PriMera Scientific
Medicine and Public Health
Volume 2 Issue 1 January 2023
ISSN: 2833-5627

Factors Influencing Cholera Death in the Democratic Republic of Congo: Development and Analysis of a New Conceptual Model

Type: Review Article
Received: December 09, 2022
Published: December 29, 2022

Citation:
Okitandjate Dimandja Antoine., et al. "Factors Influencing Cholera Death in the Democratic Republic of Congo: Development and Analysis of a New Conceptual Model". PriMera Scientific Medicine and Public Health 2.1 (2023): 45-54.

Okitandjate Dimandja Antoine[1,2]*, Coppieters Yves[3], Aruna A Aaron [4] and Chenge M Faustin[2,5]

[1]*Ministry of Public Health, School of Public Health, University of Lubumbashi, DRC*

[2]*University of Lubumbashi, School of Public Health and Faculty of Medicine, DRC*

[3]*Research Centre "Epidemiology, Biostatistics and Clinical Research", School of Public Health, Université libre de Bruxelles (ULB), Route de Lennik, 808, CP 506, B-1070 Brussels, Belgium*

[4]*Ministry of Public Health, Directorate for Disease Control (DLM), DRC*

[5]*Health Knowledge Center in the Democratic Republic of Congo, DRC*

***Corresponding Author:** Okitandjate Dimandja Antoine, University of Lubumbashi, School of Public Health and Ministry of Public Health, DRC.

Abstract

Background. In the Democratic Republic of Congo (DRC), the epidemiological profile is dominated by infectious diseases including cholera. It evolves in endemic and epidemic form depending on the province. Despite multisectoral and multidisciplinary interventions organized on the ground, the number of deaths is still high, as some contributing factors remain unknown while interventions must be directed towards these factors.

Objective. Develop and analyze the conceptual model of the factors that underlie cholera deaths in the community and in Cholera Treatment Centres (CTCs).

Methodology. Mixed approch was used. A retrospective cross-sectional study, 2000 to 2013, of the descriptive and exploratory type was used. It used the database of the Directorate of Disease Control (DLM) consisting of 500,670 cases and 11,560 deaths. Finally, the qualitative, prospective method was carried out from September 16 to December 16, 2016, multicentric and covering five cities: *Kinshasa*, *Lubumbashi*, *Kisangani*, *Mbandaka* and *Kalemie*. Focus group techniques with 50 community leaders, an in-depth semi-structured interview with 50 patients, 15 health experts and 25 cholera patients. And a structured face-to-face interview with 15 health workers assigned to the CTC was arranged. The percentage (%) of respondents' responses were calculated. Content analysis and triangulation of information were performed. Some qualitative survey data were collected by telephone mode, for obvious reasons.

Results. Four main groups of factors: (i) Service organization (training of providers, availability of inputs, principles of separation of treatment rooms, non-existence of working hours, mismanagement of inputs, lack of follow-up and systematic evaluation of patients, poor clinical evaluation of patients), (ii) Individual factors (physiological state, pathological state and immunological state), (iii) Cholera profile (endemic area, epidemic and the virulence of Vibrio cholerae). (iv) Socio-community and anthropological factors (perception and representation of cholera on the one hand, and treatment on the other) were found. These factors can influence each other with complex interrelationships without linearity.

Conclusion. The four main groups of factors are: the service organization of the Cholera Treatment Center, individual factors, the endemic or epidemic profile of cholera, and socio-community and anthropological factors. Taking these factors into account in health policies and intervention strategies would effectively contribute to reducing deaths from cholera, some of which are very vulnerable to being targeted before and during field interventions during outbreaks. or cholera epidemics. The interactions between these factors are very complex and multiple not explained in a linear way. This consideration is systematically taken during field analyzes depending on the context of the epidemic.

Based on the results obtained, this study also proposed a new classification of the fatality rate due to cholera which adapts to the rural or urban context, and this for more relevance and specificity, without however clinging to the standard of a rate of less than 1%, considered more generalist and does not reflect the real situation in terms of importance linked to this disease.

An ongoing analytical study will investigate the virulence gene characteristics and antibiotic susceptibility profiles of Vibrion cholerae O1 and 0139 in clinical and environmental isolates in Lubumbashi, DRC.

