
Mortality of Ebola Survivors in the Administrative Regions of Conakry, Kankan, Faranah and Kindia, 2016 to 2020

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Abstract: *Introduction:* Ebola virus disease (EVD) is a highly contagious and fatal viral haemorrhagic disease. The average lethality rate is around 50%, this rate can reach 90%. In Guinea Survivors of the 2016-2020 Ebola virus disease (EVD) could face major medical, social and death issues after the acute phase of the disease. Our study aimed to determine the outcome of Ebola virus disease survivors in the administrative regions of Kindia, Kankan, Conakry and Faranah from 2016 to 2020. *Methodology:* It was a cross-sectional, descriptive and analytical study that focused on all survivors followed from the database of the National Agency for Health Security (ANSS). We collected data from all survivors on pre-established forms and used the "SPSS 2.1" software for logistic regression and univariate and multivariate analyses. *Results:* A total of 26 individuals died with a male predominance of 14 deaths, i.e. a sex ratio of 1.16. The most represented age group was that of 40 to 49 years with 8 people or 30.76% of cases. There is a statistically significant difference between prefectures ($p=0.008$) and age group (0.0009) in the occurrence of deaths among those cured of Ebola. Idiopathic causes, cerebrovascular accidents and arterial hypertension and road accidents are the main known causes of death among Ebola survivors, respectively 9 (35%) cases, 7 (23.52%) cases and 6 (27%) cases and 4 (15.3%) cases. *Conclusion:* Mortality is high among Ebola virus disease survivors. The most numerous causes would be idiopathic causes followed by cerebrovascular accidents, high blood pressure and road accidents. Regular monitoring and treatment of EVD survivors in case of illness or accident should be considered by EVD teams in Guinea.

Keywords: Ebola, Survivors, Deaths, Guinea

1. Introduction

Appeared in 1976, in a village on the RANGE of the Ebola River, in northern Zaire and southern Sudan [1]. Ebola virus disease (EVD), a fatal viral haemorrhagic disease, is caused by infection with the Ebola virus of the Filoviridae family. The disease has become a global public health threat due to a large immigrant population. Initially, patients present with non-specific flu-like symptoms and eventually progress to shock and multi-organ failure. There is no specific treatment protocol for EVD and only supportive and symptomatic therapy is the line of treatment. [2].

The average lethality rate is around 50%, this rate can reach 90%. The virus is transmitted to humans from wild animals (zoonosis) and then spreads in populations by human-to-human transmission. [3].

WHO notes that there remains a risk of re-emergence of EVD. The Ebola virus is enzootic in the Democratic Republic of the Congo and can persist in some body fluids of survivors for several months, which in rare cases can lead to secondary transmission. [4].

Since 1976, the Democratic Republic of Congo has reported 12 outbreaks of the virus, including the current one in North Kivu province. In 1994, Ebola was first reported in West Africa, initially in Côte d'Ivoire. [5].

The largest known Ebola outbreak in history began in 2013, eventually spanning over 30 months and killing more than 11,000 people in Guinea, Sierra Leone, Liberia and other countries. [6].

The new outbreak of the Ebola virus disease particularly worried the international political community, because of its rapid spread, its extremely deadly nature and its long duration. Indeed, officially occurring in Guinea in March 2014 - although its first signs there date back to December 2013, the infection has "exported" to the surrounding states, particularly affecting Sierra Leone and Liberia. Nigeria, Mali, the United States, Senegal, Spain, the United Kingdom and Italy were also affected to a lesser degree. [7].

On August 8, 2014 Ebola outbreak was declared the in West Africa a "public health emergency of international concern". [8].

In one year, this new epidemic has caused nearly six times more loss of human life than those recorded during the twenty or so epidemics that occurred previously. [7].

Although high morbidity and mortality have been recorded in the various Ebola treatment centers, more than 10,000 patients have been declared cured. [9].

To manage residual risks of reintroduction or re-emergence of Ebola, WHO supported the establishment of strengthened surveillance systems in Guinea, Liberia and Sierra Leone to alert authorities to cases of febrile illness or death that could be linked to EVD. [10].

