

# Level of Community Preparedness for Ebola Virus Epidemics in the Democratic Republic of the Congo: A Multiple Case Study

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**Abstract:** The Ebola virus disease (EVD) epidemics analysis from the Democratic Republic of the Congo (DRC) and West Africa showed an increased frequency in the intervals between outbreaks and the unpreparedness of the local health system including the community in the response thereto. This study describes the level of DRC community preparedness for EVD and other epidemics in order to judge its potential involvement in epidemiological surveillance at the Health Zone (HZ) level. A secondary analysis was conducted on the data collected during the evaluation of the DRC epidemiological surveillance system, carried out from December 2015 to May 2016 in 32 HZs of the 16 provinces at risk of EVD. Data were collected using semi-structured interview with leaders of the Health Area Development Committees (HADC), village chiefs as well as by focus group with the women of the community. Those respondents were sampled through a purposive sampling strategy. Community preparedness was explored in terms of community organization, knowledge of epidemiological surveillance, and knowledge of EVD. Data were transcribed verbatim in French and analysed using thematic analysis. Some results were tabulated and summarized as proportion. A total of 72 communities were studied. The study showed that the community participates in epidemiological surveillance through the HADCs. The HADC members and community health workers (CHWs) conduct case searches in the community and case referrals to the health centres. The majority of CHWs and community members were unknowledgeable of epidemiological surveillance and very few had received training for epidemic prone diseases. Few knew how to actually describe the steps of a case search. The study also noted that the level of knowledge of the population on EVD in the communities visited was not optimal with a lot of erroneous data and a perception that could be harmful for epidemiological surveillance and outbreak response. The study showed that the population as a whole claimed to participate in epidemiological surveillance only through sensitization and the passing on of information. These study results show that the community at the local level in the DRC is not optimally prepared for EVD and other epidemics. These results suggest a strengthening of community preparedness in the DRC more extensively for diseases with epidemic potential through sensitization and social mobilization, in particular by strengthening the capacity of the teams of health centres, health committees and CHWs in terms of training, technical guides and simple prevention materials.

**Keywords:** Ebola, Congo, Community Health Workers, Health Committee, Preparedness

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## 1. Introduction

The Democratic Republic of the Congo has witnessed several disasters in past decades, including several communicable disease epidemics. These disasters have resulted in several deaths, morbidity and economic losses. To date, the Democratic Republic of the Congo (DRC) is the only country in the world to have known and managed more than eight outbreaks of Ebola virus disease (EVD) [1–4]. Experience has shown that most EVD outbreaks occur in Health Zones (HZs) located in large forested areas, close to national parks and in the HZs that regularly report cases of haemorrhagic diseases [4].

It was also noticed that the interval of occurrence of EVD outbreaks is becoming shorter and shorter. The epidemics occurred in 1976, 1977, 1995, 2007, 2008, 2012, 2014, 2017 and 2018. This shows that over the last decade, the DRC has managed four out of seven epidemics with an interval of about three years. This situation indicates a need to improve preparedness in at-risk areas, particularly in terms of epidemiological surveillance and community preparedness. It has been shown that the organization of the health system, particularly that of the surveillance system and the preparedness of the community for epidemics, can prevent, detect and respond to the major threats such as epidemics at an early stage [5]. The latter, like other disasters, are serious attacks on the functioning of community or society as a result of the substantial human, material, economic and environmental losses that they entail, losses that exceed the capacity of affected communities to cope with them using their own resources.

Disaster preparedness and response includes activities to protect community, property and the environment. Recent outbreaks of haemorrhagic virus diseases in West and Central Africa have shown the importance of the community in responding to epidemics [3, 6, 7]. In the DRC, despite having suffered from several epidemics, studies have shown the lack of clear planning and strategies involving communities in the preparation and response to epidemics [8, 9]. Community members, the starting point for managing epidemics in several health systems, trace information back to health centre level, thus triggering the epidemiological surveillance system in several countries [10]. The DRC has opted for the Integrated Disease Surveillance Strategy and response proposed by WHO since 1998. This surveillance is passive and the data go back according to the structure of the country's health pyramid [5]. Since 2015, some 17 diseases, conditions and events have been included in the DRC surveillance system strategy as weekly reportable weekly health problems with mandatory declaration; and among these is the EVD. This strategy involves communities and health facilities at all levels of the health system [5].

