Research Article
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Cholera response in Northwest Syria; community perspective and concerns

Abstract

Background: In September 2022, the first cholera case in Northwest Syria (NWS) was confirmed, marking the start of a major health crisis. The outbreak is exacerbated by ongoing conflict, which has caused displacement, destroyed infrastructure, and hindered access to clean water and healthcare, complicating efforts to control the spread. This study aims to explore the perspectives and concerns of the affected communities in NWS regarding cholera response efforts after more than 12 months since the onset of the outbreak.

Methods: The study employed a cross sectional qualitative approach to gather in-depth information from community members. Ten Focus Group Discussions (FGDs) were conducted in 5 sub-districts in NW Syria, involving various stakeholders, including health providers and community leaders, in total 89 participants.

Results: The study engaged 89 participants, evenly distributed between health professionals (44) and community leaders (45), with 61 (68.5%) males and 28 (31.5%) females, comprising both host community members (35) and internally displaced people (IDPs) (54). Participants' ages ranged from 20 to 68 years, with a mean age of 40.53 years. Regarding cholera vaccination, 75% (66) reported receiving the vaccine.

The study demonstrated good knowledge about cholera, its sources, spreading, and symptoms, and showed fair levels of cholera knowledge regarding the preventive measures, while gaps exist in treatment understanding. The findings reveal a mixed attitude towards the outbreak response, with some expressing concerns about distrust, insufficient awareness, and socio-economic barriers, while others remain optimistic, highlighting the role of trusted influencers in disseminating awareness, with 75% of participants expressing confidence in Community Health Workers (CHWs) and 66% in doctors.

The study identifies prevalent misinformation fueling hesitancy towards vaccination campaigns. Rumors regarding vaccine side effects and conspiracy theories were notably reported.

Financial barriers hinder access to healthcare, and distrust affects response effectiveness. Additionally, participants emphasized the need for improved health facilities and highlighted challenges in waste management, sewage infrastructure, and access to clean water.

The lack of a cohesive governing body has led to a tendency to refrain from officially declaring cholera outbreaks, opting instead to label them as Acute Watery Diarrhea (AWD).

Recommendations include comprehensive sanitation improvements, targeted outreach, and increased awareness efforts. Addressing misinformation and enhancing vaccination campaigns are crucial for effective response.

Conclusion: The study concludes with a nuanced understanding of the community's needs, preferences, and challenges in the context of cholera response. Building on the identified gaps, the findings emphasize the importance of tailored interventions that address specific concerns raised by the community.

Keywords: cholera, outbreak, perspective, Northwest Syria, response, vaccine

Volume 13 Issue 2 - 2024

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Received: May 29, 2024 | **Published:** June 13, 2024

Abbreviations: NWS, northwest Syria; FGDs, focus group discussions; CHWs, community health workers; AWD, acute watery diarrhea; WHO, world health organization; NGOs, non-governmental organizations; IPC, infection, prevention and control; WASH, water, sanitation, and hygiene; EWARN, early warning alert and response network; IDP, internally displaced people; KAP, knowledge, attitudes, and practices

Introduction

Cholera is a rapid-onset intestinal infection caused by eating food or drinking water contaminated with a bacteria called Vibrio cholerae O1 and O139, known for its highly contagious nature.[1,2] It presents with sudden and watery diarrhea, 10% of those infected encounter severe symptoms,[3,4] which if not promptly treated, can result in dehydration and fatal outcomes.[1,4,5]

Cholera persists as a significant global public health concern, highlighting disparities and deficiencies in social development.[1] In 2022, cholera outbreaks were reported in 29 countries, primarily across Africa and the Eastern Mediterranean regions,[1,6] while the World Health Organization reports 1.3 million to 4 million cases annually.[1,7]

Cholera primarily affects individuals living in impoverished conditions with limited access to clean water and proper sanitation. It thrives in areas marked by inadequate sanitation, overcrowding, conflict, and food insecurity.[1,4]

Syria has been grappling with a protracted humanitarian crisis since the military conflict in March 2011, characterized by severe living conditions and complex emergencies.[8] This conflict has created an area in NWS that has become outside of government control. As a result, the region's healthcare and water, sanitation, and hygiene systems have been stretched to their limits.[9]