Keywords: Deaths; cholera; conceptual model; DRC

Introduction

Cholera remains a major public health problem and a marker of social inequalities in health, poor social development and poverty; it disproportionately affects vulnerable poor populations worldwide [1, 2]. A fatal and contagious infectious disease, it manifests as profuse diarrhea caused by a Gram-negative bacillus, Vibrio cholerae O1 and O139, which is transmitted through ingestion of water or food contaminated with feces [2].

The World Health Organization (WHO) estimates each year, nearly 1.3 to 4.0 million cases of cholera, causing between 21,000 and 143,000 deaths in the 47 countries affected by this disease, more than 50% of which are in Africa [3]. In 2017, the Democratic Republic of Congo (DRC) alone reported more than double the annual average of cases (20,000 cases) of the previous five years and 230 Health Zones (ZS) out of 516 were affected, in 24 of the country's 26 provinces. Indeed, in 2017, the DRC reported 54,588 cases and 1,145 deaths, a case fatality rate of 2.1% [4, 5].

In Lubumbashi, capital of Haut-Katanga province, the setting of our study, 5112 cholera cases and 146 deaths were notified to the Cholera Treatment Center (CTC), representing an overall case fatality rate of 2.9% from January 2017 to December 2020 [5].

For several decades, interventions to improve prevention and medical management of cholera patients have faced mixed success due in part to misperceptions [5, 6]. Although a decrease in cases and deaths has been observed, efforts to eliminate cholera in DRC remain [6]. Our hypothesis is that there are interactions between the different factors underlying cholera deaths in DRC.

To our knowledge, no studies addressing the conceptual model of cholera deaths have been conducted in DRC. The situation of cholera as a public health problem can be explained not only by its incidence, but also and above all by its still very high mortality and lethality. The burden of disease and mortality attributable to this disease exceeds all expectations. Indeed, according to the World Health Organization (WHO), in 2013, 22 African countries reported 56,329 cases and 1367 deaths, a case fatality of 2.4% [2; 3].

In the DRC, there are an estimated 208,875 cases and 7,335 deaths with a case fatality rate of 3.5% [4-6]. This represents nearly 90% of data worldwide. In the same country in 1994, in one month, a cholera epidemic, on a larger scale with 35,000 cases and 25,000 deaths, a case fatality rate of 69%, was recorded in the Rwandan refugee camps in Goma [3]. In addition, for a period from 2000 to 2013, i.e. nearly 14 years, about 5,000,670 cholera cases and 11,560 deaths were reported in the DRC, a case fatality of 2.3% [9] with strong disparities depending on the province. In Katanga Province, the case fatality rate due to cholera of 8.5% was observed, and that of 11.1% in the city of Lubumbashi in 2002 [10].

The objective of this study is to develop and analyze the conceptual model of the s-factors, which are at the root of cholera deaths in the DRC. Taking these factors into account when managing epidemics, and upstream will ipso facto lead to the reduction of fatality and mortality through targeted interventions carried out in the field.

Methodology

Mixed approach methodological have been developed: (i) A quantitative descriptive approach transversal toanal data on cases and deaths and (ii) A qualitative approach to dig into and isolate the death factors in a systemic and analytical vision.

The cross-sectional study covered the period from 2000 to 2013 through a database consisting of 500,670 cases and 11,560 deaths.

The qualitative method consisted of [11] techniques: Focus groups with 50 former patients, 10 per site, semi-structured interviews with 25 sick guards, 5 per site and with 15 experts and health authoritieswho managed thecholera epidemics over this period. Finally, structured face-to-face interviews with 15 health workers involved in the cholera response were conducted. The percentages (%) of responses were calculated against data collected from patients interviewed or surveyed.

This research took place in two main stages: A first stage concerned the development of knowledge and bundles of arguments, from a phenomenological and societal point of view, on the factors likely to influence positively or negatively on death due to cholera; the second stage concerned the work of elaboration and Analysis of the new conceptual framework in the light of the results obtained on the basis of the first stage.

Setting and location of the study

This research was organized as part of the doctoral study in public health, in the DRC.

The DRC is one of the largest countries in Africa and consists of 25 provinces plus the city of Kinshasa, the capital. At the national level, the organization of the health system is based on 3 levels: central, intermediate and peripheral. Our study concerned the actors and executives of three levels of the health pyramid. Policy makers, partner experts and other health workers as well as the community were interviewed throughout this study.