However, the capacity of the community in terms of epidemic preparedness in several provinces of the DRC, conditioning their participation in the management of epidemics including EVD epidemics, remains unknown. This

study describes the level of preparedness of DRC communities to EVD and other epidemic prone diseases in order to judge its involvement in epidemiological surveillance at the HZ level. This study can form a basis for future progress on interventions in this area.

## 2. Materials and Methods

This study is a secondary analysis of data collected during the evaluation of the epidemiological surveillance system of the DRC, carried out from December 2015 to May 2016 in the 32 Health Zones (HZs) of the provinces at risk of EVD. It was a multiple case study nested in an analytical cross-sectional study. In its community section, the study focused on the chairs of health area development committees (HADCs), village chiefs where health centres are located, and women community members in the household. Participants in this study were selected using multi-stage sampling. In the first stage, some 16 of the 26 provinces in the DRC have been purposively selected on the basis of the following eligibility criteria: (i) to be a province located in the ecologically friendly zone favourable to filovirus circulation as described Peterson in his article “*biogeography of disease: a framework for analysis*” [11]; (ii) to have a rating greater than two according to the ad hoc criterion established for this purpose by the DRC Ministry of Health General Directorate for Disease Control; and (iii) to have been confirmed by the circulation of other rare haemorrhagic viruses in the DRC, such as the Mangala virus, Congo-Crimea virus or Ebola virus.

Within each selected eligible province, two HZs were selected following a simple random sampling without return based on the list of HZs, arranged in alphabetical order and numbered. In each selected HZ, two health areas (HAs) with health centres (HCs) that have the highest attendance according to the literature review of the previous 12 months were selected. If the selected HZ was urban-rural, two urban HAs and two rural HAs with HCs with the largest associates were selected. In the rural HZs, two HAs with HCs that have the highest attendance numbers of associates and that are accessible are selected. In each HA, eligible persons (members of the health area development committee, village leaders and women) were purposively selected according to specific characteristics.

The data were collected using several techniques and collection tools, including individual semi-interviews with the managers of the health area development committee (HADC) and village chiefs as well as focus group discussion with a focus group guide in the community for women. The choice of women was justified by their primary role in detecting health problems at the household level.

Data were collected in relation to the variables related to the different essential and supporting functions of an epidemiological surveillance system as described in the integrated disease surveillance and response (IDSR) technical guide. The level of preparedness of the DRC communities for



### 3.1. Interviews with Health Area Development Committee Members

#### 3.1.1. Organization of the Community

The study showed that all the 72 communities included in this study had a health area development committee, which is the interface structure between the health facility and the population, and almost all the respondents surveyed were presidents of the HADCs (97.2%). They asserted that they became HADC members mainly through election by the community (84.7%) (Table 1). According to respondents, the HADC carries out community activities including epidemiological surveillance activities with the collaboration of the health centre. Almost half of HADCs participated in

data analysis meetings of their respective HC (51.4%) and almost two-thirds in the preparation of their HC activity reports. Respondents said that HADCs reported in the majority to head nurse during meeting or separately (76.4%). In most cases, this reporting was done either verbally (45.8%) or in writing (38.9%). Moreover, in two-thirds of cases, respondents asserted that HADCs received feedback from head nurse or were supervised by him (63.9%). The majority of HADCs rated collaboration with health providers in epidemiological surveillance activities as good (84.7%) and reported that they mostly worked with village or street chiefs in epidemiological surveillance (81.9%).

Table 1. Epidemiological surveillance characteristics of visited health area development committees.