The recent declaration of a cholera outbreak in Syria,[10] with the first cholera case was confirmed in NW Syria on September 19th, 2022, and by July 22nd, 2023, the total suspected cases reached 113,405, with 863 cases confirmed and 24 resulting deaths.[11] The escalating Cholera outbreak in NW Syria has posed a severe threat to public health, necessitating immediate and thorough intervention and implement a robust and community-centered response to prevent further escalation of this crisis. World Health Organization (WHO) and several Non-Governmental organizations (NGOs) took the initiative to response to this outbreak, with support extending from neighboring Turkey.[12] Thus, a response a cholera taskforce was established to follow up the progress of the outbreak and set a response plan of actions which included: coordination, surveillance and reporting, risk communication and community engagement, case management and Infection, Prevention and Control (IPC), Water, Sanitation, and Hygiene (WASH), vaccination, supplies, and research.[13]

The situation was further exacerbated by two powerful earthquakes in February 2023, two strong earthquakes with 7.8 and 7.6 magnitudes, respectively, hit Türkiye and NWS in Idlib and Aleppo, caused mass destruction of residential and public buildings, including hospitals and other infrastructure.[14,15] The earthquake has impacted the living conditions becoming overcrowded and increased risks of water borne diseases like Cholera.[10,15]

This study aims to explore the perspectives and concerns of affected communities, delving deeper into the dynamics of community feedback related to the cholera response after more than one year since the onset of the outbreak in NW Syria. The valuable insights gained from this study could inform future interventions and enhance the effectiveness of cholera response strategies in NWS.

Material and methods

Study design: This study employed a cross sectional qualitative approach utilizing focus group discussion method to offer an in-depth understanding of the human dimensions of the Cholera outbreak in NW Syria.

Geographic scope and site selection: The study took place in five cholera-affected locations; Salqin, Dana, Harim, Atareb and Afrin in both Aleppo and Idlib governorates in NW Syria, the locations were selected based on coordination with the Early Warning Alert and Response Network (EWARN) and cholera response taskforce of the health cluster in NW Syria, considering the most crowded and most affected areas with the outbreak.

Figure 1 shows the map of prevalence of suspected cholera cases per sub-districts in NW Syria.[11] Two FGDs were conducted in each sub-district, one focus group with health professionals including pharmacists and health workers, and one focus group with community leaders, was conducted in each targeted sub-district.

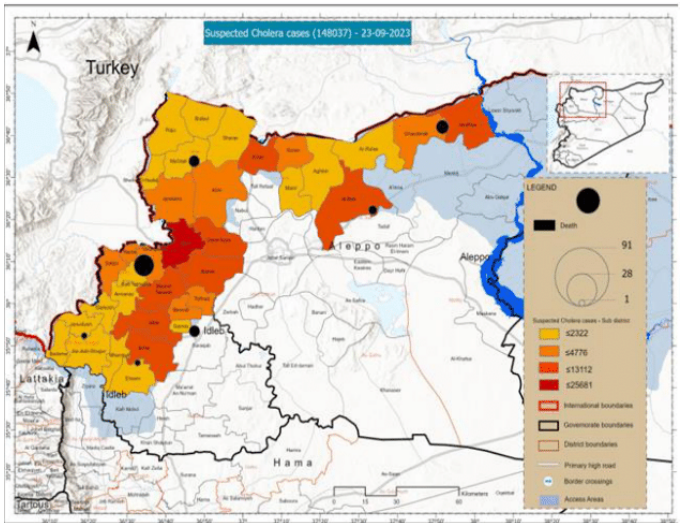

Figure 1 Map of prevalence of suspected cholera cases per sub-districts in NW Syria.[11]

Selection of participants: Participants were purposively selected from diverse demographic groups within the affected communities in NWS. In collaboration with local healthcare authorities and community leaders, individuals with varying degrees of knowledge and exposure to the cholera outbreak were identified to ensure a comprehensive representation of perspectives.

The participants were separated into groups of health professionals and community leaders, the health professionals consisted of doctors, nurses, hospital administration staff, midwives, pharmacists, and lab technicians. Whereas the community leaders were made up of, camp managers, teachers, elders in the community, educators, administrative employees, and women leaders.