As part of the longer-term plan currently being developed, enhanced surveillance, a long-term care program for Ebola survivors and other response mechanisms remain in place after the outbreak ends. These activities will help maintain heightened

vigilance and help build a resilient health system. [11].

EVD survivors need comprehensive medical support to address the medical and psychosocial conditions they suffer from as well as to minimize the risk of continued Ebola virus transmission, including sexual transmission. [12].

Reports from previous outbreaks in Uganda and DRC show that survivors experience short- and long-term physical and neuropsychological sequelae after discharge from Ebola treatment centres. [13].

In Sierra Leone, almost all survivors of the Ebola virus outbreak face limitations in performing basic daily physical activities and limited mobility. These two limitations constitute a post-Ebola handicap. [9].

In Guinea the Ebola virus caused an epidemic of unprecedented size and severity, with 3,814 cases reported, of which 3,358 were confirmed (88.0%) and 2,544 (66.7%) died. [14].

Guinea alone has 1,270 discharged healed; 6220 orphans and 500 widows and widowers. [15].

Survivors of the 2016-2020 Ebola virus disease (EVD) could face major medical and social challenges after the acute phase of illness. [16, 17].

It would be obvious as far as possible to be interested in the survival of patients declared cured of Ebola virus disease in Guinea.

So, what was the outcome of Ebola virus disease survivors in the administrative regions of Kindia, Kankan, Conakry and Faranah from 2016 to 2020?

2. Objectives

2.1. General Objective

To assess the outcome of Ebola virus disease survivors in the administrative regions of Kindia, Kankan, Conakry and Faranah from 2016 to 2020.

2.2. Specific Objectives

- 1) Determine the mortality frequency of Ebola virus disease survivors in the administrative regions of Kindia, Kankan, Conakry and Faranah from 2016 to 2020;
- 2) Identify the causes of mortality of Ebola virus disease survivors in the administrative regions of Kindia, Kankan, Conakry and Faranah from 2016 to 2020;
- 3) Determine the factors associated with the mortality of EBOLA survivors.

3. Methodology

3.1. Study Framework

The administrative regions of Kindia, Kankan, Conakry and Faranah served as a framework for this study.

3.2. Type and Duration of the Study

This was a cross-sectional study of the descriptive type

with an analytical aim, focusing on survivors of the Ebola virus disease.

3.3. Target Population

These are all 535 Ebola virus disease survivors from the administrative regions of Kindia, Kankan, Conakry and Faranah recorded in the ANSS database.

3.4. Study Population

These are 535 survivors of the Ebola virus disease found in the various sites of the administrative regions of Kindia, Kankan, Conakry and Faranah diagnosed and treated in the epidemiological treatment centers during the Ebola epidemic of 2014-2016.

3.5. Inclusion Criteria

The study Included all 535 Ebola virus disease survivors from the regions of Kindia, Kankan, Conakry and Faranah recorded in the ANSS database.

3.6. Exclusion Criteria

The study excluded, the 171 survivors of the Ebola virus disease in the administrative regions of Kindia, Kankan, Conakry and Faranah registered in the ANSS database that we did not find in the field.

3.7. Sampling

This was an exhaustive sampling of all Ebola survivors residing in the administrative regions of Kindia, Kankan, Conakry and Faranah recorded in the ANSS database.

3.8. Study Variables

The variables were sociodemographic, epidemiological and clinical.

Data collection procedure and medium:

Data collection was conducted in all the prefectures of the

administrative region of Kindia, Faranah, Kankan, Conakry and Kankan where at least one Ebola virus disease survivor lives.

3.9. Data Collection and Analysis

Data were collected using a pre-test electronic standardized questionnaire in advance/ The questionnaire was administered by the study manager or focal point. We used Kobo collect to collect information from respondents. Data were exported via Excel 2010 and analyzed using SPSS software in version 21.1. Descriptive analyzes were carried out to determine the numbers, the frequencies, the means (with standard deviations) of the various variables of the study with a confidence interval of 95%. We used the chi-square test to compare the proportions.