This study was multicenter in the provinces: Kinshasa, Lubumbashi, Kisangani, Mbandaka and Kalemie.

In the DRC, cholera evolves in an endemo-epidemic mode, and particularly in Lubumbashi, recent studies have demonstrated the roles of the determinants of morbidity and mortality due to cholera [5], but also of the low level of knowledge, attitudes and practices of providers and community leaders on cholera in Lubumbashi [12].

Data collection

The data were collected on the one hand in the health zones (ZS), the health areas (AS) and in the database of the Directorate of Disease Control (DLM), and on the other hand during surveys organized among former patients, sick guards, experts and care providers at the CTC on the basis of a questionnaire and interview grids. Individual interviews were held in the homes of former patients. For interviews with experts and health authorities, they were conducted in their workplaces and sometimes on the phone while guaranteeing the confidentiality of the information.

The investigators were briefed on the purpose of the study and the data collection procedure to reduce information bias; Focus groups were organized in health trainings, the DLM office and the Provincial Health Divisions (DPS).

Study variables

The variables of this study were chosen on the basis of the field experience of different actors as well as the literature review and grouped into specific entities.

Sociodemographic variables: Age, sex, occupation, religion, level of education, province, distance to CTC, economic level, marital status, previous health status.

Organization of the service: Availability of inputs, availability of CTC activity planning, availability of patient monitoring protocols, stock-outs of inputs, input management method; time between management at the CTC and the arrival of the patient, number of staff assigned to the CTC during the epidemic, training of the actors involved, revision of the management protocol, supervision of teams of providers, systematic clinical evaluation upon arrival of the patient and during care, the organization of reception at the CTC, medical history, awareness of patients and guards to the CTC and the discharge of the patient.

Community and anthropological variables: Perception and representation of the disease, perception and attitude towards oral rehydration treatment (ORS) and infusion, education, information and communication at CTC or UTC, community conception of the disease, reasons for motivation for consultation at the CTC, average duration of the disease before the consultation, route of care followed, types and modes of treatment usedbefore the consultation.

Data collection tools

This study used the interview guide for decision-makers, providers and patients admitted to the CTC as well as the survey questionnaire administered to the community in the post-epidemic period, seven to fourteen days, and to cholera patients at the discharge of CTCs. The WHO case definition of cholera, translated into the local language of the region and adapted by the Ministry of Public Health, was used.

Data analysis

The data analysis was carried out in two stages, namely quantitative analysis via Excel 2007 and QGIS 2.8.2 software, and qualitative content analysis to identify the meaning and meaning of the data, after triangulation and saturation.

Based on our field experience, the new classification of the case fatality rate proposedby our study: *Acceptable (at least 1%), high (1 to 2.9%), very high (3 to 4.9%) and huge (5% and more)*. was used to differentiate and imply casefatality rates across urban and rural areas, and especially to compare field efforts in public health interventions. And this instead of reducing everything to the threshold of 1% according to the WHO, regardless of the Health zone or the Health area, which may seem reductive, in our opinion.

Study Limitation

This study deals exclusively with the theme of death factors due to cholera in the DRC, in its aspects: health, clinical, societal, community and organizational; and not the biological aspects related to the virulence of Vibrio cholera, for example.

Result

In this section, the results are structured into: (i) case fatality rates by province, (ii) presentation of the conceptual model developed, (iii) service organization (CTC), (iv) socio-community and anthropological factors, (v) health factors, and (vi) analysis of interactions between groups of factors.

Cholera case fatality rate from 2000 to 2013.

The figure. 1 Below shows the case fatality rate due to cholera in the DRC from 2000 to 2013.