Informed consent: Prior to the focus group discussions, informed consent was obtained from all participants, emphasizing the voluntary nature of their participation, confidentiality, and the purpose of the study.

Moderation and data collection: Experienced moderators fluent in the local languages facilitated the discussions, following a semi-structured interview guide. The guide covered topics such as community perceptions of the outbreak, knowledge of cholera, challenges faced, and recommendations for effective intervention strategies. Sessions were audio-recorded to ensure accuracy in data capture. The sessions took place from the 19th of November to 5th of December.

Data analysis: Thematic analysis was employed to identify recurrent patterns, key themes, and variations in responses across focus groups. The qualitative data collected during the discussions were transcribed, coded, and analyzed to derive meaningful insights into the community's perspectives on the cholera outbreak.

Results

A total of ten FGDs were conducted, each comprising 8 to 10 participants. The study encompassed a total of 89 participants, with 61 (68.5%) being males and 28 (31.5%) females. The age range of participants varied from 20 years to 68 years, resulting in a mean age of 40.53 years (Table 1).

Citation: AlKhatib I, Sultanoğlu E, Salem M, et al. Cholera response in Northwest Syria; community perspective and concerns. *MOJ Public Health.* 2024;13(2):117–123. DOI: 10.15406/mojph.2024.13.00448

Table 1 Number of participants in focus group discussions by cadre

	Focus groups discussions participants (N=89)	
	Health professional n =44	**Community leaders n=45**
Residency Status		
Host Communities	18	17
Internally displaced people (IDP)	26	28
Sex		
Male	32	29
Female	12	16

Knowledge about cholera disease:

General knowledge about cholera disease: The participants actively engaged in discussions, with a total of 317 statements related to the knowledge of cholera. Among these, 41% (130) of the statements emanated from health providers, where 59% (187) of the statements originating from community leaders. Among these statements, 42.3% (134) focused on general knowledge about cholera, covering its source, symptoms, and related information. Encouragingly, 62.3% (84) of these statements conveyed accurate and credible information, reflecting a commendable understanding within the community. However, 37.6% (50) expressed concerns about information scarcity or displayed a lack of knowledge about cholera.

Knowledge about the treatment and management*:* The study has brought to light a significant gap in the awareness and understanding of the processes and methods for treating cholera post-infection, with only 28 statements addressing this critical aspect. Remarkably, 43% (12) of these statements highlighted the influential role of specific individuals in shaping the discourse on cholera treatment, possibly indicating a lack of broader engagement from health professionals. Conversely, 57% (16) of the statements revealed a limited understanding or a complete lack of awareness regarding the necessary actions for effective treatment and management.

Preferred source of information: In terms of the community's preferences for cholera-related information sources, the participants expressed the highest trust in health professionals, notably Community Health Workers (CHWs) and doctors, with significant percentages of 75% and 66%, respectively. There is a moderate level of trust in nurses and pharmacists, around 29% and 18 respectively. This highlights the pivotal role of health workers as the primary informants.

Community leaders and religious leaders both have a similar level of trust, standing at 29% and 21%, respectively. Teachers are also among the trusted sources but at a slightly lower percentage of 16%. Social media and auditory/visual mediums are moderately trusted by 39% and 24%, respectively. On the lower end, mothers and EWARN are considered less reliable, each with single-digit percentages.

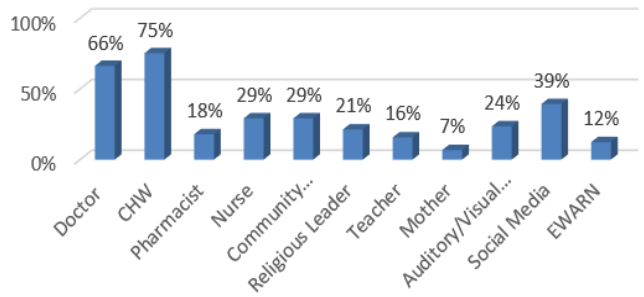

Chart 1 The community's preferences for cholera-related information sources.