4. Ethical Considerations

The study protocol was submitted for the approval of the national ethics committee and was approved before the beginning of the study. Before any administration of the questionnaire, the free and informed consent of each survivor was obtained, without any constraint. We reassured them of respect for anonymity and confidentiality in the use of the information provided.

5. Results

Of the 706 Ebola survivors who were registered in the administrative regions of Conakry, Kankan, Kindia, Kankan and Faranah according to the Ebola survivor's database of the National Health Security Agency, 535 survivors were investigated. Their distribution varies from one region to another as indicated as follows: 130 in Conakry, 91 in the Kankan-Faranah regions and 314 in the Kindia region. We did not have any information concerning the other 171 cured who either moved or died.

Table 1. Distribution of Ebola survivors by socio-demographic characteristics in the administrative regions of Kindia, Conakry, Kankan and Faranah, 2016-2020.

Variables	Kindia	Conakry	Kankan-Faranah	TOTAL
Gender				
Male	237	67	46	350
Female	67	69	49	185
Residence area				
Rural	239	0	66	305
Urban	75	130	25	230
Level of education				
None	180	31	53	274
Primary	60	33	25	118
Secondary	42	43	12	97
University-occupational	22	23	1	46
Age range				
0-9	10	54	8	72
10-19	12	10	56	78
20-29	45	19	52	116
30-39	20	6	15	41
40-49	10	30	18	58
50-59	12	23	45	80

Variables	Kindia	Conkary	Kankan-Faranah	TOTAL
60-69	10	25	12	47
70 and more	16	13	14	43
Total	135	180	220	535

Age average = 31,85 Years; standard deviation = 16,07 Years; Min = 6 years; Max = 75 Years

Table 2. Distribution of deaths according to the date of onset among Ebola virus disease survivors in the administrative regions of Kindia, Conakry, Kankan and Faranah, 2016-2020.

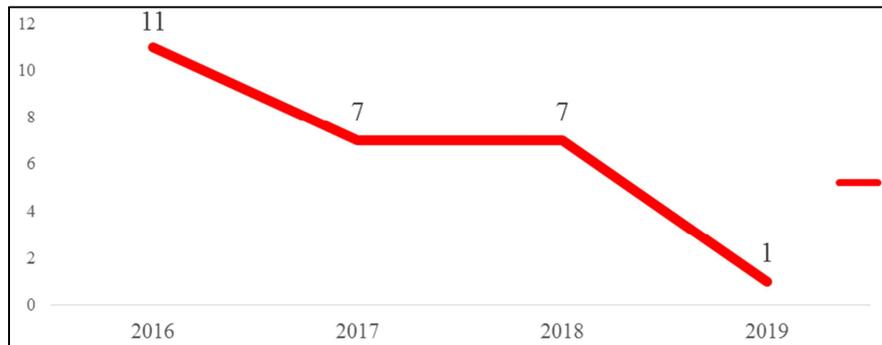
Prefecture	2016	2017	2018	2019	Total	Percentage
Coyah	2	1	1	0	4	15%
Dubr�ka	1	0	1	0	2	8%
For�cariah	4	2	2	1	9	35%
Kindia	1	1	0	0	2	8%
Ratoma	0	1	1	0	2	8%
Matoto	1	0	1	0	2	8%
Kaloum	2	1	1	0	4	15%
Kerouane	0	1	0	0	1	4%
TOTAL	11	7	7	1	26	100%

Table 3. Distribution of deaths of survivors of the Ebola virus disease of surveyed in the region of Kindia, Conakry, Kankan and Faranah from November 20 to December 10, 2020.

