 (12.1%) were above 40 years. 300 (60.6%) were undergraduate students, 186 (37.6%) were postgraduate students, and 9 (1.8%) were diploma students. About 333 (67.3%) offered a health science program, 105 (21.2%) offered an environmental/agricultural science program, 24 (4.8%) offered arts/social sciences, 18 (3.6%) offered business, 9(1.8%) offered an engineering program and 6 (1.2%) offered other programs.

Knowledge of Cholera

From **Figure 1**, about 99% of the respondents have knowledge of cholera while 1% lack knowledge of cholera.

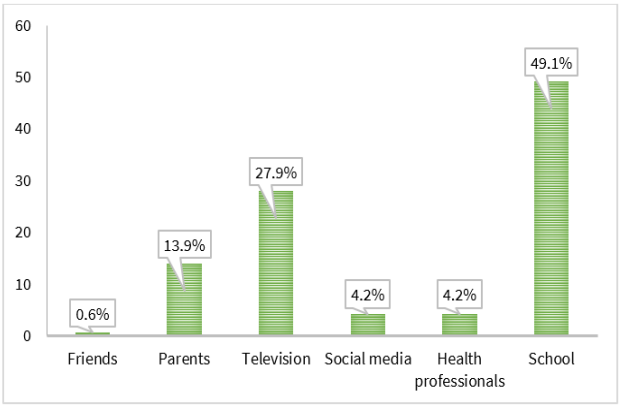

Figure 2. Sources of knowledge on cholera (Source: Authors' own elaboration)

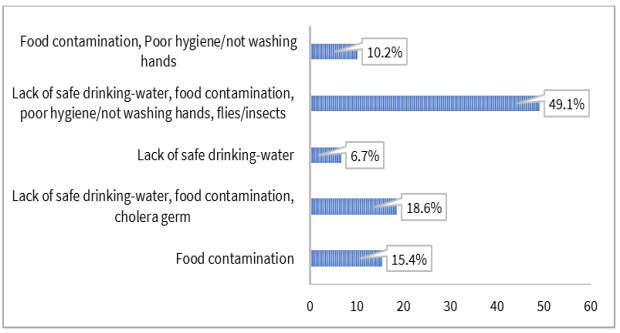

Figure 3. Causes of cholera (Source: Authors' own elaboration)

Concerning the effectiveness of antibiotics in treating cholera, 97% of the respondents indicated yes thereby agreeing to its effectiveness while 3% disagreed. Only 17% of the respondents have knowledge on cholera vaccine while about 80% don't have knowledge on that. About 54% said yes, when asked whether there are side effects associated with the cholera vaccine, while 46% said no.

Some sources of knowledge on cholera listed in **Figure 2** according to respondents were school (49.1%), television (27.9%), parents (13.9%), social media (4.2%), health professionals (4.2%), and friends (0.6%).

According to respondents in **Figure 3**, the causes of cholera were the lack of safe drinking water, food contamination, poor hygiene, files (49.1%), 18.6% of them mentioned lack of safe drinking-water, food contamination, cholera germ, (15.4%) also mentioned food contamination. About 10.2% of the respondents said food contamination, poor hygiene/not washing hands and 6.7% said lack of safe drinking-water.

About 43% of the respondents are of the view that cholera is transmitted through the cholera gem, 20% mentioned contact with infected person and cholera gem, 18.2% said contact with infected person, through animals and cholera gem, 15.2% said through contaminated food and feco-oral route while 3.6% don't know according to **Figure 4**.

According to **Figure 5**, thirty six percent of the respondents identified vomiting, stomach pain, dehydration and watery diarrhea as symptoms of cholera, 21.2% said fever, vomiting, stomach pain, dehydration and watery diarrhea, 15.8% mentioned vomiting and watery diarrhea, 9.7% said fever, vomiting and watery diarrhea, 8% said vomiting, 6.5% said

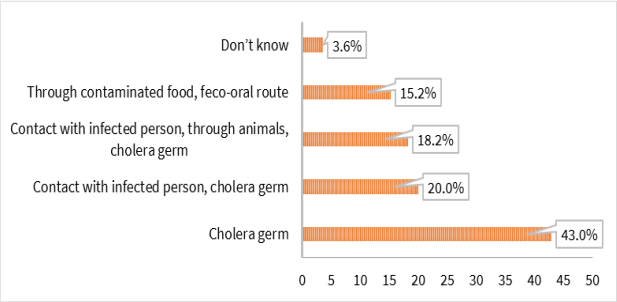

Figure 4. Mode of cholera transmission (Source: Authors' own elaboration)

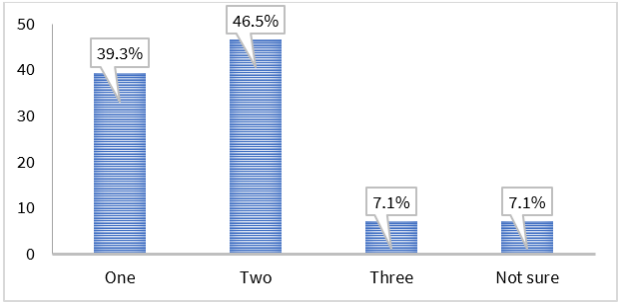

Figure 7. Number of cholera doses required (Source: Authors' own elaboration)