Earthquake and it's impacting the outbreak:

Most of the participants comprising two-thirds of health providers and one-third of community leaders overwhelmingly conveyed the perception that the seismic event had a discernible impact on the escalation of the cholera outbreak, citing deteriorating infrastructure and overcrowding in camps as key factors. Conversely, a smaller proportion presented a contrasting viewpoint, they stated there was no considerable rise in the number of cholera cases associated with the earthquake.

Most participants highlighted and recognized the efforts made by humanitarian organizations in addressing cholera concerns amidst the immediate aftermath of the seismic event. While the rest conveyed a different perspective, indicating a perceived deficiency in humanitarian efforts.

Attitude regarding the outbreak response:

A total of 198 statements revealed insights into the community's attitudes toward humanitarian aid and cholera-related services. Notably, many participants, especially community influencers, expressed concerns about widespread distrust, insufficient awareness, and significant socio-economic barriers influencing the response to the cholera outbreak. Past negative experiences with health services have fostered a pervasive sense of distrust, leading individuals to take matters into their own hands.

Conversely, an equally significant portion of participants conveyed a more optimistic view. They highlighted trusted figures such as teachers and community influencers who leverage their knowledge to disseminate awareness, offering hope for improved engagement and response to the cholera outbreak.

(A health professional stated,)

"SPREADING AWARENESS AMONG FAMILY MEMBERS AND THE SURROUNDING COMMUNITY AND PLACING BROCHURES ABOUT CHOLERA IN THE PHARMACY AND PRIVATE CLINIC. MY ROLE IS TO EDUCATE PATIENTS ABOUT THE SERIOUSNESS OF THE DISEASE AND THE METHODS OF INFECTION AND EXPLAIN WAYS TO PREVENT IT. I WAS VERY AFRAID WHEN I CAME INTO CONTACT WITH A PATIENT WHO HAD THE SAME SYMPTOMS."

Despite an acknowledgment of the availability of cholera services, a striking consensus emerges among participants—they perceive these services as lacking. This overarching perception underscores a critical gap between the community's expectations and the perceived effectiveness of the humanitarian response.

About one-third of participants acknowledged positive and healthy habits practiced either individually or collectively within the community. However, a larger segment expressed a lack of awareness regarding good health practices. Notably, many of these negative practices were also related to challenges such as inadequate hygiene infrastructure and clean drinking water in camps or communities and financial issues faced by residents.

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Most of the participants stated that the community's priorities often lean towards basic needs rather than seeking information about the severity of the cholera outbreak. Many comments emphasize the necessity of providing food baskets or hygiene kits alongside services, underscoring a substantial gap in the community's understanding of the gravity of the cholera situation. Financial and transportation challenges emerge as significant barriers, leading some community members to opt for facing the disease without seeking assistance from health centers.

In general, there's a reported lack of coordination among humanitarian actors, and the absence of a unified governance body leading to delays in declaring the outbreaks, duplicated efforts, misinformation, and community hesitancy.

Cholera response services

Cholera awareness interventions: The majority of participants stated their knowledge of awareness activities conducted and stated a need for more awareness and orientation activities. The most notable common interest of both community leaders and health providers has been the inclusion and empowering of community influencers to lead the awareness initiatives.

Some participants highlighted the lacking awareness efforts in some locations especially in Salqin subdistrict and lacking trust towards humanitarian workers.

Cholera response on the health center Level: Impressively, a significant proportion of participants stated appreciation and gratitude toward the available health centers. The sentiment expressed reflected a positive acknowledgment of the efforts made to improve health facilities. Conversely, a smaller yet notable proportion, constituting 32% (37), presented a contrasting viewpoint and brought attention to perceived gaps in the capacity of health facilities, particularly concerning the challenges posed by the cholera disease.

Cholera response on the humanitarian response level: The analysis of statements evaluating humanitarian aid efforts in response to the cholera disease, encompassing services like awareness and orientation activities, household visits, vaccine campaigns, cholera kits, and IEC dissemination, involved a thorough examination of 276 statements. Impressively, a substantial 71% (197) conveyed appreciation and gratitude for the humanitarian response from various organizations, citing specific activities and their impact. Conversely, a notable 29% (79) presented a contrasting viewpoint.