Variables	Death (n=26)		Chi-square	P-Value
	Oui n (%)	Non n (%)		
Sex				
Man	12 (46,15%)	185 (34,57%)	1,44	0,236
Woman	14 (53,84,0%)	350 (65,42%)		
Age range				
0-9 years	0 (0%)	72 (13,45%)	24,56	0,0009
10-19 years	0 (0%)	78 (14,57%)		
20-29 years	4 (17,39%)	116 (21,68%)		
30-39 years	5 (19,23%)	41 (7,66%)		
40-49 years	8 (30,76%)	58 (10,84%)		
50-59 years	7 (26,92%)	80 (14,95%)		
60-69 years	2 (7,69%)	47 (8,78%)		
70 years and more	0 (0%)	43 (8,03%)		
Residence				
Rurale	14 (53,84,0%)	305 (57%)	0,32	0,63
Urban	12 (46,15%)	230 (43%)		
Distance between the residence and the nearest health center				
Les than 5 km	10 (46,15%)	331 (61,86%)	1,74	0,43
5 to 10 km	8 (38,46%)	150 (28,03%)		
More than 10 km	8 (7,69%)	160 (29,9%)		
Prefecture				
Ratoma	2 (7,69%)	78 (15,57%)	21,01	0,008
Matoto	2 (7,69%)	98 (18,31%)		
Kaloum	4 (15,38%)	20 (3,73%)		
Kerouane	1 (3,84%)	42 (7,85%)		
Coyah	4 (15,38%)	86 (16,07%)		
Dubr�ka	2 (7,69%)	67 (12,52%)		
For�cariah	9 (34,61%)	92 (17,19%)		
Kindia	2 (7,69%)	32 (9,98%)		
Telimele	0 (0%)	78 (18,31%)		
Community level of education				
Did not go to school	10 (38,46%)	274 (51, 21%)	2,06	0,58
Primary	6 (23,07%)	118 (22,05%)		
Secondary	7 (26,92%)	97 (18, 13%)		
University	3 (11,53%)	46 (8, 59%)		
Occupation				
Driver	3 (11,53%)	30 (5,60%)	7,48	0,28
Farmer	4 (15,38%)	107 (20%)		
Student	3 (11,53%)	48 (8,97%)		
Trader	6 (19,23%)	96 (17, 94%)		
Housewife	5 (23,07%)	152 (28,41%)		
Carpenter	2 (2,40%)	10 (1,86%)		
Without occupation	3 (11,53%)	92 (17,19%)		

Table 4. Distribution of causes of death among Ebola survivors found in the administrative regions of Kindia, Conakry, Kankan and Faranah, 2016-2020.

Causes of death	2016	2017	2018	2019	Total	%
AVC	3	2	1	1	7	27%
AVP	1	1	2	0	4	15%
HTA (AVC)	1	1	2	1	6	23%
Not known	4	3	1	1	9	35%
Total	9	7	6	3	26	100%

**Figure 1.** Distribution by date of death of Ebola virus disease survivors surveyed in the administrative regions of Conakry, Kankan, Faranah and Kindia from 2016 to 2019.

6. Discussion

A total of 535 Ebola virus disease survivors participated in the study in the administrative regions of Kindia, Conakry, Kankan and Faranah and the average age of the respondents was 31.85 ± 16.07 years with extremes between the ages of 6 and 75. We noted a female predominance of 350 (65.42%) with a sex ratio of 1.9 and the most represented age group was that of 20 to 29 years with 116, or 21.68%. 305 (57%) of respondents lived in rural areas compared to 230 (43%) in urban areas.

The majority of the surveyed people come from the Matoto health district center with 98 people, or 18.31%, followed by the Forécariah health district with 92, or 17.19%. While in the Kaloum health district, only 20 people participated in the survey, i.e. (3.73%).

During our study, among survivors of the Ebola virus disease, 17 deaths or 65.38% were notified in the administrative region of Kindia with a male predominance of 9 (18.8%). The Conakry region also recorded at least 9 deaths, or 34.61%. There was also a predominance of out-of-school survivors with 274 people, or 51.21% of cases.

Deaths whose causes are not known are the most frequent, i.e. 9 (35.94%) of the cases. In addition, cerebrovascular accidents are the main known causes of death among our respondents, followed by arterial hypertension and road accidents, respectively 7 cases (26.92%), 6 cases (23.07%) and 4 cases (15.38%) of cases.