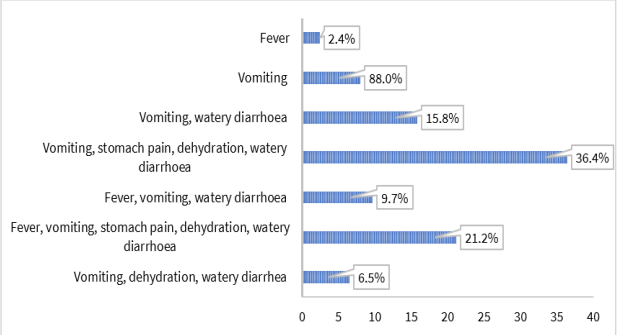

Figure 5. Symptoms of cholera (Source: Authors' own elaboration)

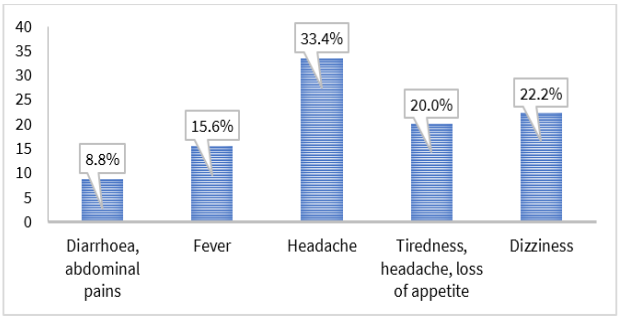

Figure 8. Side effects of cholera vaccine (Source: Authors' own elaboration)

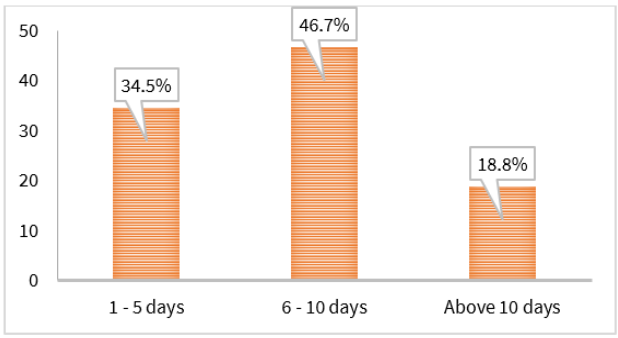

Figure 6. Period for one to develop symptoms (Source: Authors' own elaboration)

vomiting, dehydration and watery diarrhea and 2.4% said fever.

In relation to how long does it take for one to develop symptoms, 46.7% said 6 to 10 days, 34.5% said 1 to 5 days and 18.8% said more than 10 days (**Figure 6**).

According to the 17% of respondents who had knowledge on the vaccine, the required number of doses were two (46.5%), 39.3% said one, 7.1% of them said three while 7.1% were not sure (**Figure 7**).

Some side effects listed in **Figure 8** in association with the cholera vaccine were headache (33.4%), 22.2% of the respondent's mentioned dizziness, 20% said tiredness, headache and loss of appetite, 15.6% said fever, and 8.8% said diarrhea and abdominal pains.

From **Table 3**, Chi-square statistics was used to examine the association between respondents age and knowledge on cholera vaccine.

The Chi-square test conducted revealed that there was a significant relationship between age of respondents and their knowledge on cholera vaccine at 5% significance level (x^2 = 34.272, df = 3, p = 0.000).

Pearson correlation of program and level of study of respondents was found to have low negative correlation and not statistically significant (r = -0.054, -0.051, p > 0.05). This shows that the program of study or level of study does not influence respondents' knowledge on cholera (**Table 4**).

Practices relating to the prevention of cholera

Table 5 shows the responses obtained in relation to prevention of cholera (hygiene and food safety). The three-point Likert scale is considered an interval scale and was used to obtain the responses of respondents (1–disagree, 2–neither agree or disagree, and 3–agree).

Table 3. Age of participants correlates to knowledge on cholera vaccine

		Knowledge on cholera vaccine		Total	p-value
		Yes	No		
Age group of participants	20 years and below	15	156	171	0.000*
	21-30 years	21	150	171	
	31-40 years	27	66	93	
	Above 40 years	21	39	60	
Total		84	411	495	

Note. *Significant at 95% confidence level

Table 4. Program and level of study will influence knowledge on cholera (n = 495)

		Knowledge about cholera	Level of study	Program of study
Knowledge about cholera	Pearson correlation	1	-0.054	-0.051
	Significance (2-tailed)		0.115	1.280
Level of study	Pearson correlation	-0.054	1	-0.383**
	Significance (2-tailed)	0.115		0.000
Program of study	Pearson correlation	-0.051	-0.383**	1
	Significance (2-tailed)	1.280	0.000	

Note. **Correlation is significant at the 0.01 level (2-tailed)

Table 5. Practices relating to the prevention of cholera (n = 495)