Variables	Frequency	%
Existence of a health area development committee	72	100.0
Respondent is president of the HADC	70	97.2
Accessing mode to HADC membership		
Election by the community	61	84.7
Choice of the head nurse	4	5.5
Co-optation by the territory administrator	5	6.9
Choice of the village chief	2	2.7
Proportion of respondents HADC members for at least 3 years	42	58.3
Participation in data analysis meeting at the health centre	37	51.4
Participation in health centre activity report writing	44	61.1
Reporting epidemiological surveillance findings to head nurse	55	76.4
Reporting procedures for epidemiological surveillance		
Written report	28	38.9
Verbal report	33	45.8
Receiving feedback from head nurse or his supervision	46	63.9
Appreciation of health provider collaboration in relation to surveillance as good	61	84.7
Appreciation of collaboration with the street/village leaders in epidemiological surveillance as good	59	81.9
Active participation in epidemiological surveillance activities	65	90.3
Activities carried out as part of the epidemiological surveillance		
Home visits	70	97.2
Awareness / mobilization / communication campaigns	72	100.0
Orientation and / or accompaniment of cases	61	84.7
Active case search	56	77.7
Attendance at meetings	62	86.2
Distribution of commodities (bed net, drugs, vaccines...)	41	56.9

#### 3.1.2. Knowledge of and Participation in Epidemiological Surveillance

The effective participation of community members in epidemiological surveillance requires an optimal knowledge of the elements of the surveillance system. Analysis of this level of knowledge has shown that the majority of HADC members do not have a clear knowledge of epidemiological surveillance, even though some have stated that they participate in epidemiological surveillance activities. The analysis of the interview contents gives three main trends. More than half of the respondents declared they did not know the significance of epidemiological surveillance and about a quarter of respondents said that epidemiological surveillance was about raising awareness and warning the community about the occurrence of epidemics. These respondents described it as the work conducted by CHWs to prevent illness. Only about a quarter of respondents (14/55) defined

epidemiological surveillance as the active search for sick people in the community during home visits and their orientation or accompaniment to the HC.

*It is the monitoring of the health of the population in the neighbourhood to find out where the problem lies and direct them to the health centre" (Vice-President, HZ 6).*

*It is to see in the population, the members who present the signs of a disease and report them to the health centre" (President, HZ36).*

However, it is important to note that only one of the respondents in this group emphasized that it was about epidemic diseases.

After the research team explained the concept of epidemiological surveillance and these components at the community level, respondents were asked to report on their community's participation in epidemiological surveillance and the activities in which they participated (Table 1). Almost all respondents (90.3%) reported that their

community through CHWs and HADCs had already been actively involved in epidemiological surveillance activities. Most of the community level epidemiological surveillance activities already carried out were sensitization (100.0%), home visits (97.2%), case orientation (84.7%), and active case search (77.7%). These activities also included attendance at HC meetings (86.2%) and distribution of health commodities to households in the community for nearly half of the communities (56.9%). Analysis of the content of the interviews showed that only 22 respondents stated that their HADC had community case definitions (30.5%).

Respondents who reported not having participated in epidemiological surveillance had mentioned several reasons, including lack of knowledge of epidemiological surveillance, lack of training, or lack of knowledge about the activities to be carried out during this surveillance. A final group of respondents reported that their environmental circumstances and an absence of specific problems would have meant that the head nurse did not give them permission to carry out epidemiological surveillance (2/8).

*Depending on the circumstances of the community, the head nurse has not yet had any problems for letting us realize that [epidemiological surveillance]"(President, HZ1).*

The exploration of home visits carried out generally did not provide a clear pattern in the respondents' responses. No respondent clearly described the sequence of tasks to be carried out according to the purpose of the home visit. For the majority of respondents, this was a door-to-door visit carried out by the CHWs in community at the level of households in their area. Others spoke of case finding at the household level. Still others said they moved from household to household to see how people were doing or how their health was.

It also appears that the responses, without particular constancy, included information on planning and reporting in relation to these home visits. Some respondents stated that these visits were planned with the head nurse during HADC meetings, reporting done in the notebooks reserved for this purpose in a small proportion and discussed with the HC team at monthly meetings.

Regarding case orientation, for the majority of respondents interviewed, the case orientation is carried out either by advising or convincing the sick person and / or his entourage to go to the health centre or by accompanying him to the health centre. For others, the case orientation was to send the patient with or without an information note to the health centre. In two communities, case orientation was based on the community case definition. One respondent reported that in her community case referral the patient was handed a voucher when being referred to the health centre and having the voucher withdrawn again at the health centre level to ensure the effectiveness of the referral.