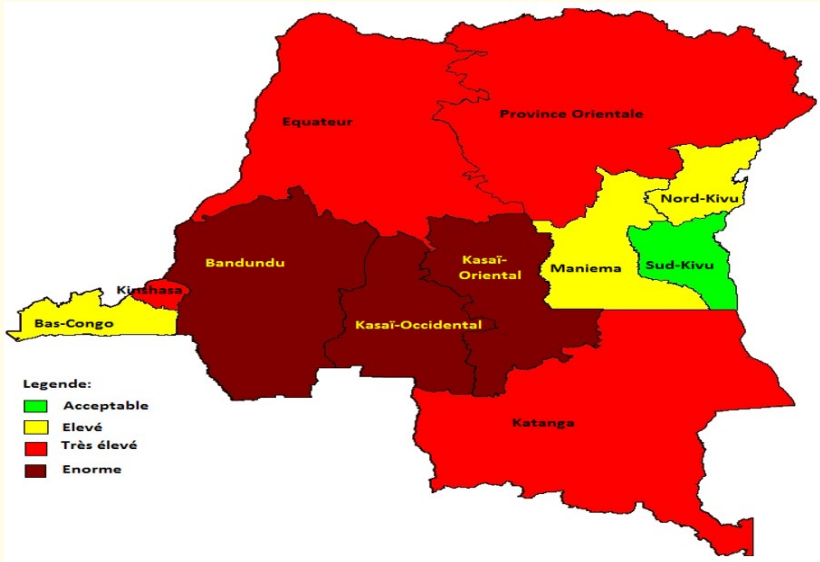


Figure 1: Distribution of the case fatality rate* due to cholera in the DRC, from 2000-2013.

****Acceptable (at least 1%), high (1 to 2.9%), very high (3 to 4.9%) and huge (5% and above).***

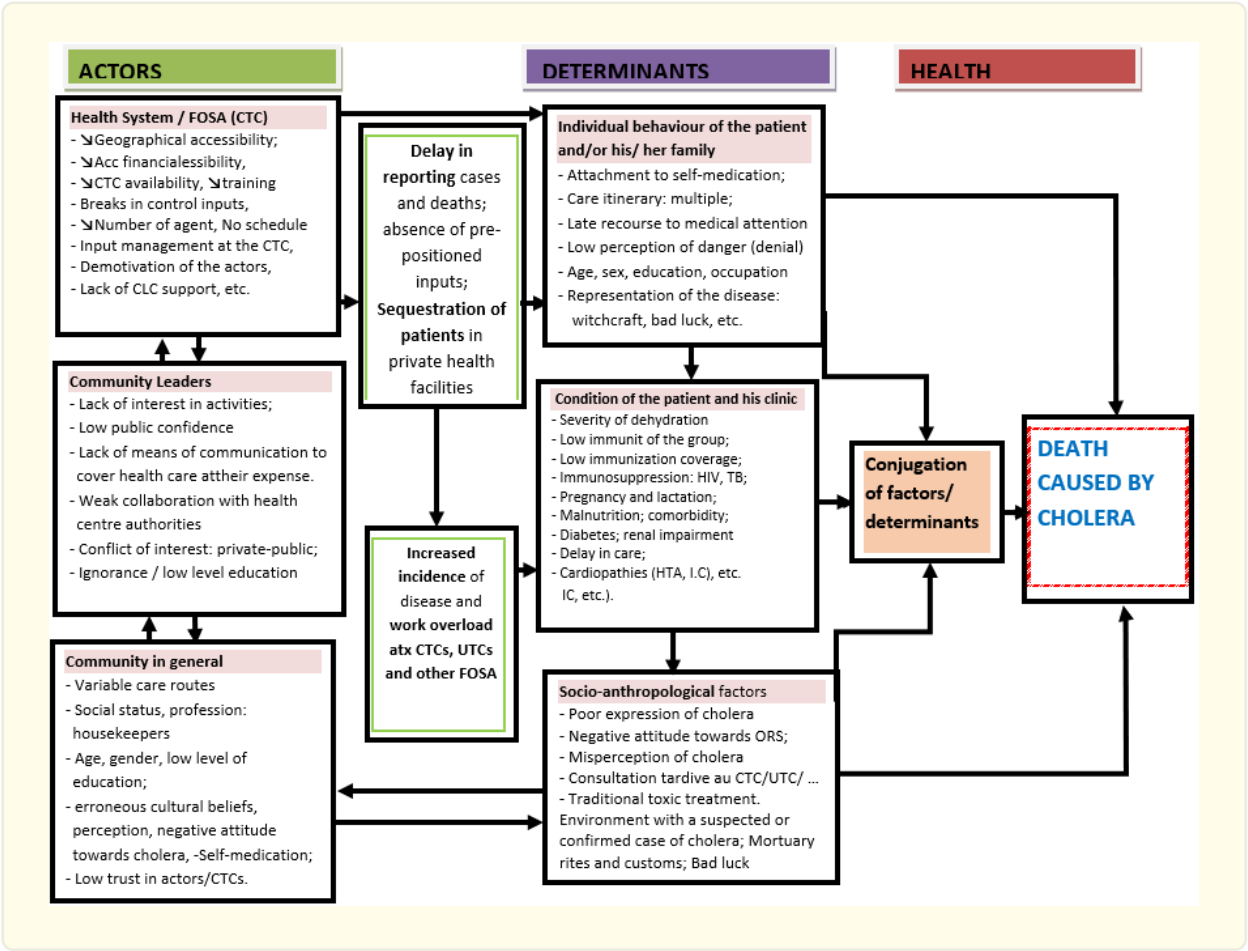
The provinces of Equateur, Kinshasa and Province Orientale recorded a case fatality rate of nearly 4% each; while that of Kasai-Oriental was 5.2%, 50% (2 deaths among the 4 reported cases) for Kasai-Occidental and 6.2% for Bandundu. Only the province of South Kivu (0.7%) has an estimated case fatality rate of less than 1%.