Variable	Minimum	Maximum	Mean	Standard deviation
Hygiene				
I wash my hands with soap before handling or preparing food.	1	3	2.67	0.521
I wash my hands with soap before eating food.	1	3	2.70	0.520
I wash my hands with soap after using the toilet.	1	3	2.90	0.296
I wash my hands with soap before treating a wound.	1	3	2.49	0.711
I wash my hands after handling garbage.	1	3	2.84	0.417
I wash my hands after blowing nose, coughing, or sneezing.	1	3	2.92	0.688
I dispose of rubbish properly.	1	3	2.93	0.282
Food safety				
I wash my food with safe water.	1	3	2.97	0.172
I wash my utensils with clean water.	1	3	2.99	0.110
I cook my food or reheat it thoroughly.	1	3	2.93	0.260
I eat my food while it is still hot.	1	3	2.70	0.520
I eat uncovered food.	1	3	1.41	0.613

Table 6. Knowledge about cholera correlates to hygiene practices (n = 495)

		Knowledge about cholera	Hygiene practices
Knowledge about cholera	Pearson correlation	1	0.124**
	Significance (2-tailed)		0.006
Hygiene practices	Pearson correlation	0.124**	1
	Significance (2-tailed)	0.006	

Note. **Correlation is significant at the 0.01 level (2-tailed)

Table 7. Knowledge of cholera corresponds to cholera prevention practices (n = 495)

		Knowledge about cholera	Cholera prevention practices
Knowledge about cholera	Pearson correlation	1	0.114*
	Significance (2-tailed)		0.011
Cholera prevention practices	Pearson correlation	0.114*	1
	Significance (2-tailed)	0.011	

Note. **Correlation is significant at the 0.05 level (2-tailed)

The mean is very significant in determining the responses for a particular item. From 1 to 1.67, it means disagree. From 1.68 to 2.33, it means neither agree or disagree. From 2.34 to 3.0 means agree.

In the first section on hygiene, when asked if they wash their hands with soap before handling or preparing food, the mean was 2.67 which indicates that majority of the respondents agree to it. In relation to whether they wash their hands with soap before eating food, the mean was 2.70 which means that most of the respondents agreed. When asked whether they wash their hands with soap after using the toilet, the majority of them agreed.

Also, on whether they wash their hands with soap before treating a wound, the majority agreed. When asked if they wash their hands after handling garbage, most of the respondents agreed. When asked if they were washing their hands after blowing nose, coughing, or sneezing, the majority agreed. When asked if they dispose of rubbish properly, the majority of the respondents agreed.

In relation to food safety, concerning the washing of food with safe water, the mean was 2.97 which indicates that the majority agreed. When asked if they wash utensils with clean water, the mean was 2.99 which indicates that most of the respondents agreed. When asked whether they cook food or reheat it thoroughly, the mean was 2.93 which indicates that the majority agreed. Also, on whether they eat food while it is still hot, the majority agreed. Finally, when asked if they eat uncovered food, the mean was 1.41 which indicates that the majority disagreed.

Pearson correlation of knowledge about cholera and hygiene practices was found to have a low positive correlation and statistically significant ($r = 0.124$, $p < 0.01$). This shows that an increase in knowledge about cholera would lead to an increase in good hygiene practices (**Table 6**).

Pearson correlation of knowledge on cholera and cholera prevention practices was found to have a low positive correlation and statistically significant ($r = 0.114$, $p < 0.05$). This shows that an increase in knowledge would have a positive influence on respondents' practices toward cholera prevention (**Table 7**).

Table 8. Attitude towards cholera management (n = 495)

Variables	Yes (%)	No (%)
Are you willing to go to the hospital to treat yourself when you suspect you have cholera?	455 (92)	40 (8)
Are you willing to seek traditional medicine to treat yourself in a suspected case of cholera?	223 (45)	272 (55)
Are you willing to practice good hygiene?	495 (100)	0 (0)
Are you willing to educate your family and friends on cholera?	475 (96)	20 (4)
Are you willing to get vaccinated or to vaccinate your children and family?	445 (90)	50 (10)
Are you to encourage people for cholera vaccination?	475 (96)	20 (4)

Table 9. Knowledge of vaccine will influence respondents' willingness to get vaccinated with family

		Willingness to get vaccinated with family		Total	p-value
		Yes	No		
Knowledge of vaccine	Yes	69	15	84	0.006*
	No	378	33	411	
Total		447	84	495	

Note. *Significant at 95% confidence level

Table 10. Practices towards cholera prevention will positively correlate to their attitude towards cholera management (n = 495)

		Practices towards cholera prevention	Attitude towards cholera management
Practices towards cholera prevention	Pearson correlation	1	0.197**
	Significance (2-tailed)		0.000
Attitude towards cholera management	Pearson correlation	0.197**	1
	Significance (2-tailed)	0.000	

Note. **Correlation is significant at the 0.01 level (2-tailed)

Table 11. Practices towards cholera prevention will have an impact on their attitude towards cholera management

Hypothesis	Regression weights	Beta coefficient	R^2	F	p-value	Hypothesis supported
H3	Practices → Attitude	0.096	0.039	19.856	0.000*	Yes