Cholera kits and supplies: 64% of participants appreciate the quality and quantity of distributed cholera kits, but 36% express concerns about size and suggest larger quantities or more frequent distributions. Some note the need for additional essential services alongside kit distribution. Heightened awareness about proper kit utilization is emphasized, with a focus on community education. There's a call to increase supplies, particularly clean water and hygiene materials.

Cholera and vaccination: Among participants, 75% (66) reported receiving the cholera vaccine, while 25% (23) stated they have not. Some participants emphasized the prevalence of unfavorable conditions towards vaccination campaigns. Another prominent observation was the lack of knowledge about the availability of vaccine campaigns, what it is, and their source. There have also been several comments portraying misinformation about the cholera vaccine, such as "THE VACCINE CAUSES IMPOTENCE." (*A Community leader said).*

Additionally, some participants highlighted challenges in waste disposal mechanisms and a perceived low capacity, reflecting a nuanced perspective on the operational aspects of vaccine campaigns within the community.

The dataset reveals 36 statements consistently pointing out the prevalence of misinformation among affected individuals. This misinformation notably fueled hesitancy towards accepting the cholera vaccine. Rumors included concerns about vaccine side effects, doubts about efficacy, and unfounded conspiracy theories about its origin or composition.

(A Camp Manager stated);

"We are in a war zone, and at times like these, experiments often occur for companies that manufacture vaccines. I do not accept being a testing ground, nor taking the vaccine so that the vaccine will not be tested on me."

Barriers against cholera response

Infrastructure barriers: The evaluation of infrastructure barriers revealed that 93% of statements emphasized significant gaps, hindering access to cholera-related services due to transportation challenges, financial constraints, and issues with health facilities. Most participants highlighted concerns about contaminated water sources and difficulties adopting healthy habits. Some noted community efforts and positive sentiments about sewage systems, but the majority emphasized challenges posed by damaged infrastructure, overcrowded camps, and difficulties accessing clean water.

However, some participants presented a contrasting viewpoint and shed light on community efforts and the initiatives of certain organizations striving to address this issue.

Significant concerns were expressed about shortages of essential resources such as staff, medicine, health facility kits, and infrastructure materials, hindering patients from accessing proper health services. Challenges in waste disposal mechanisms and perceived low capacity were also highlighted.

Socio-cultural barriers: Within the vast expanse of information gathered from the 10 FGDs, only a modest number of 20 statements made explicit mentions of socio-cultural barriers in the context of the cholera outbreak response. This seemingly limited representation may be interpreted in two contrasting ways—one that socio-cultural factors are not heavily influential in the response, or that these barriers are underreported or not fully understood.

Financial barriers: An overwhelming majority, constituting 92% of the comments collected, underscored that transportation and financial constraints stand as the foremost obstacles compelling affected individuals to avoid health facilities. Most Participants highlighted profound financial and transportation barriers amidst the cholera outbreak, with concerns about delayed access to health facilities due to weak transportation infrastructures. These challenges hinder timely access to healthcare and securing clean water and essential medicines, crucial for cholera treatment.

Community needs

The majority of the participants emphasized urgent needs in response to the cholera outbreak. They stressed the necessity for comprehensive improvements in sanitation and sewage systems, alongside joint initiatives in waste management and awareness practices. Addressing logistical barriers to accessing health services, such as transportation and clinic hours, was identified as crucial. Targeting high-risk populations through cholera outreach efforts and collaborating with local community leaders and influencers were also

highlighted. Increasing awareness activities covering all aspects of the cholera outbreak emerged as a priority. Additionally, addressing transportation and financial barriers hindering access to health services, conducting periodic vaccination campaigns, and providing additional supplies like soaps, clean water, and hygiene kits, were underscored as essential interventions.

Discussion

The results of this qualitative study offer vital insights into the perspectives of affected communities in NW Syria and highlight several critical themes that are instrumental in understanding the efficacy and challenges of the current cholera response.