Conceptual model

The synthesis of qualitative results is presented in the conceptual model (Fig.2), based on an adaptation and contextualization of the Green and Kreuter model [13].

In the DRC, as elsewhere, the epidemiological situation of cholera has its roots beyond a single health sector. The understanding of the factors affecting morbidity and mortality is increasingly clarified by recent studies carried out in recent decades [5]. On the other hand, several grey areas persist on the real determinants of mortality and lethality in the context of developing countries, including the DRC.

This conceptual framework was built on the basis of data collected during the surveys, grouped into determinants and then analyzed with regard to their links with death. The analyses focused on understanding the relationships between groups of the determinants identified by our study. The study thus reveals the combinatorial role of the various potential actors, including the community. Some interactions were obtained between the actors and the determinants on the one hand and between the determinants on the other hand (Figure 2).



Death from cholera may be due to a single factor or to a combination of several (Fig.2). It is the result of different factors such as (i) individual or community behaviour, (ii) clinical and state patient, (iii) socio-anthropological, (iv) health service organisational. The latter are implicitly based on the behaviour of actors, managers, community leaders and the residential population (Fig.2).

Cholera Treatment Center Service Organization

As factors, surveys have shown that CTCs are generally built late or late in AIs affected by the epidemic, and often none exist at all. Patients must then be cared for in existing health facilities or in hangars built and fenced, posing a serious problem in the patient circuit, usually in rural areas. This constitutes a factor of amplification of the disease in the health training because the observance of the prevention and control measures of the epidemic will be deficient in these conditions mentioned above.

Socio-community and anthropological factors

This study recognized the importance of socioeconomic and anthropological factors in the occurrence of cholera deaths. A lack of interest, the role of the circulation of false information (Infodemic), the poor perception of ORS treatment was objectified to nearly 69%, by the patients interviewed because, according to them, because of the mediocre taste and does not cure cholera. Nearly 76% of the patients surveyed prefer parenteral treatment (perfusion and injection) than ORS.

Interactions between groups of factors

- *Individual, organizational service and socio-community factors*: This study highlighted the role of patient sequestration in private health facilities, until the patient is deprived of all his financial resources to be referred to the CTC or HGR. In addition, the increased workload in the CTC was found to involve in part poor follow-up of patients, as well as poor management of observational cases. This was explained by the difficulty of CLC support partners in budgeting for new staff, including volunteers assigned to the CTC, to cover the need for human resources, which are sometimes acute during outbreaks.
- *Health and anthropological factors*: relational interactions were obtained between these two factor groups. Indeed, the "perception of the disease by the patient and or community, which still remains in more than three quarters: disease of an individual and not of the community, and therefore non-transmissible and less serious". Then, the best treatment for cholera remains infusion and injections; because according to 49% of former patients "ORS is not effective in adults, at least in children". Thus, an adult with cholera and put on ORS, frequently escapes from the CTC and will go to a private health facility to benefit from the injections. Cholera, according to three of Kalemie's seven patients: "Kipundu-pindu is hardly cured in modern medicine, only in prayers, among the mfumu (customary chiefs) and in traditional medicine." "ORS is less effective against cholera compared to Regideso tap water and tastes bad." These designs prevent patients and their families from seeing health facilities at the first sign at an early stage, which can delay treatment, especially in rural areas.
- *Factor Individual and anthropologicals*: the lack of medication in the CTC, the poor quality of care, the dispensing of prescriptions by CTC providers, reinforce misconceptions about the disease and its management by the community. Including modern or traditional self-medication, cases of papaya roots, avocado trees that according to some patients interviewed in Kinshasa, and Kisangani, say they have "*experienced the effectiveness of these roots natural products with curative effects against cholera*».