Note. *$p < 0.05$

Attitude Towards Cholera Management

Table 8 shows that 92% of the respondents are willing to go to the hospital to treat themselves when they suspect they have cholera while 8% are unwilling to do so. Less than half of the respondents (45%) are willing to seek traditional medicine to treat themselves in a suspected case of cholera while 55% of them are unwilling to do the same. All respondents (100%) are willing to practice good hygiene. Ninety six percent of the respondents are willing to educate their family and friends on cholera. However, 4% percent are unwilling to educate their family and friends. About 90% of them are willing to get vaccinated or to vaccinate their children and family while 10% are unwilling. Also, 96% of the respondents are willing to encourage people for cholera vaccination and 4% are unwilling to encourage people for cholera vaccination.

From **Table 9**, Chi-square statistics was used to examine the association between knowledge on vaccine and willingness to get vaccinated with family. The Chi-square test conducted revealed that there was a significant relationship between knowledge on vaccine and willingness to get vaccinated at 5% significance level, ($x^2 = 7.693$, df = 1, $p = 0.006$).

Pearson correlation of cholera preventive practices and attitude towards cholera management was found to have a low positive correlation and statistically significant ($r = 0.197$, $p < 0.01$). This shows that good practices towards cholera prevention would lead to a positive attitude towards cholera management (**Table 10**).

From the Pearson correlation in **Table 10**, the hypothesis was further tested to assess the strength of the relationship between cholera preventive practices and attitude towards cholera management. Cholera preventive practices significantly predicted attitude towards cholera management, $F (1, 493) = 19.856$, $p < 0.01$, which indicates that preventive practices can play a significant role in influencing respondents' attitude ($b = 0.096$, $p < 0.01$). These results clearly direct the positive effect of good practices. **Table 11** shows the summary of the findings.

DISCUSSION

Socio-Demographic Characteristics of Respondents

Table 2 shows the demographic characteristics of respondents. The research reveals that majority of the respondents 261 (52.7%) were females while 234 (47.3%) were males. The gender distribution reveals a higher representation of females compared to males; this demographic disparity could prove advantageous for the community, particularly in a cultural context where women are traditionally tasked with maintaining environmental cleanliness, a crucial factor in preventing cholera infection [19]. As outlined by [20], owing to their gender-specific roles, women hold the capacity and influence to safeguard family units against contamination. Correspondingly, research by [12] examining the awareness of cholera preventive measures among Durumi District residents in Nigeria indicated a greater female participation, noteworthy due to the cultural inclination in Nigeria, where maintaining a clean household environment and preparing hygienic, nutritious meals predominantly falls under the woman's purview.

Moreover, the study in [21] highlighted that numerous studies conducted in the western region of the country demonstrate that women and girls tend to exhibit more environmentally conscious and eco-friendly behaviors. More

than half of the respondents 423 (85.5%) were urban residents and 72 (14.5%) were rural residents. About 342 (69%) of them were 30 years and below, 93 (18.8%) were 31 to 40 years and 60 (12.1%) were above 40 years. The general view of the demographic variables shows that most of the students were young people, whose age group was 30 years and below.

A substantial proportion of the youthful population within the community holds the potential to disseminate acquired knowledge through social media, educational institutions, and peer interactions. This advantageous position empowers them to effectively combat cholera transmission by staying well-informed about contemporary insights, which can be readily employed not only for cholera prevention but also for addressing other health concerns. Their youthful vigor also equips them to contribute to maintaining a clean environment [22, 20]. Similarly, the research by [12] identified a sizable number of young individuals in the Durumi Community, suggesting their potential commitment to upholding environmental cleanliness. Young people typically possess a greater breadth of disease-related knowledge compared to older individuals due to their active engagement with social media. This demographic advantage can be harnessed effectively if they are motivated to participate in activities promoting environmental sanitation, thereby enhancing the community's appearance. Additionally, the study in [10] noted that the youthful energy within a community makes them well-suited for engaging in communal and environmental sanitation efforts.

More than half of the respondents 366 (73.9%) were single and 129 (26.1%) were married. The study in [12] also reported comparable results in their research, revealing a parallel pattern in terms of marital status among the community residents. Their study highlighted a significant proportion of single individuals within the community (43%). This finding further reinforces the notion that unmarried individuals may shoulder fewer responsibilities and could potentially channel their youthful energy and single status towards actively participating in community-wide efforts to prevent cholera through enhanced environmental sanitation practices. 300 (60.6%) were undergraduate students, 186 (37.6%) were postgraduate students, and 9 (1.8%) were diploma students. About 333 (67.3%) offered a health science program, 105 (21.2%) offered an environmental/agricultural science program, 24 (4.8%) offered arts/social sciences, 18 (3.6%) offered business, 9 (1.8%) offered an engineering program and 6 (1.2%) offered other programs. The educational background of the individuals is promising, as indicated by all respondents having attained tertiary education. This level of education attained through various institutions is expected to facilitate the efficient and effective dissemination of health messages within the local communities [22]. This educated demographic is more likely to stay updated with contemporary knowledge and comprehend information comprehensively, especially related to measures aimed at containing cholera [20].