This qualitative study conducted ten FGDs involving 89 participants who were evenly split between health professionals (44) and community leaders (45), providing a balanced view of both technical and community perspectives on the cholera response. The inclusion of both male and female participants ensures that the study reflects the perspectives of different genders. Including both host community members (35) and IDP (54) highlights the different challenges faced by these groups and provides a nuanced understanding of the cholera response.

The study unveiled a notable level of engagement and awareness among the participants, with most demonstrating accurate knowledge about cholera, its sources, spreading, and symptoms, and showed fair levels of cholera knowledge regarding the preventive measures, this finding in line with a study from Lebanon assessing the Knowledge, Attitudes, and Practices (KAP).[16] Yet, our results diverge from those of various KAP studies on cholera, which typically indicate a lack of knowledge in nations such as Bangladesh[17] and Yemen.[18] The study highlighted a notable gap in awareness regarding cholera treatment and management, with only a small fraction of statements addressing treatment, it is evident that there is insufficient engagement from health professionals in educating the community about effective treatment protocols. Studies from Democratic Republic of Congo[19] and South Africa[20] showed high levels of treatment cholera knowledge, likely related to previous reporting of several outbreaks in the countries. Insufficient understanding and awareness, coupled with improper practices related to the disease, can contribute to the transmission of cholera.[21] Participants acknowledged the efforts made in cholera awareness but emphasized the need for more targeted and inclusive activities. Health professionals, especially CHWs and doctors, were the most trusted sources of cholera-related information. This high level of trust underscores the critical role these professionals play in disseminating accurate health information. However, moderate trust levels in other sources, such as social media and community leaders, indicate potential areas for improving communication strategies. The role of media, community influencers and health professionals emerged as a pivotal factor in the success of these initiatives in disseminating accurate and timely messages.[16,23]

The results highlight significant challenges and opportunities for improvement. Specifically, many participants expressed widespread distrust and skepticism toward humanitarian aid and cholera-related services. While they acknowledge the presence of cholera services, there's a consensus among participants that these services are perceived as insufficient, revealing a critical gap between the provided services and community expectations. A significant portion of the participants mentioned to the lack of adherence to good health practices, compounded by deficient hygiene infrastructure, limited access to clean water in camps, and financial difficulties among residents. The source of drinking water has been associated with various infectious diseases, as prior studies have suggested a potential connection between groundwater and enteric infections.[16,23]

A notable portion of participants acknowledged the humanitarian endeavors, encompassing awareness initiatives, vaccination campaigns, the quality and quantity of cholera kits, and the accessibility of health facilities for cholera treatment. However, 32% identified deficiencies in capacity and ongoing challenges in managing cholera. A parallel qualitative study conducted in the Democratic Republic of Congo[24] revealed that healthcare providers appreciated the cholera response but emphasized the necessity for sustained support for fundamental public health measures in the long term.

Seventy-five percent of participants reported receiving the cholera vaccine. Some mentioned encountering unfavorable conditions during vaccination campaigns and a significant lack of awareness about the availability and purpose of the vaccines. Misinformation fueled hesitancy, with concerns about side effects, doubts about efficacy, and conspiracy theories, indicating deep-rooted fears among the community. This aligns with findings from a prior qualitative study conducted in Mozambique, which revealed hesitancy towards oral cholera vaccination.[25] The study suggested fostering community engagement as a vital component of trust-building initiatives aimed at combating the cholera epidemic. This aligns with a similar recommendation from a study conducted in Zambia,[26] which emphasized the importance of providing transparency about the effectiveness of the cholera vaccine and its potential side effects. This approach aims to boost vaccine uptake and counteract any conspiratorial beliefs surrounding the vaccine. Operational challenges, including waste disposal and low campaign capacity, further complicated vaccination efforts. A study conducted in Zanzibar[27] underscored the significance of trust in health systems, efficient implementation of vaccine campaigns, and offering vaccinations free of charge as key factors influencing cholera vaccine acceptance.

