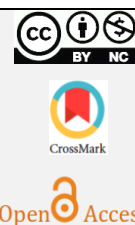




Available online on 15.09.2020 at <http://ujpr.org>
Universal Journal of Pharmaceutical Research
An International Peer Reviewed Journal
 ISSN: 2831-5235 (Print); 2456-8058 (Electronic)
 Open access to Pharmaceutical Research
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Volume 5, Issue 4, 2020



RESEARCH ARTICLE

SURVEY OF SAFETY PRACTICES IN DIARRHEAL TREATMENT CENTERS: CHOLERA TREATMENT CENTERS IN YEMEN

Mahamoud Abdullah Omer Ogaili¹ , Eshrak Abdulmalik Al-gunaid² , Hassan A. Al-Shamahy³ , Bushra Mohammed Jaadan⁴

¹Medical Laboratories, Faculty of Medicine and Health Sciences, Hudaidah University, Yemen.

²The National Center of Public Health Laboratories (NCPHL), Sana'a, Yemen.

³Medical Microbiology and Clinical Immunology Department, Faculty of Medicine and Health Sciences, Sana'a University, Republic of Yemen.

⁴Medicinal Chemistry, Faculty of Pharmacy, Sana'a University, Republic of Yemen.

ABSTRACT

Objectives: Monitoring of Diarrheal treatment centers (DTCs) was conducted so as to assess the quality of care and help draw evidence-based decisions on the current and future support of DTCs and other cholera prevention interventions.

Methods: This monitoring exercise was included 102 DTCs, data were collected by a trained team of 18 doctors, 18 nurses, and 2 supervisors during the month of June, 2019 to cover the center's performance in the prior month i.e. May 2019. Specially designed forms were used for data collection applying mixed methods: direct observation, record review, direct and phone interviews with the staff and patients as well as discussions with the health offices and community leaders whenever feasible.

Results: No more than 23% of DTCs have water for hand washing, showering and washing clothes at all times and in all important locations such as hand washers and toilets; and 76% have one toilet for every 50 patients, but only 57% of toilets are regularly disinfected. Hazardous practices ranged from 32 to 62% leading to cholera infection among 4 out of 10 health workers and 5 visitors of the DTCs. Around 27 % of the DTCs do not have a designated area to bury body excreta from severe cases; only 23% have an isolated area for the deceased. A high of 59% of designated staff are neither trained nor equipped to deal appropriately with dead bodies and only 39% of dead bodies are disinfected with chlorine solution 2%.

Conclusions: The DTC network provides much-needed services over the width of the country. Lives are being saved on a daily basis despite the ongoing conflict and other humanitarian interventions. However, despite the efforts made so far, there are remaining areas for the quality of the improvement, most importantly availing water and strengthening the infection control measures and preventions of hazardous practices.

Keywords: Cholera epidemic, DTCs, Survey, Safety Practices, Yemen.

Article Info: Received 30 June 2020; Revised 15 July; Accepted 28 August, Available online 15 September 2020



Cite this article-

Ogaili MAO, Al-gunaid EA, Al-Shamahy HA, Jaadan BM. Survey of safety practices in diarrheal treatment centers: cholera treatment centers in Yemen. Universal Journal of Pharmaceutical Research 2020; 5(4):6-10.

DOI: <https://doi.org/10.22270/ujpr.v5i4.432>

Address for Correspondence:

Prof. Hassan A. Al-Shamahy, Medical Microbiology and Clinical Immunology Department, Faculty of Medicine and Health Sciences, Sana'a University, Republic of Yemen, Tel: +967-1-239551, E-mail: shmahe@yemen.net.ye

INTRODUCTION

The United Nations considered the situation in Yemen the worst humanitarian crisis in the world. Amidst this, the largest and fastest spread of cholera has erupted since the World Health Organization began recording cholera outbreaks in 1949^{1,2}. As of October 7, 2018, the WHO estimated a cumulative total of 1,236,028 reported cases of cholera to have occurred in Yemen since the beginning of the outbreak in April, 2017. Out of these cases, 2556 were fatal, yielding a 0.21% fatality rate³. Children constitute 58% of the reported cases⁴. After the previous Tsunami wave of the cholera

epidemic in Yemen in 2017, Yemen is facing a massive reoccurrence of cholera in 2019. The new wave is also one of the world's worst outbreaks, with more than 137,000 suspected cases and almost 300 death cases in the first three months of the year. With more than 2,000 suspected cases recorded daily—a doubling since the beginning of the year the country, could be facing a major new health crisis⁵. According to the World Health Organization, more than 108,000 cases have been reported from the beginning of 2019 until the 17th of March, in comparison to 371,000 cases in the whole of 2018. The current figures are edging

closer to those of the 2017 outbreak, when more than 1 million cases were reported⁶.