### **3.1.3. Realization of the Active Case Search**

About two-thirds of respondents reported that active case finding was carried out in their community. For the majority of these respondents, active case finding was done during

home visits at the household level. It was during these visits that the CHWs spoke with the heads of households about certain diseases, providing the specific signs according to the Community case definition. Other respondents stated that they actively searched for cases based on information provided by street or village leaders about the existence of a sick person in a household. Other respondents reported accompanying the sick to churches or village healers. Another group of respondents reported having done active case finding through community-based rumour information about the existence of patients in the household. In this case, they would make a household visit to inquire about the case and if the case was based on true information, they advised a consultation at the health centre.

*"The information about the sick person is first obtained by the head of street or by the head of the village, then the community health worker came to investigate on the case before referring to the health centre...we visit every household under our responsibility in the evening and talk with parents about the signs of the particular disease and collect information about sick person."(President HZ17).*

### **3.1.4. Preparation of HADCs for Surveillance Activities**

For the majority of respondents, HADCs held monthly meetings during which several topics related to the health sector were discussed (88.8%). They asserted that they also benefitted from training provided by health centre head nurse. However, only two-thirds of them acknowledged that as HADC members they had received training in the last 12 months preceding data collection (66.6%). The topics most addressed during training were the distribution of insecticide treated mosquito nets and the counting of the population during the campaigns against malaria. Other topics mentioned included immunization topics such as polio immunization and acute flaccid paralysis (AFP) case finding. Some respondents said they had received information on certain health problems and diseases such as measles, tuberculosis, malnutrition or EVD. Analysis of the interview content showed that very few respondents mentioned epidemiological surveillance as topic of training they received. For those who mentioned it, it was about AFP surveillance or diseases in general.

### **3.1.5. Knowledge of the Most Common Health Problems**

During the interviews, respondents were asked to list five common diseases in their community. The content analysis noted that the most commonly reported diseases, based on perceived signs, were malaria (60/72), diarrheal diseases (43/72), measles (34/72), acute respiratory infections (27/72), tuberculosis (14/72) and Monkey pox (11/72). EVD had not emerged as one of the most common diseases in these communities. It was mentioned by only one respondent in his series.

### **3.1.6. Information, Knowledge About EVD and Source to Have Information on Ebola**

The content analysis of the interviews showed that only 22 of the 72 respondents reported that their HADC had a

community based definition document of diseases with epidemic potential (30.5%). This document was for the most part a calendar received from the health centre. The majority of respondents (69/72) said that they had heard about EVD and eight of them reported in their interviews that they had experienced a phenomenon in their community in the last 12 months that caused them to think about EVD. The phenomena mentioned were the presence of patients in their community with gingival haemorrhages or bleeding in the nostrils. Some respondents spoke of people with asthenia, vomiting of blood, with cutaneous lesions such as petechial. One respondent said that some members of his community had caught fish in rivers with bodily injuries such as small cuts.

Most respondents said that they had heard about EVD through radio (23/69), or experienced EVD outbreaks in their community (11/69). Some respondents who mentioned radio as information source pointed out that the information about EVD was provided by the politico-administrative authorities. Others spoke about the awareness created by the head nurse at local church meetings (5/69) or at meetings with head nurse at the health centre as CHWs (5/69) or at training courses in the health centre (3/69). Some communities reported learning about EVD through television (2/69), through service providers (2/69), or travellers (2/69), newspapers, flyers at level of health centres (1/69).

### 3.1.7. Knowledge of EVD Symptoms and About Its Mode of Transmission

Symptoms of the EVD have been explored. Of the 62 respondents who provided answers about EVD symptoms, the majority of respondents provided a combination of two to six symptoms (40/62). Most respondents mentioned two (20/62) or three (13/62) signs. Fifteen respondents mentioned one sign and eight respondents did not mention any signs, saying they did not know about EVD. The most commonly mentioned symptom alone was diarrhoea or haemorrhage without any other precision. Other mentioned signs were: combined bleeding (30/62), diarrhoea (26/62), fever (25/62), vomiting (10/62), headache (5/62), bleeding from openings including epistaxis (9/62), weakness (5/62); and cutaneous lesions including petechial (4/62).