Knowledge of Cholera

Cholera is classified as a significantly transmissible infection that possesses the potential to trigger epidemic outbreaks. Such infections tend to be more prevalent in regions lacking proper sanitation infrastructure and adequate hygienic practices. Consequently, there is an imperative to enhance public knowledge and consciousness regarding cholera infections and the requisite preventive measures [9]. Educational interventions play a crucial role in the endeavor to mobilize communities [23]. The results in **Figure 1** show that about 99% of the respondents have knowledge of cholera while 1% lack knowledge of cholera. This indicates that the majority of the respondents have knowledge of cholera. Similar outcomes were documented in the research conducted by [24] within the Kigamboni Municipality, where out of 410 participants, 288 (70.2%) exhibited an awareness of cholera, while 122 (29.8%) displayed limited knowledge about the disease. Correspondingly, the study in [23] observed that a substantial ninety percent of the respondents had been exposed to educational content pertaining to cholera. Furthermore, the study by [25] highlighted that an overwhelming majority of participants (99.4%) possessed knowledge about cholera. Similarly, the study in [5] reported that in terms of familiarity with cholera, 425 individuals (99.3%) were acquainted with the disease. Some sources of knowledge on cholera listed in **Figure 2** according to respondents were school (49.1%), television (27.9%), parents (13.9%), social media (4.2%), health professionals (4.2%) and friends (0.6%). In a similar vein, the research conducted by [23] highlighted that community health workers (71.2%), mass media (32.3%), and healthcare providers (14.4%) were identified as the primary sources of information on cholera. According to [26], respondents indicated the following sources of information: family members/neighbors/friends (59%), media (51%), community meetings/leaders (13%), health workers (7%), community health volunteers (6%), and posters (5%). Sources of information and news about cholera, as indicated by respondents according to [27], included social media outlets (22.6%), followed by healthcare professionals, television channels, the World Health Organization (WHO), the Ministry of Public Health of Lebanon, and family and friends.

According to the respondents, some causes of cholera were lack of safe drinking water, food contamination, poor hygiene, files (49.1%), 18.6% of them mentioned lack of safe drinking-water, food contamination, cholera germ, (15.4%) also mentioned food contamination. About 10.2% of the respondents said food contamination, poor hygiene/not washing hands and 6.7% said lack of safe drinking-water. Responses obtained show that the participants are familiar with the causes of cholera. This study aligns with the findings of [24], where a majority of 368 (89.8%) respondents identified germs as the causative agent of cholera. However, a small percentage, 9 (2.2%), believed witchcraft to be the cause of cholera, and 33 (8%) indicated that they had no understanding of the causative agent of cholera. About 43% of the respondents are of the view that cholera is transmitted through the cholera gem, 20% mentioned contact with infected person and cholera gem, 18.2% said contact with infected person, through animals and cholera gem, 15.2% said through contaminated food and feco-oral route while 3.6% don't know according to **Figure 4**. Comparable results were observed in the research conducted by [9], where 52.3% of the participants were aware that cholera can be transmitted through contaminated water. However, 64.8% held the belief that contaminated food does not contribute to cholera transmission, and over 70% believed that the disease is spread by flies, mosquitoes, poor hygiene, and inadequate sanitation. Furthermore, more than 90% of respondents were of the opinion that cholera cannot be contracted from others and does not propagate through interpersonal transmission. According to **Figure 5**, thirty six percent of the respondents identified vomiting, stomach pain, dehydration and watery

diarrhea as symptoms of cholera, 21.2% said fever, vomiting, stomach pain, dehydration and watery diarrhea, 15.8% mentioned vomiting and watery diarrhea, 9.7% said fever, vomiting and watery diarrhea, 8% said vomiting, 6.5% said vomiting, dehydration and watery diarrhea and 2.4% said fever. Comparable findings were documented in the study conducted by [24], where a majority of 384 (93.7%) respondents recognized severe diarrhea and vomiting as symptoms of cholera. Conversely, 9 (2.2%) identified normal diarrhea and vomiting, while 17 (4.1%) associated weight loss with cholera symptoms. Similarly, the study in [25] reported watery diarrhea (98.9%) and vomiting (93.1%) as the predominant symptoms of cholera, followed by dehydration (28%), abdominal pain (21.7%), and fever (10.9%). The study in [26] also found that diarrhea was recognized by 90% of respondents as a primary symptom of cholera, though 8% could not identify any symptoms in their study. The study in [5] highlighted watery diarrhea (89.7%) and vomiting (75.0%) as cholera symptoms among their study participants. In a study by [28], the primary symptoms mentioned were vomiting (84.83%) and diarrhea (81.04%). Diarrhea was more prevalent in group 3 (88.96%) compared to group 1 (86.58%) and group 2 (83.19%). Additional symptoms reported included weight loss, fever, and dehydration.