How could an outbreak of this scale reoccur? This may even happen over a short span of time. WHO and UNICEF are indicating that the reasons behind the rapid spread are high rates of malnutrition, food insecurity, collapsing health system, sanitation, and clean water systems, which in turn are due to the country's ongoing conflict. Over the past 4.5 years, key infrastructure in Yemen has been destroyed, which hampers the possibility of prevention and control of cholera in the country⁷. The health system is struggling to cope, with more than half of all health facilities closed due to damage, destruction, or lack of funds⁸. Furthermore, shortages in medicines and supplies are persistent and widespread. The main seaport to Yemen, Al-Hodeidah, has been bombed by Saudi-Emirati aggression and later on blocked for a period of time. The port is still partially blocked even after the fighting parties signed the Stockholm peace initiative at the end of 2018. This block disrupted the flow of the supplies of aid and other supplies into the country^{9,10}. The aim of the DTCs monitoring was to assess the quality of care and help draw evidence-based decisions on the current and future support of DTCs and other cholera prevention interventions in Yemen.

SUBJECTS AND METHODS

A cross sectional study was conducted among DTCs in Yemen. Monitoring in this phase covered the functioning of 117 DTCs in 105 districts over 20 governorates in Yemen during May 2019. Field visits were made to collect on-site data using various methods. These visits were facilitated by several local officials, advisors and consultants from the Ministry of Health and Population (MOPHP) and WHO.

Sample Size and Sampling Technique: We received a list of (233) DTC - (136) WHO-supported DTC and (97) under the cluster partners' support. As agreed with WHO, we drew a random sample of 50% from each list. This gave a sample of (117) DTCs to be visited each month for 3 consecutive months (The results of this study are for the first month only). We applied a multistage sampling in order to ensure proportional representation of the organization affiliation as well as the geographical location. First, half of the centers supported by each of the WHO and other partners were selected. Then, the centers in each group were selected from the governorate level and after that selection was made at the district level. This process widely distributed 117 DTC 71 WHO-supported DTC and 46 affiliated to other cluster partners among 105 districts and 20 governorates. The selected DTCs was screened as an initial step, 12 centers were excluded as they were closed or functioning as an ORC. Accordingly, the final sample included 102 DTCs.

DTC Monitoring: This component covered Infection Prevention and Control (IPC); availability and quality of water in the DTC, availability of suitable latrines for patients and other DTC members, appropriate management of infected waste; appropriate management of the dead bodies of cholera cases.

Data entry and Analysis: Data were collected by using Android tablets, where all the forms were pre-installed Survey CTO platform. The data were uploaded to our servers using 3G or Wi-Fi internet connections. Then, follows a process of data review, cleaning and verification at the central level. The early handling of data ensured instant quality checks and corrections. An Excel programme was used for analysis. Results are presented as frequencies and proportions in tables.

Table 1: Level of application of Infection Prevention and Control measures in DTCs in Yemen during 2019 cholera epidemic.

| S. N. | IPC | % Yes | % No |
|-------|---|-------|------|
| 1 | Hand washing stations are available at the point of entry and exit with chlorine solution 0.05% or soap and water | 68 | 32 |
| 2 | A staff is posted at the entry and exit to ensure washing of hands and shoes 24 hours a day | 44 | 56 |
| 3 | A maintained foot bath or spraying of shoes are available at the point of entry with chlorine solution 0.2% (maintained = muddy solution is replaced regularly) | 55 | 45 |
| 4 | All areas are maintained properly ordered, clean and tidy | 70 | 30 |
| 5 | Hand washing stations with chlorine solution 0.05% or soap and water are available in each ward | 51 | 49 |
| 6 | Health staff and relatives wash hands after each manipulation of the patient | 38 | 62 |
| 7 | Gloves are worn when IV catheter or NG tube is inserted/removed | 58 | 42 |
| 8 | Is there any worker in the DTC who has been infected with cholera during work? | 41 | 59 |
| 9 | Is there any member of the patient's family has been infected after visiting the DTC? | 52 | 48 |

RESULTS

Hazardous practices are common and Infection Prevention and Control (IPC) measures are neither consistently observed nor adequately applied; 32% of DTCs lack hand-washing stations, 62% of Health staff

and relatives do not wash hands after each patient manipulation (Table 1). Our study shows that out of 10, 4 workers and 5 visitors of the DTCs have been infected with cholera (Table 1). In fact, 15% of DTCs did not have water for hand-washing or cleaning purposes (Table 2). The staff are not adequately

supported to provide quality care; slightly over one-third of the staff received training on cholera diagnosis and management, a few DTCs have the diarrhea treatment plans displayed (49%) or have clear discharge criteria (39%). Only a fifth have water for drinking and preparation of ORS and half of the centers had water at all times and in all critical locations for

cleaning purposes (Table 2). The majority of the centers have 1 latrine per 50 patients in the hospitalization area, one fifth do not have latrines and 57% of the latrines were disinfected regularly with 0.2 % of chlorine solution or 2 % solution poured inside the latrine (Table 3).