The majority of 62 respondents mentioned at least two modes of transmission of EVD. The most popular modes were being in contact with or eating a wild animal found dead or sick (42/62) and being in contact with a sick or dead person with EVD (30/62). As another mode of contamination, only one respondent cited intercourse, and another spoke of contact with bodily fluids. It should be noted that two respondents mentioned the consumption of wild meat and another respondent the consumption of fruits eaten by bats. One respondent cited the handling of objects and property belonging to a sick or dead person. Moreover, it should be noted that respondents from 10 communities reported that they did not know the mode of transmission of EVD.

### 3.1.8. Knowledge of EVD Prevention Methods

The content analysis showed that the most cited preventive

measures by the respondents were to avoid contact with a corpse or sick patient infected with EVD (21/62), not to pick-up, touch or eat meat from a wild animal found dead or sick (17/62); wash hands with soap and observe personal hygiene rules (14/62) and avoid touching or eating meat from wild animals (10/62).

The other measures cited were to avoid hand greeting (3/62), to isolate the sick person (3/62). Two respondents said they did not have information on what to do in case of EVD. It should be noted that only 17 out of 62 respondents cited at least two preventive measures.

### 3.1.9. Perception of EVD by the Population

Content analysis showed that there was no clear trend in the perception of the population in relation to EVD. It should be noted that 15 respondents reported that in their communities, the majority of the population did not have a clear perception of EVD for not having experienced an EVD outbreak. For ten respondents, the population in their community was afraid of the disease without clearly providing the reasons. For nine respondents, EVD was a very dangerous, deadly and severe disease. Eight respondents thought that the trend in their community with regard to EVD was that of a disease like any other natural disease originating from animals. A number of respondents reported that some members of their communities perceived the disease as a diabolical, satanic, witchcraft or curse-like manifestation, signing for some the end of the world.

Four respondents reported that in their communities, many people thought of EVD as a complication created by doctors to make money or by Whites (Western Europeans or North-Americans) responsible for projects to mobilize funds, or to exterminate Africans.

*“According to information in the community, the population thinks it is a disease from chimpanzees, sent by foreigners from the United States to kill Africans” (President, HZ7).*

### 3.1.10. Proposal to Improve Community Participation Activities Related to Epidemiological Surveillance

Respondents' proposals turned in most cases around the training of CHWs in epidemiological and other surveillance activities, the strengthening of the capacity of HADCs, the provision of materials and necessary equipment to achieve activities including bicycles for travel, posters, picture boxes, megaphones, raincoats, boots and macarons. Only one respondent talked about making community case definitions available.

*“I propose to train CHWs on the disease epidemiological surveillance and on EVD and to make the community case definitions more available” (President, HZ19).*

Some respondents pointed out that although community service is voluntary, they requested that they be granted certain benefits or incentives such as a salary or an incentive bonus, the right to free or low-cost care at the health centre or the possibility of receiving free medicines at the health centre.

*“It's a volunteer service, I'm asking for motivation, the*

*right to have free of charge care, even drugs. It also requires bicycle for travel during case research activities and awareness raising." (President, HZ6).*

### **3.2. Interviews with the Street / Village Chiefs**

The study in the community also addressed the relationship between health services and local authorities. In total, some 51 village chiefs were met during the study. In general, the majority of local authorities reported being associated with surveillance activities (84.3%), particularly in terms of seeking information on cases of illness in the community or support for orientation of patient to the health centre. They rated the community based epidemiological surveillance activities (82.4%) and their collaboration with CHWs (84.3%) as good. This collaboration was achieved in particular by the contribution of village officials in the information or sensitization of village members on certain diseases or the announcement of the visit of CHWs for certain mass activities. The majority of local authorities rated the collaboration with the health centre team as good (92.2%).

### **3.3. Interviews with Women**

At the community level, the population was called upon to participate in epidemiological surveillance. This section focuses on information collected at the population level about community organization and participation by taking women in the community as a representative group.