The onset of cholera symptoms is characterized by sudden, painless, and copious watery diarrhea, often without vomiting. Symptoms can range from mild to severe [29]. Some individuals may not exhibit any symptoms at all. In cases of symptomatic patients, the rapid loss of water and salts through diarrhea and vomiting can lead to severe dehydration. The stool might appear gray or opaque white due to mucus content. Dehydration is a critical condition that, if not promptly treated, can lead to fatalities [30]. Severe cholera cases can result in a stool volume exceeding 250 mL/kg of body weight within 24 hours [29]. The significant diarrhea volume can cause uncontrollable bowel movements, leading to profound dehydration [31]. Additional symptoms might encompass intense thirst, muscle cramps, weakness, sunken eyes, and in turn, kidney failure, shock, coma, and death. Even after recovery, patients may remain carriers of the bacteria [29, 32]. During dehydration, complications like hypoglycemia, hypokalemia (potassium loss in stool), and bicarbonate loss in children can arise and can contribute to the elevated mortality rate in cholera cases [33].

In relation to how long does it take for one to develop symptoms, 46.7% said 6 to 10 days, 34.5% said 1 to 5 days and 18.8% said more than 10 days (**Figure 6**). Symptoms typically manifest within a period of 12 to 72 hours following infection. The specific duration of the incubation period can vary based on the serotype, although the average period is generally around 5 days [34]. Concerning the effectiveness of antibiotics in treating cholera, 97% of the respondents indicated yes thereby agreeing to its effectiveness while 3% disagreed according to **Figure 1**.

The central focus of cholera treatment lies in oral or intravenous rehydration, which is vital for managing the condition. In tandem with effective hydration, the use of antibiotics is also recommended. Antibiotics should be prescribed for individuals experiencing moderate to severe dehydration, as well as those who have undergone substantial fluid loss through stool during rehydration therapy. This treatment approach is particularly pertinent for patients requiring hospitalization [29, 33].

The choice of antibiotics should be based on local antibiotic susceptibility patterns. In many countries, doxycycline is typically recommended as the primary treatment for adults, while azithromycin is favored for pregnant women and children. Azithromycin has been shown to be more effective than erythromycin and ciprofloxacin. It's important to note that there are no guidelines recommending the use of antibiotics as a prophylactic measure for preventing cholera. All established guidelines stress the importance of administering antibiotics in conjunction with aggressive hydration. For instance, a single 300 mg dose of doxycycline has proven to be as effective as a 3-day course of tetracycline treatment. Resistance to tetracycline and other antimicrobial agents has been documented among Vibrio cholerae in both endemic and epidemic cholera situations [29, 33].

Only 17% of the respondents according to **Figure 1** have knowledge on cholera vaccine while about 80% don't have knowledge on that. This research aligns with the findings of [14], who revealed that a mere 16% of participants were familiar with cholera vaccines. Interestingly, only a small subgroup of participants (9 out of 30) had some awareness of cholera vaccines, although their knowledge remained limited. Similarly, the study conducted by [36] highlighted insufficient knowledge levels concerning cholera vaccines. This could be attributed to the absence of cholera vaccination availability in Lebanon during the ongoing outbreak. Furthermore, the study conducted by [23] also identified a lack of awareness regarding cholera vaccines. It becomes imperative to include vaccine education as a vital component of awareness campaigns in order to enhance public understanding and acceptance.

According to the 17% of respondents who had knowledge on the vaccine, the required number of doses were two (46.5%), 39.3% said one, 7.1% of them said three while 7.1% were not sure (**Figure 7**). In **Figure 1**, when asked whether there are side effects associated with the cholera vaccine, 54% said yes and 46% said no. Some side effects listed in **Figure 8** in association with the cholera vaccine were headache (33.4%), 22.2% of the respondent's mentioned dizziness, 20% said tiredness, headache and loss of appetite, 15.6% said fever, and 8.8% said diarrhea and abdominal pains.

From **Table 3**, Chi-square statistics was used to examine the association between respondents age and knowledge on cholera vaccine. The Chi-square test conducted revealed that there was a significant relationship between age of respondents and their knowledge on cholera vaccine at 5% significance level, (x^2 = 34.272, df = 3, p = 0.000). The general view of the demographic variables shows that most of the students were young people, whose age group was 30 years and below. The substantial presence of young individuals within the community could play a crucial role in disseminating acquired knowledge through social media, educational institutions, and peer interactions. This situation may confer an advantage in combating cholera infections, as these young individuals are more readily exposed to and updated on current information. This knowledge can be readily applied not only to cholera prevention but also to addressing other health concerns. Additionally, their youthful vigor positions them well to maintain a clean environment. The studies in [20, 22] underline this vitality. Similarly, The study in [12] in the Durumi Community echoed the presence of relatively youthful members, which could suggest a propensity for active engagement in environmental cleanliness efforts. Youth are better equipped with disease-related knowledge due to their

active participation in social media platforms. Consequently, the substantial representation of young individuals could prove advantageous if guided toward active involvement in community-wide environmental sanitation initiatives, thereby contributing to an uplifted community ambiance. Pearson correlation of program and level of study of respondents was found to have low negative correlation and not statistically significant ($r = -0.054, -0.051$, $p > 0.05$). This shows that the program of study or level of study does not influence respondents' knowledge of cholera (**Table 4**). This could be as a result of lack of education on cholera among the various programs of study in the schools and therefore played no significant role or impact on their knowledge on cholera.