Table 2: Water availability in DTCs in Yemen during 2019 cholera epidemic.

| S. N. | Water availability | % Always | % Partially | % Absent |
|-------|---|----------|-------------|----------|
| 1 | Water is available at all times and in all critical locations (for preparation of ORS and drinking). | 23 | 26 | 51 |
| 2 | Water is available at all times and in all critical locations (for hand washing, and cleaning purposes). | 48 | 37 | 15 |
| 3 | Water for consumption has turbidity less than 5NTU and chlorine residual of 0.5 - 1.0 mg/l and is tested regularly. | 15 | 20 | 65 |
| 4 | Free residual chlorine is monitored daily in the storage tank. | 25 | 25 | 50 |
| 5 | The quantity of water available is enough for at least 60 litres/patient/day. | 15 | 21 | 64 |

Table 3: Latrine availability in DTCs in Yemen during 2019 cholera epidemic.

| S. N. | Latrine availability | % Yes | % No |
|-------|---|-------|------|
| 1 | The center has 1 latrine per 50 patients in the hospitalization area (minimum 2 latrines male/female). | 76 | 24 |
| 2 | The centre has at least 2 latrines (male/female) for staff/visitors. | 60 | 40 |
| 3 | Hand-washing stations with chlorine solution 0.05% or soap are provided at all latrines (separate for men and women). | 42 | 58 |
| 4 | The latrines pits are dislodged after filling up. | 68 | 32 |
| 5 | The latrines are disinfected regularly with 0.2 % (floors, doors and slabs) and 2 % solution poured inside the latrine. | 57 | 43 |

As waste management is critical in DTCs; three-quarters of the centres have a designated area to bury the infected excreta and similar proportion dispose of non-infectious waste according to the local standards. However, only 38% of the DTCs use colour-coded waste bins waste- segregation (Table 4).

Dealing with cholera-related death: Slightly over one-fifth of the DTCs reserve an isolated area for the deceased, only 41% of the designated staff are trained and equipped to prepare and disinfect dead bodies, and a mere 39% of the dead bodies are disinfected with chlorine solution 2% (Table 5).

Table 4: Waste Management in DTCs in Yemen during 2019 cholera epidemic.

| S. N. | Waste Management | % Yes | % No |
|-------|--|-------|------|
| 1 | The centre has a designated area to bury the faeces and vomit of the severe cases (or another safe disposal method such as pit latrine). | 73 | 27 |
| 2 | Non-infectious waste is managed according to local standard. | 71 | 29 |
| 3 | Color coded waste bins are used for segregation of waste. | 38 | 62 |
| 4 | Infectious waste syringes, etc is disposed of safely (incineration or pit dumping). | 75 | 25 |

Table 5: Dead bodies management in DTCs in Yemen during 2019 cholera epidemic.

| S. N. | Dead Bodies Management | % Yes | % No |
|-------|---|-------|------|
| 1 | The centre has a designated isolated area for the deceased. | 23 | 77 |
| 2 | Designated staff are trained and equipped to prepare and disinfect dead bodies. | 41 | 59 |
| 3 | Dead bodies are disinfected with chlorine solution 2%. | 39 | 61 |

DISCUSSION

Part of this survey addressed a broad and important set of safety issues at randomly selected DTCs from all of Yemen's regional governorates. The survey examined the main areas of safety concerns in DTCs: the physical environment of the workplace, microbiological safety, the waste disposal system, safe working practice

among workers, and safety practices for cholera-related deaths. There is limited or no study to show a picture of health facility safety issues in Yemen, especially in diarrhea treatment centers during this cholera epidemic. This study is a prototype that provides a basic insight into the key safety concerns of the studied DTC centers and can be used to estimate the safety status of other health facilities in Yemen. DTCs are expected to be