Discussions

The objective of our study was achieved. It consisted of developing and analysing the new conceptual model of factors underlying cholera deaths in the DRC.

The discussion concerns successively the results relating to: (i) lethality data, (ii) conceptual model of the factors that influence deaths due to, (iii) CTC service organization, (iv)socio-community and anthropological factors.

Case fatality rate data

Ten of the eleven former provinces recorded a case fatality rate above 1%, once considered the norm, with the exception of South Kivu which reported a case fatality rate of 0.74% (Fig. 1). This would be explained by the intense organization of the response with the permanent support of partners in this province. Also, as an endemic area known for more than ten years, the control mechanisms are also known and the population is sufficiently aware in terms of prevention and early warning.

A classification into five scales was proposed by our study: ≤1% (acceptable); 1.1 to 2.9% (high); 3 to 4.9% (very high) and ≥ 5% (huge), Fig.1. The provinces of Kasai-Oriental, Kasai-Occidental and Bandundu have presented rates of more than 5%, possibly by the fact that they are the non-endemic areas in cholera, and therefore, they have very little experience in the management of this disease; and low knowledge, attitudes and practices on cholera as demonstrated by the recent ones conducted by Okitandjate et al in 2022 in Lubumbashi, DRC that these factors influence illness and death [12].

Conceptual modeling: innovation, strengths and previous studies

Of these factors, only those related to population behaviour and the clinical component are very poorly developed in previous studies, as found by Gbary Akpa et al in a study conducted on the Benin coast in 2008 [14].

For 37% of patients and sick guards interviewed, the population has an erroneous perception and representation of cholera. This observation is close to that found in the city of Kalemie in 2011, in which 40% of the population has a false representation of the dis-

ease and its severity [15]. This difference would be due to the methodological approach, since our study was multicenter, whereas that of Kalemie, in a single city.

Our study explored the different types of problems, some of which can only be vulnerable through the actions of decision-makers, health authorities, including: mismanagement of inputs, delay in care, weak relationship between patients and practitioners and the genuine involvement of community and community leaders.

Cholera Treatment Centre (CTC) Service Organization

Generally, late installation and poor organization of the CTC are observed. This would explain the high lethality at the beginning of epidemics [1; 16]. This study further revealed that the breakdown in control inputs in the CTC would be caused, in part, by the mismanagement orchestrated by the nursing staff, this was estimated at nearly 11%. The reception of patients was judged to be of low quality at 24% in urban areas compared with 37% in rural areas. The demonstration of this aspect was largely explained by Aubry et al on the outcome of the 395 patients hospitalized at the CTC of South Dahomey [17]. Our study highlighted the importance of the medical care route followed by patients, the community, including traditional healers, churches, fetishists, houses of prayer and self-medication before going to the CLC. This has been previously elucidated by some authors, including Chenge et al in a study conducted in the Health District of the city of Lubumbashi [18]. This could indirectly cause a delay in patient consultation at the CTC and lead to a high case fatality rate, through an increase in patient deaths. Added to this are the as yet unproven but probable effects of traditional substances or products ingested or used in the form of enema by patients. These products can be at the root of the deplorable complications related to intoxication, including renal, hematological and digestive complications induced by these substances.

This observation can in some ways influence death during outbreaks in these affected areas.

In addition, it was noted above all the economic barrier, because most of the costs are paid when treating patients in existing structures, both private and state, in the event of a lack of support for management by the state or an NGO and especially before the declaration of the epidemic. This situation is often observed at the beginning of the epidemic, in the absence of any intervention or subsidy, such as the formal establishment of a CTC, where free care is required by the State.