#### **3.3.1. Most Common Health Issues in the Community**

Women participating in 72 focus group discussions organized free-listed in total 34 health problems in the perspective of the community. These can be categorized into three broad groups: sickness problems, health service problems and community related problems. The most commonly reported sickness problems were malaria (37/72), diarrheal diseases (24/72), anaemia (16/72), typhoid fever (10/72) and respiratory infections (cough) (8/72). However, some diseases under epidemiological surveillance have also been cited as measles (5/47), whooping cough (Pertussis), monkey pox and PFA [also known as *Bukabuka* in local language]. The health service problems listed were related to the difficulty of providing care, the difficulty of ensuring blood transfusion and the lack of medicines at the health centre level.

Community related health problems mentioned included lack of safe drinking water especially during periods of flooding, and the presence of unhealthy eating habits that may be at the root of malnutrition. It should also be noted that none of the participants in these group discussions mentioned EVD as a health issue for their community.

#### **3.3.2. Common Means of Information on Health Problems**

The women in the community listed seven common ways through which community received information about health problems. Decreasingly, they mentioned health care providers who provide health education and communication

during health activities at the health centre (32/72), and CHWs during awareness activities, home visits and health education sessions held at the health centre during preventive activities (20/72). They also cited information circulating in the community during the occurrence of cases as rumours (18/72), friends and relatives (8/72), and the church (4/72).

#### **3.3.3. Participation of Women in the Resolution of Health Problems**

Women participating in focus group discussions reported being partly involved in the resolution of health issues. On the basis of the opinions gathered, the women thought they were involved in resolving community health problems and asserted that they had been associated with head nurse during their stay at the health centre, or at the meetings of the HADC. However, it does not show in the content how they were really associated outside of being part of the HADC or being CHWs themselves.

At the community level, around one out of three women said they were not involved in the actions organized for the resolution of health problems (20/72). Those who claimed to participate asserted that their involvement was to raise awareness around them and pass on the information obtained from health providers to others (18/72) or by participating in activities organized at the community level by health providers or the HADC (12/72).

Some participants thought they could participate in health problem solving activities by having their children vaccinated normally (6/72), by correctly applying the advice obtained from health care providers and CHWs (6/72), by guiding cases found in the community and persuading those concerned to go to the health centre (4/72), and practicing hygiene and sanitation (8/72).

They raised a matter that sometimes community members despite being advised to attend health services, did not use them. They asserted that the main reason for non-use of health services was the lack of money to pay as out-of-pocket fees for health care in the event of a problem. Some participants thought that the fees charged by health centres were too high. Other women advanced reasons relating to ancestral beliefs, which favour the consultation of traditional healers and practitioners. Others advanced the presence of churches in the village. Some participants pointed to the poor quality of services related to lack of drugs, the poor reception attitude of providers and the behaviour of providers selling drugs outside the health services.

#### **3.3.4. Expectations of the Population for Adherence to Surveillance**

The analysis shows that community expectations for adherence to epidemiological surveillance consist mainly of awareness and appropriate health education. Women believe that these information activities should focus on diseases. Other expectations relate to the realization in the community of certain activities that can improve the living conditions of the population such as the development of water sources, the construction of latrines, the supply of products to the population for the purification of water such Aquatab®.

Other participants were more general in requiring the supply of medicines from health centres, the allocation of health care providers, the construction of health centres, and the provision of free health care.

## 4. Discussion

The epidemiological surveillance and response system in the DRC, as in many resource-limited countries, is based on an active community component that enables community participation in the detection, reporting, response and monitoring of health events within the community. This assumption requires a certain level of preparation of grassroots communities for epidemics, in particular for the EVD epidemic. This article aimed to describe this level of preparedness for the basic communities of the DRC specifically in provinces at risk of EVD.

The study showed that communities at the health area level are organized and have HADC for the health sector. The HADC is one of the governance structures in the health system at the local level, which response teams must consider when preparing to enter a community during an epidemic such as EVD [9, 12]. The HADC offers not only human resources that can be used but also a network of actors connecting with several authorities and local leaders. This HADC is formed of, among others, CHWs, who participate in epidemiological surveillance at the community level, particularly through active case search during home visits and orientation at the health centre [7, 12]. They are in a unique position to help control people's lack of trust in the health system and the dissemination of false information and rumours within the community [7, 13]. CHWs and HADC members are also members of the community that makes it important to invest in to gain entry to the community and improve community mobilization and engagement [4, 14]. In some African countries including the DRC, CHWs form a broad and more effective communication network to inform the community and public about health, especially in areas where mass communications such as community radio are lacking [14].