safe and operate according to the highest safety standards to protect their workers, the community, and the patients they serve¹¹. Practicing safe work is also linked to the reliability of diarrhea cholera patients treated. However, DTCs in poor conditions suffer from poor safety practices, and the outcomes of patient care we studied are no exception¹². Although DTCs have been reported differently, based on the observations of investigators, the most common weaknesses in relation to safety standards include: hazardous practices, have no area designated for burying body waste from severe cases; they have no isolated area for the deceased, most of the staff recruited are not trained or equipped to properly handle corpses and most corpses are not

disinfected with a 2% chlorine solution. WHO standards require that all safety practices be appropriate to treat and control the spread of cholera¹². Current study shows that out of 10, 4 health care workers (40%) were infected with cholera (Table 1), the current study rate (40%) is higher than previously reported as infectious diseases have recognized the prevalence of occupational-related diseases in hospital-based HCWs contain tuberculosis, hepatitis C virus, hepatitis B virus, HIV, occupational asthma and contact dermatitis, discovering an association between occupational hazards and disease prevalence but did not reach 40%^{11,13-26}.

Table 6: Application of Appropriate Case Management Practices.

| S. N. | Case Management | % Always | % Partially | % Absent |
|-------|---|----------|-------------|----------|
| 1 | The patient's file is correctly filled in and the admission time is registered. | 44 | 34 | 22 |
| 2 | Does the DTC have clear clinical definition of cholera? | 60 | 21 | 20 |
| 3 | Case management flow chart is available. | 46 | 21 | 33 |
| 4 | Does the DTC display the WHO diarrhea treatment center chart showing plan A, B and C treatments. | 49 | 25 | 46 |
| 5 | Does the DTC keep records of all cholera patients and their clinical outcome? | 47 | 29 | 24 |
| 6 | Does the DTC have supplies for obtaining a stool specimen from a suspected cholera patient in order to confirm the diagnosis? | 59 | 23 | 18 |
| 7 | Is the proper antibiotic available? | 43 | 45 | 12 |
| 8 | Does the DTC have clear discharge criteria? | 39 | 41 | 20 |
| 9 | Have health care providers been trained to clinically diagnose and treat cholera. | 35 | 49 | 16 |
| 10 | Do healthcare providers follow the guidelines and criteria for selecting patients for RDT. | 52 | 27 | 21 |

Whereas the health effects of occupational hazards are recognized, their prevalence in public health care facilities in Yemen is unknown. Lack of risk recognition is a major obstacle to risk reporting and risk management efforts. The diversity of health care professionals, in terms of education and exposure to risk, as well as severe resource constraints, present a challenge to the implementation of the standardized "risk management framework". Exposure to workplace hazards is related to the availability of basic facilities such as ventilation, lighting, comfortable seating arrangement, rest houses, drinking water facilities and other measures mentioned in Table 1 to Table 6^{12,27-29}. Inappropriate working conditions can also affect employee motivation and productivity within the organization^{12, 30-32}. During the interviews, some workers at the centers and workers responsible for cleaning at the facility expressed concern about cleaning the facility when there was insufficient water. Accordingly, they reported avoiding or reducing the frequency with which these functions were performed. Doctors sometimes avoid touching patients for examination because they cannot access running water or soap to wash hands in an operating clinic, and examining patients without washing hands will not only harm HCW but also to other patients. Even though half of the workers reported that they suffer from the excess workload and difficult work schedules

in a difficult work environment and do not receive a regular salary, the vast majority of workers was satisfied with the work and reported a good personal relationship with co-workers and centers management.

CONCLUSION

The DTC network provides much-needed services nationwide. Lives are being saved on a daily basis despite constant conflict and other humanitarian interventions. On the other hand, despite the efforts made so far, there are still areas for improvement, most importantly providing water and strengthening infection control measures and preventing dangerous practices. The safety of DTCs in Yemen is below the standard. DTC staff and patient monitors and relatives are at high risk of microbial risk. Immediate recognition of the problem and immediate action is mandatory to ensure a safe working environment in DTCs in Yemen.

RECOMMENDATIONS

Education and communication with relatives and society to avoid hazardous practices in centers such as chewing Qat and eating at the centers. There is a need to investigate the role of DTCs in cholera transmission

as suggested by the high incidence of infection among workers and visitors.

ACKNOWLEDGEMENTS

The authors would like to acknowledge WHO, Grant Thornton and Ministry of Health and Population, Sana'a, Yemen for allow us to publish part of DTCs monitoring results.

AUTHOR'S CONTRIBUTION

This research work is part of the round 1 monitoring of DTCs that done under the supervision of the Ministry of Health and Population, Sana'a, Yemen, and WHO, Sana'a office. All authors were members of this work.

CONFLICT OF INTEREST

No conflict of interest associated with this work.

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