We noted a decreasing trend in mortality among survivors of Ebola virus disease during the period from 11 deaths or 42.03% of deaths, 7 deaths in 2017 or 26.92%, and 7 deaths, 26.92% of cases were notified in 2018. For the year 2019, we only recorded one death, therefore, a drop between the two periods 7 deaths in 2018 and a single death in 2019. This table shows that 2016 was the deadliest year because 9 cases or 34.61% of deaths among those cured of Ebola were

recorded during this period. For the periods 2017 and 2018 respectively 7 deaths were notified, i.e. 26.92% and in 2019, only one death was notified, i.e. 3.8% death. We found that this mortality slowed down between the second half of 2017 and 2019 ranging from 7 deaths in 2018 to one death in 2019.

These results are comparable to those found by Mory Keita and collaborators [15], who reported that for a period of one year of follow-up, survivors of Ebola virus disease had a five times higher risk of mortality compared to Ebola virus disease. general population (age-standardized mortality ratio 5-2 [95% CI 4-0 -6-8 (16). did not differ between Ebola virus disease survivors and the general population OR = 2 [95% CI 0.2-4]) [15].

By comparing the number of deaths between the two studies, we also noted a decrease in deaths among the cured between the two studies varying between 59 deaths were reported between December 8, 2015 to September 30, 2016 and 27 deaths were recorded between December 31 2021 2016- a reduction of 33 deaths in months compared to the first study [15].

During the first study from December 8, 2015 to September 30, 2016 the causes of death were mainly attributed to renal failure 37 cases or 62.71% of deaths. In the second study, the main causes of death were idiopathic 9, i.e. 35%, stroke 7, i.e. 27%, hypertension 6, i.e. 25% [15].

On the other hand, our results are lower than those reported by Hilary Bower and collaborator in Sierra Leone [18] because of the 151 survivors of Ebola virus disease followed for a period of 10 months after their discharge, four deaths were notified all within six weeks after discharge from epidemiological treatment centers. These deaths would be due either to late complications or to previous tuberculosis [18]. During our study, we noted 26 deaths among survivors of the Ebola virus disease in the administrative regions of Kindia, Kankan, Conakry and Faranah with a female predominance of deaths out of the 26 notified for all the

health districts of the country, i.e. 53.84%. The most represented age group was that of 40 to 49 years with 8 people or 30.76% of cases. Survivors of the Ebola virus disease residing in rural areas were the majority, i.e. 14, or 53.84% against 12 in the urban area, or 46.15%.

Regarding sex, there is a female predominance 53.84% against 46.15% male. Survivors residing less than 5 km away separating them from the nearest health facility predominated, i.e. 10 (46.15%). We noticed among the deceased 8 people or 38.46% live at least 10 km from the nearest health structures and in distances of more than km from health structures, we notified 10 deaths and the health district of Matoto had recorded the highest number of deaths 9, or 34.61%.

Regarding the level of education, there was also a predominance of survivors with no schooling 10 (38.46%) followed by those with a primary education level 6 people or 23.07%. For the other levels, 7 people (26.92%) reached secondary level and 3 people (11.53%) were able to reach universities regardless of the type of university.

Regarding the occupation, housewives, farmers and merchants are the most numerous respectively 4 people for each of them.

In the bivariate analysis, there is no statistically significant difference between gender, area of residence, distance between residence and the nearest health facility, occupation and level of education with regard to the occurrence deaths among those cured of Ebola.

On the other hand, there is a statistically significant difference between the prefectures p (0.008) and the age group p (0.0009) as regards the occurrence of deaths among those cured of Ebola. We say that the prefectures of residence and the age group are risk factors for the occurrence of deaths among Ebola survivors.

7. Conclusion

At the end of our study, we noted a high mortality among survivors of Ebola virus disease. The most numerous causes would be idiopathic causes followed by cerebrovascular accidents, high blood pressure and road accidents. This mortality was decreasing over the years.

In addition, we found the prefectures of residence of Ebola survivors and their age groups are risk factors for the occurrence of deaths among Ebola survivors ranging from October 2016 to December 31, 2021.

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