Apart from the eyes of the supervisors of the ZS teams or those of the partners, the organization of the care structure poses a serious problem of Leadership, including the management of cholera inputs. The negligence of providers assigned to the CTC/UTC, the untimely breakdown of control inputs whose causes are mismanagement, poor planning, and demotivation of health care providers are identified as factors related to the health service and can influence the death of patients. Unscrupulous follow-up of care protocols and summary assessment of patients admitted to the CTC were cited as major factors. This neglect can be explained by the low remuneration of actors who are involved in the fight against cholera.

In addition, the delay in accessing health facilities, the delay in the effective start of care, are potential factors of death due to cholera cited by 49% of patients surveyed and their families. Nearly 62% of deaths occurred at night and away from the eye of the clinician, who was sank into fatigue or overwhelmed by the workload at the CTC.

In 14% of cases, our study showed the delay in the management of patients already admitted to the CTC, with a median time between arrival at the CTC and the start of care estimated at 36 minutes (23-54). Overwork and lack of qualified personnel were highlighted at 17% and 22% respectively. Delays in effective case management have been responsible for nearly 8% of deaths at the CTC by other scientific studies [19].

Nearly 71% of CTC patient deaths were recorded at night, between 11:00 p.m. and 3:50 a.m. This raises questions about the organization of the CTC and the problem of a schedule of activities adapted to the volume of work that must be reviewed gradually and daily during epidemic periods, to increase the critical mass of providers during these hours of care. Also, this raises the need to employ competent supervisors, qualified and well-trained personnel in cholera management.

To strengthen their skills, periodic recycling must be carried out on an ongoing basis before, during and after cholera outbreaks. In epidemic profile ZS, given that each epidemic is unique and has its own context [5; 12], the updating of the management protocol, technical guides, standard operating procedures (SOPs) must be adapted to the "new" epidemiological situation, in order to achieve a positive impact on reducing the case fatality rate and deaths due to cholera in the DRC.

Socio-community and anthropological determinants

Socio-cultural factors in the local community may also be associated with CTC patient deaths. This has been demonstrated in DRC, CAR, Chad and Angola as important determinants of lethality and death of cholera [21-24]. On the other hand, according to the WHO [7; 25] and the recent study carried out in 2022 in Lubumbashi, DRC [5; 12], ORS alone can treat nearly 80% of cholera patients and without severity.

Geographic accessibility, the distance the patient has to travel to reach the CTC, has in some studies influenced cholera lethality [17; 24]. And in nearly 34% patients traveled in rural ZS more than 10km to fetch water [16-17]. Hence, the role played by this factor in increasing lethality, by constraints related to rivers, lakes, impassable roads, etc.

Regarding perception of oral rehydration solution (ORS) treatment, the results differ from those found by MDM-F [15], in a community perceptions survey conducted in Kalemie, Katanga, in 2011. Where the patient's misperception of ORS is 52%. Our study is more general and covered not only patients admitted to the CTC, but also the community, and lasted until the immediate post-epidemic period, 7 days of unloading patients from the CTC. The rational and intelligible use of ORS treats more than 90% of cholera cases [21; 24; 26].

Our study showed that few promotional actions have been organized with regard to ORS. The population no longer pays attention to awareness messages that have become routine, and without evaluation for its improvement.

Conclusion

Significant progress has been made in cholera control strategies in the DRC that can reduce its incidence. In addition, few studies and implementation strategies that target the drivers of cholera deaths have been conducted to date.

Our study contributes to the understanding of the factors that influence and interact with holera death. These factors constitute the straight line on which efforts must be made to effectively and significantly reduce the still high death and case fatality rate in the DRC.

The conceptual model developed has the advantage of taking into accountnearly 96% of the factors of death due to cholera in health facilities and in the community, thus insinuating the various individual, community, socio-anthropological, health, clinical, and organizational risk factors; with the exception of those related to Vibrio cholerae, including virulence, antibiotic resistance, etc. as an explanatory factor, partly of death due to cholera. These elements must be taken into account in the organization of the planning of activities, in the management of patients during cholera epidemics by rapid intervention teams, with particular attention to patients fulfilling one or more of these risk factors.

An ongoing our analytical study will investigate virulence gene characteristics and antibiotic susceptibility profiles of Vibrio cholerae O1 and 0139 in clinical and environmental isolates in Lubumbashi, DRC.