The study identified major barriers to an effective cholera response, primarily infrastructure and financial constraints. Significant gaps in transportation, contaminated water, damaged infrastructure. Socio-cultural barriers were mentioned less frequently, possibly indicating underreporting. Resource shortages, including staff, medicine, and infrastructure materials, further hindered access to health services, alongside challenges in waste disposal mechanisms. Comparable constraints were unveiled in a study conducted in the Democratic Republic of Congo,[24] which underscored the impact of financial constraints, insufficient staff training, and inadequacies in referral pathways on the cholera response and treatment-seeking behavior. Another study outlining the challenges of cholera prevention and control in the Eastern Mediterranean region identified similar constraints.[28] Factors such as political instability, conflict, insecurity, mass gatherings, and densely populated environments, especially in areas with inadequate WASH programs within camps accommodating internally displaced persons, elevate the susceptibility to cholera outbreaks and other infectious diseases.[28,29] Another significant hurdle in NW Syria is the lack of a cohesive governing body, which has led to a tendency to refrain from officially declaring cholera outbreaks, opting instead to label them as Acute Watery Diarrhea (AWD). This approach frequently leads to the withholding of laboratory test results and intentional underreporting of cases, resulting in insufficient implementation of control measures.[28]

The World Health Organization has prioritized the implementation of a comprehensive and integrated cholera prevention and control plan, spanning across both the health and WASH sectors, to ensure effective management of cholera outbreaks.[1] Participants stressed the necessity

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for improved sanitation, waste management, and increased awareness efforts. Addressing logistical barriers, targeting high-risk populations, and collaborating with local leaders were identified as crucial. Regular vaccination campaigns and providing essential supplies like soap and clean water were underscored as vital interventions.

Limitations

Similarly, as most research, this study is not exceptional, this study encountered limitations primarily stemming from the challenging context of conflict zones. Limited geographical scope, it is important to note that the findings of this study are specific to the context of NW Syria and may not be directly generalizable to other regions or countries. However, they provide valuable insights into the unique challenges faced by the population in a conflict-affected setting and offer potential strategies for improving response against cholera and other waterborne diseases.

Conclusion

The findings reveal a nuanced understanding of cholera within the community, with strong awareness of the disease but significant gaps in treatment knowledge, emphasizing the need for greater health professional engagement. Despite some trust issues, there is interest in community-led initiatives, highlighting the importance of collaborative efforts.

Distrust, limited awareness, and socio-economic barriers persist, stemming from past negative experiences. Trusted community figures are key to spreading awareness and building trust.

Participants have mixed views on health practices: while some recognize positive habits, many lack awareness due to infrastructure and financial challenges. Barriers to accessing assistance underscore the need for cohesive interventions to address these issues and combat misinformation.

Many participants link spreading the cholera outbreak to the earthquake, though some disagree. Concerns about the adequacy of the post-earthquake response persist, with infrastructure deterioration and camp overcrowding seen as major factors.

Gratitude is expressed for health centers, though gaps in services are noted. Misinformation significantly impacts vaccine hesitancy, highlighting the need for accurate information dissemination. While the majority appreciate cholera kits, concerns about their adequacy indicate the need for better support and proper utilization awareness.

Infrastructure barriers significantly impact the outbreak, with major gaps in sewage systems, waste management, and healthcare access. Financial constraints further impede access to necessary services.

A comprehensive response is urgently needed, focusing on waste management, awareness practices, and sewage system monitoring. Addressing logistical barriers, targeting high-risk populations, and collaborating with local leaders are essential for effective intervention.

Acknowledgments

We extend our sincere appreciation to AFAQ humanitarian Relief Organization for their generous financial support, which made this study possible. We are profoundly grateful to the participants for their cooperation and willingness to participate in this research. Special recognition goes to the research assistants for their invaluable contributions in facilitating the Focus Group Discussions (FGDs) and collecting data. Additionally, we would like to acknowledge the health directorates for granting us permission to conduct this study.

Conflicts of interest

The authors declare there is no conflict of interest.

Informed consent statement

Prior to the commencement of the study, all participants provided their informed consent and voluntarily participated in the Focus Group Discussions (FGDs).

Funding

This study was funded by the AFAQ humanitarian Relief Organization.

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Citation: AlKhatib I, Sultanoğlu E, Salem M, et al. Cholera response in Northwest Syria; community perspective and concerns. *MOJ Public Health.* 2024;13(2):117–123. DOI: 10.15406/mojph.2024.13.00448