Practices Relating to the Prevention of Cholera

As per [24], the enduring solution for cholera control hinges on economic progress and ensuring universal access to safe drinking water and proper sanitation. This entails promoting the use of safe water, fundamental sanitation, and effective hygiene practices within regions prone to cholera outbreaks. Hygiene, in this context, pertains to safeguarding one's personal well-being from potential harm or danger. It also involves preparing and maintaining conditions that foster health benefits. Improving hygiene can significantly mitigate the risk of contracting life-threatening diseases. Neglecting proper hygiene management can lead to disease outbreaks, culminating in a widespread global health burden [37]. In essence, hygiene conditions can yield positive outcomes by preventing various diseases, or conversely, result in negative consequences by triggering such diseases. Hence, numerous studies underscore the imperative and significance of maximizing the positive impacts of hygiene while minimizing its adverse effects [38]. Preventing cholera within high-risk demographics necessitates a comprehensive approach that encompasses various strategies, with health and hygiene education serving as a pivotal element. This education aims to encourage the adoption of behaviors conducive to health promotion [25]. From **Table 5**, responses were obtained in relation to prevention of cholera (hygiene practices and food safety). The three-point Likert scale is considered an interval scale and was used to obtain the responses of respondents (1–disagree, 2–neither agree or disagree, and 3–agree).

The results obtained on hygiene shows that, majority of the respondents wash their hands with soap before handling or preparing food, they wash their hands with soap before eating food and wash their hands with soap after using the toilet. Also, most of them wash their hands with soap before treating a wound, after handling garbage and after blowing nose, coughing, or sneezing. The findings of this study align with the research conducted by [7], which underscores the significance of pre-cooking food washing, particularly for vegetables, adhering to hand hygiene practices before and after meals, and implementing proper handwashing after using the restroom to prevent cholera infection. This research also establishes a connection between robust hygiene practices and effective cholera prevention. In a similar vein, the study in [39] found that 65% of individuals residing in Wadata, a rural settlement in Makurdi, Benue State, Nigeria, exhibited commendable cholera prevention practices. These outcomes also harmonize with the observations made by [40], who documented positive preventive practices among Samaru Community residents. Likewise, the results from this study align with those of the investigation in Kenya, revealing that a majority (89.5%) of respondents engaged in handwashing after using the toilet [5]. In a Bangladeshi context, the study in [41] discovered that 88% of individuals practiced handwashing after defecating. Moreover, the study in [7] identified that approximately 80% of the participants displayed sound practices in cholera management. Additional congruence is apparent in the study by [27], where 90.0% of respondents consistently washed their hands with soap and water prior to eating. Similarly, the study in [24] reported that the majority of community members, totaling 328 (80%), adhered to regular handwashing, while a minority of 64 (15.6%) washed their hands occasionally. Among the respondents 384 (93.7%) wash their hands after visiting toilets while 26 (6.3%) don't wash. Again, it is revealed that most 363 (88.5%) of the respondents possess soap and detergents at their homes for washing hands and other domestic use. The results of this study indicate that a significant portion of the respondents appropriately dispose of rubbish, aligning with the findings presented by [27]. WHO suggests that preventive strategies should encompass the promotion of proper hand-washing and safe practices for handling food [35]. Integral to the fight against cholera are the practices of waste disposal and hand hygiene, although it's crucial to treat pits effectively to prevent the proliferation of cholera bacteria [24].

Concerning health matters, the presence of food safety hazards has far-reaching economic consequences, encompassing factors such as reduced business activities and increased healthcare expenditures [42]. Food safety stands as a significant global concern that affects individuals worldwide. In an increasingly interconnected world, the availability and safety of the food supply are intertwined, heightening the importance of food safety. The production of food must prioritize safety to yield positive public health outcomes and environmental advantages. The field of food safety pertains to guarding the food supply chain against the introduction, growth, or survival of hazardous chemical and microbial agents [43, 44]. Food hygiene encompasses the conditions and measures that prevent food contamination across the entire production-to-consumption spectrum. Poor hygiene practices at different stages of the food chain ranging from slaughtering or harvesting to processing, storage, distribution, transportation, and preparation can expose consumers to foodborne infections, some of which can prove fatal. Effective food hygiene practices pivot on principles such as cleanliness, proper cooking temperatures, and appropriate storage before and after cooking [45].