References

1. Ali M., et al. "Updated global burden of Cholera in endemic countries". PLoS Negl Trop Dis 9.6 (2015).
2. Nelson EJ., et al. "Cholera transmission: the host, pathogen and bacteriophage dynamic". Nat Rev Microbiol 7 .10 (2009): 693-702. World Health Organization. Cholera outbreaks: assessment of outbreak response and improved preparedness. Geneva, 2020.
3. Bompangue D., et al. "Lakes as source of cholera outbreaks, DRC". Emerg Infect Dis 14 (2008): 798-800.
4. Ingelbeen B., et al. "Recurrent Cholera Outbreaks, Democratic Republic of the Congo, 2008-2017". Emerging Infectious Diseases

25.5 (2019): 856-864.

5. Okitandjate AD., et al. "Determination of morbidity and mortality due to cholera in Lubumbashi, Democratic Republic of Congo: unmatched case-control study". ESJ 18.21 (2022): 65-92.
6. Piarroux R. "Cholera: Epidemiology and Transmission. Experience from several Humanitarian interventions in Afrique, Indian Ocean and Central America". Bull Soc Path Exotic 95 (2002): 345-350.
7. WHO: World Health Organization. Weekly epidemiological record 3.85 (2010): 117-128.
8. CDC: Centers for Disease Control and Prevention. Outbreak cholera RDC. MMWR 59.48 (2010): 1586-1590.
9. Direction de lutte lutte maladie (DLM) DRC/Africhol. Project to combat Cholera in DRC. Cholera Database 2000-2013.
10. Piola P. "Cholera epidemic in Katanga province, 2002". DR Congo, MSF-Belgique, Epicentre 168.
11. Humblet P. "Introduction to the qualitative approach. In public health". Notes from course. School of Public Health University of Brussels. Year 2009-2010.
12. Okitandjate Dimandja Antoine., et al. "Knowledge, Attitudes and Practices of Health Care Providers and Community Leaders on Cholera in Lubumbashi, Democratic Republic of Congo". Health Sci. Dis 23.12 (2022).
13. Green LW and Kreuter MW. "CDC's Planned Approach to Community Health as an application of PRECEDE and an inspiration for Proceed". Journal of Health Education 23 (1992): 140-147.
14. Gbary Akpa Raphael., et al. "The determinants of low lethality of the cholera epidemic dans le Littoral au Bénin en 2008". Santé Publique 23 (2011): 345-358.
15. Doctors of the World-France (MDM-F). Cholera disease perception survey DRC, Tanganyika Health District, Kalemie (2011).
16. Okitandjate Dimandja A. Study of cholera epidemics in the district of Tanganyika, DRC, 2006-2008. Master's thesis in Public Health/ Epidemiology and Bio statistics, Academic Year, 2011-12, Université Libre de Bruxelles, Belgium.
17. Aubry P., et al. "An experience of African cholera. Has 395 cases observed in two treatment centres in southern Dahomey". Bull. Soc. Path. Exot 65 (1972): 351-356.
18. Chenge M., et al. "The health map of Lubumbashi, Democratic Republic of Congo. Part II: analysis of operational activities of health care facilities". Glob Health Promot 17.3 (2010): 75-83.
19. Http://www.unicef.org/wcaro/03-02_WHO_Presentation Africa.pdf
20. Http://www.unicef.org/wcaro/03-02_WHO_Presentation Africa.pdf
21. Lavalée, Les déterminants du cholera. Development and Health 152 (2001): 1-8.
22. Ministry of Health/DRC. Guide to the management of cholera outbreaks in the health zone (2006).
23. WHO, Epidemiological Profile of Communicable Diseases in the Central African Republic and Chad (2009): 15-21.
24. Gunnlaugsson G., et al. "Epidemic cholerain Guinea-Bissau: the challenge of pretending deaths in rural West Africa". Int J. Infect Dis 4 (2000): 8-13.
25. WHO, Weekly Epidemiological Record (2007): 273-284.
26. Serajuddin A., et al. "The 2008 Cholera Epidemic in Zimbabwe: Experience of the icddr, b. Team in the Field". Health Popul Nutr 29.5 (2011): 541-546.