However, this study has shown that very few CHWs and HADC members in the DRC have benefited from training that takes into account potential epidemic diseases including EVD, and very few of them know how to actually describe the steps of a case search, a critical activity in epidemic response [4]. In addition, it also appears that only one-third of health areas have community case definitions available to HADC members and CHWs. However, the fragmented knowledge of these CHWs is a foundation upon which the response teams coming from upper level of health system can rely to build community knowledge specifically regarding risk communication [14]. Several authors in health promotion also advise as a plan for sustainability of epidemic response the ongoing training of CHWs on epidemics and support to their activities, for instance by providing materials and equipment [9]. Others believe that the training of CHWs is one of the strategies for improving global health security, preventing future epidemics and strengthening the health

system from the bottom [7], specifically in resource limited countries. These proposals are related to the activities performed by CHWs at the community level [7] and to their unique position within the community [15]. CHWs in DRC have similar roles to community animators in other settings [16].

The study also noted that the level of knowledge of the population on EVD in the visited communities was not optimal. Community members seems to have many erroneous information and potentially deleterious perception of epidemiological surveillance and response activities. This situation was also noted at the community level in West African countries such as Liberia during the EVD outbreak [17] and even among CHWs [7]. This insufficiency of knowledge has in previous epidemics such as cholera in Europe in the 18th century and during the EVD outbreak in West Africa made the bed of community resistance [18]. However, the elements of prevention especially in terms of washing hands, avoiding contact with people who are sick or dead from the disease as well as avoiding the consumption of dead animals and food soiled by bats have been reported although sparsely. This situation also shows that there is a deficit in the communication of the population on the EVD at the country level but also that it is not excluded that the communities confronted with the EVD epidemic continue to manifest deleterious attitudes for the response [17] such as those observed in West Africa and the DRC during the 2018-2019 EVD epidemics. Another element was that it was rare for participants in this study to mention EVD among most common diseases or health problems in their community. Most of them did not refer to the context of epidemics or to the possibility of having community members report exposure to risk factors such as having participated in burial or having cared for a sick family member [19]. This situation shows also the health sector authorities did not take the opportunity of recurrent EVD outbreaks to improve sufficiently awareness of community on EVD and associated problems. It seems that only some community members confronted with an EVD outbreak learnt from it but other communities living in similar context did not.

Finally, the study showed that the population as a whole claims to participate in epidemiological surveillance only through sensitization and passing on of information obtained from health care providers and CHWs and by putting into practice recommendations and proposed actions. However with its knowledge deficits, community engagement in this conditions and context is not optimal.

## 5. Conclusion

The results of this study show that the community at the local level in the DRC is not optimally prepared for EVD and other epidemics. This situation is related to insufficiency of knowledge on EVD and epidemiological surveillance issues even though community governance structures such as HADCs and actors such CHWs exist and operate. Results shows also that the health sector authorities did not take the



opportunity of recurrent EVD outbreaks to improve awareness of community on EVD and associated problems. The results suggest that a substantial effort needs to be made by health authorities to inform and sensitize grassroots communities about EVD in order to strengthen community preparedness for epidemic prone diseases. These efforts should include the identification of all practices in communities that may be conducive to the spread of the disease, such as funeral practices and patient care behaviours. It is outside crises that these practices must be identified, discussed and be subject to a change in social behaviour communication in order to reduce community resistance and misconception.

One way to achieve this is by strengthening the entire health centre team and the HADC at the health area level. Methods that exclude other members of the health centre team and privilege only the nursing staff should be avoided. It is also about providing the health centre with case definitions, technical guides and procedural manuals that can help health providers to train and support CHWs and HADC members. The use of video and other new technology of information has to be explored. At the community level, the study results suggest reinforcing the training of HADC members and CHWs, notably in community case definitions, active case finding and simple prevention techniques. Community members in general could also be reached by information and communication using community radio, and other mass media. As the health centre is the starting point for information, it is desirable to set-up a real-time system for transmitting epidemiological surveillance information. This system can begin at the level of health areas taking opportunity of telephone coverage, to extend gradually to other health areas.

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