In relation to food safety in **Table 4**, the majority of the respondents wash their food with safe water, wash utensils with clean water, cook food or reheat it thoroughly and eat food while it is still hot. This practice was also highlighted in the investigation conducted by [27], where approximately 80% of the respondents consistently wash their fruits and vegetables and ensure thorough cooking before consumption. Furthermore, when queried about consuming uncovered food, the average score was 1.41, predominantly indicating disagreement. Likewise, in the study by [24], it was observed that a significant portion of the participants take measures such as covering and refrigerating leftover food, and a majority also reheat leftover food before consumption, all in an attempt to prevent the transmission of cholera. Pearson correlation of knowledge about cholera and hygiene practices was found to have a low positive correlation and statistically significant ($r = 0.124$, $p < 0.01$) which shows that an increase in knowledge about cholera would lead to an increase in good hygiene

practices (**Table 6**). Also, Pearson correlation of knowledge on cholera and cholera prevention practices was found to have a low positive correlation and statistically significant ($r = 0.114$, $p < 0.05$) which indicates that an increase in knowledge would have positive influence on respondents' practices toward cholera prevention (**Table 7**). Respondents' knowledge about cholera has an influence on their hygiene practices, cholera prevention practices and lifestyle as they are aware of the negative impact of the disease and therefore are cautious of their actions to prevent devastating consequences. This finding aligns with the results of a study conducted by [46], which investigated the knowledge, attitude, and practice of female employees regarding cholera at Sana'a University. The findings from [46] indicate a significant positive correlation between the knowledge and practice of female employees about cholera. Similarly, this result is in accordance with the findings of [3], who observed a notable positive correlation between overall KAP scores, specifically between knowledge and practice ($r = 0.061$, $p = 0.001$). The importance of education is pivotal and closely linked to knowledge. Enhancing health education activities can potentially enhance their understanding of cholera [39]. As highlighted by [47], effective education leads to enhanced knowledge, improved attitude, and the adoption of appropriate practices.

Attitude Towards Cholera Management

About 92% of the respondents are willing to go to the hospital to treat themselves when they suspect they have cholera and less than half of the respondents (45%) are willing to seek traditional medicine to treat themselves in a suspected case of cholera (**Table 8**). The research conducted by [48] yielded comparable results, where a significant number of participants expressed their disagreement or strong disagreement with the idea of seeking assistance from traditional healers (52% and 41%, respectively) or resorting to homemade remedies (44.3% and 47%, respectively) when faced with cholera.

All respondents (100%) are willing to practice good hygiene and ninety six percent of the respondents are willing to educate their family and friends on cholera. However, 4% percent are unwilling to educate their family and friends according to **Table 8**. As indicated by [48], a substantial majority of the participants (78%) exhibited a favorable disposition towards engaging in awareness initiatives related to cholera. About 90% of the respondents are willing to get vaccinated or to vaccinate their children and family and 96% of them are willing to encourage people for cholera vaccination. From **Table 9**, Chi-square statistics was used to examine the association between knowledge on vaccine and willingness to get vaccinated with family. The Chi-square test conducted revealed that there was a significant relationship between knowledge on vaccine and willingness to get vaccinated at 5% significance level, ($x^2 = 7.693$, $df = 1$, $p = 0.006$). This could be attributed to the respondents' existing knowledge about cholera and their awareness of the significance of vaccination. As a result, they are more inclined to seek vaccination for themselves, their families, or to motivate others to do so, given their understanding of the adverse effects of cholera on human health. This discovery mirrors the observations of [48], who reported that approximately 93.8% of their participants expressed their readiness to receive vaccination or to have their children vaccinated in the event that a vaccine becomes available. Pearson correlation of cholera preventive practices and attitude towards cholera management was found to have a low positive correlation and statistically significant ($r = 0.197$, $p < 0.01$). This shows that good practices towards cholera prevention would lead to a positive attitude towards cholera management (**Table 10**).

From the Pearson correlation in **Table 10**, the hypothesis was further tested to assess the strength of the relationship between cholera preventive practices and attitude towards cholera management. Cholera preventive practices significantly predicted attitude towards cholera management, $F(1, 493) = 19.856$, $p < 0.01$, which indicates that preventive practices can play a significant role in influencing respondents' attitude ($b = 0.096$, $p < 0.01$). These results clearly direct the positive effect of good practices (**Table 11**). Similar results were observed in the study conducted by [7], which indicated a connection between attitude and practice ($p = 0.001$). Consequently, a noteworthy correlation between knowledge and attitude was identified (two-tailed). The correlation coefficient, with a value of $r = 0.331$, demonstrates a moderately positive correlation. This implies that as attitude improves, the practice concerning cholera prevention also increases. When evaluating the strength of the correlations, the association between knowledge and practice exhibited the highest correlation strength with an $r = 0.338$, followed by the relationship between attitude and practice, which displayed an $r = 0.331$.

CONCLUSION

The study reveals that while there is a basic awareness of cholera among respondents, many are unaware of the cholera vaccine and its dosages. Good hygiene and food safety practices are common among the respondents, which align with their knowledge of cholera prevention. There is a statistically significant positive correlation between knowledge of cholera and the implementation of good hygiene practices, suggesting that increased awareness could enhance prevention efforts. Health education, particularly in university settings, is crucial for improving knowledge and practices related to cholera prevention. Therefore, involving students in health programs could positively affect their understanding and management of the disease.

The study suggests that health professionals should educate individuals, particularly students, on health issues during visits to medical facilities, and that universities should require vaccinations for admission. Additionally, it calls for collaboration between the Ministry of Health, NGOs, and media to ensure vaccine availability at affordable prices and to raise awareness about communicable diseases like cholera.

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