



# Evaluation of Sequelae in Ebola Survivors After the Ebola Epidemic in the Kankan and Faranah Administrative Regions, 2016 – 2020

Sadou Sow<sup>1,2</sup>, Alpha Oumar Diallo<sup>2</sup>, Abdoulaye Sow<sup>2</sup>, Dadja Essoya Landoh<sup>1</sup>, Jean Konan Kouame<sup>1</sup>, Kevin Yohou Sylvestre<sup>1</sup>, Manengu Casimir Tshikolasoni<sup>1</sup>, Boubacar Sow<sup>2</sup>, Katende Ntumba Alain<sup>1</sup>, Mouctar Kande<sup>1</sup>, Mamadou Alpha Diallo<sup>1</sup>, Ahmadou Barry<sup>1</sup>, Kadiata Bah<sup>2</sup>, Mandian Camara<sup>2</sup>, Mamadou Mouctar Balde<sup>2</sup>, Amadou Bailo Diallo<sup>3</sup>, Mamadou Oury Balde<sup>1</sup>

<sup>1</sup>World Health Organization, WHO Guinea Office, Conakry, Guinea

<sup>2</sup>Faculty of Health Science and Technology, Department of medicine, Chair of Public Health, Gamal Abdel Nasser University of Conakry, Conakry, Guinea

<sup>3</sup>World Health Organization, Dakar Office, Dakar, Senegal

## Email address:

Sadousow1968@yahoo.fr (Sadou Sow), docta135@gmail.com (Alpha Oumar Diallo), mbalde@who.com (Mamadou Oury Balde), drasowab@msn.com (Abdoulaye Sow), boubamorelsow37@gmail.com (Boubacar Sow), mbarry@who.int (Ahmadou Barry), diallomalpha@gmail.com (Mamadou Alpha Diallo), dialloa@who.int (Amadou Bailo Diallo), Kandem@who.int (Mouctar Kande), mamadou.balde@jhpigieo.org (Mamadou Mouctar Balde), bahkadiata86bappe@gmail.com (Kadiata Bah), katendea@who.int (Katende Ntumba Alain), konank@who.int (Jean Konan Kouame), landohd@who.int (Dadja Essoya Landoh), mandiansona@yahoo.fr (Mandian Camara), manenguc@who.int (Manengu Casimir Tshikolasoni)

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**Abstract:** *Introduction:* In December 2013, West Africa experienced an outbreak of the Ebola virus disease which originated in south eastern Guinea. Ebola virus disease (EVD) is a deadly and dreaded infectious disease, which can be responsible for debilitating physical and psychological sequelae in survivors. Unfortunately, there is little data on the sequelae of survivors in Guinea. This study therefore assessed sequelae in EVD survivors in the administrative regions of Conakry, Nzerekore, Kankan and Faranah. *Methodology:* It was a cross-sectional study, of descriptive and analytical type which focused on all the survivors followed from the database of the National Agency for Health Security (ANSS). We collected data from 91 survivors on pre-established forms and used the "SPSS 21" software for logistic regression and univariate and multivariate analyses. *Result:* A total of 91 individuals were surveyed out of a total of 135 survivors from the ANSS database. The average age was 37.60 years  $\pm$ 15.04, with extremes of 8 and 75 years; the sex ratio was 0.9. The types of sequelae observed in the survivors were predominantly urological (23%) and psychiatric (19%), followed by neurological (17%), musculoskeletal (17%) and gynecology – obstetrics (12%). *Conclusion:* The prevalence of urological and psychiatric sequelae was higher in EVD survivors. Facilitating access to specialized urological, psychiatric, neurological and gynecological services to maintain the health of Ebola survivors in Guinea should be considered by EVD teams in Guinea.

**Keywords:** Ebola, Survivors, Sequelae, Guinea

## 1. Introduction

Ebola virus disease, with no cure, began the first outbreak in West Africa in the southeast part of Guinea in 2013. It later spread to neighbouring countries: Liberia and Sierra Leone. Later, due to mobility, other countries such as Nigeria, Mali, USA, Senegal, Spain, UK and Italy were affected to a lesser degree. This is the first time that this virus has caused contamination outside of Central Africa and then outside of the African continent [1]. This epidemic was more serious than those observed since the discovery of the virus in 1976.

The World Health Organization (WHO) claimed that patient zero was a child who died in December 2013 in Meliandou (Gueckedou) in south-eastern Guinea. In August 2014, she called the outbreak "a public health emergency of global concern".

The leaders of Western countries called this epidemic "the most serious health emergency of these decades [2]. Control efforts have reduced transmission and managed, since March 2015, to limit its expression to resurgences.

The World Health Organization (WHO) has drawn a tragic toll for these three countries, after declaring the end of the first epidemic. In total, 28,000 cases diagnosed and notified, more than 11,000 deaths and more than 10,000 survivors with sequelae [3].

Guinea and its bilateral and multilateral partners have made considerable efforts to stop the spread and limit lethality. Despite this, the epidemic has spread to almost all the prefectures and communes of the country. The following data were notified: 26 prefectures/communes affected, 3814 confirmed cases notified, 2544 deaths, 1272 survivors, 6220 orphans and 500 widows and widowers [4].

Survivors of the 2014 - 2016 epidemic could face a major challenge, that of coping with the sequelae and forms of stigma after the disease [5].

In 2016, an evaluation program for Ebola survivors called the POSTEBOLEGUI project was set up to better understand the future of survivors in Guinea [13].

While understanding presumed disease transmission from recovering patients is critical to EVD prevention, clinicians and public health professionals must also study and address the sequelae of the disease and the social stigma associated with it. EVD in affected populations.

Recovering EVD patients reported significantly higher arthralgia and myalgia than control patients during the 1995 Kikwit outbreak [6]. Additionally, 15% of Kikwit survivors surveyed reported ocular sequelae including eye pain, photophobia, hyper lacrimation and loss of visual acuity. Patients reporting ocular sequelae had uveitis that responded to topical treatment [7].

Another study published by the WHO revealed ocular sequelae such as uveitis, cataracts, disease of the retina and optic nerves [14].

It is for these reasons that monitoring and rapid treatment must be put in place for all EBOLA survivors, especially those with ocular symptoms [17].

In 2017, it emerged from a study in the psychiatry department of the national hospital of DONKA that EBOLA

survivors presented a state of post-traumatic stress (4.41%) and decreased depression without psychotic signs (10.29%) [15].

In 2007, survivors in Uganda also presented with arthralgias, ocular deficits, hearing loss, neurological abnormalities, sleep disturbances, memory loss and various other constitutional symptoms [8]. In addition to the medical burden associated with recovery, survivors must deal with considerable psychological issues such as fear, denial and shame. In severe cases, the social stigma associated with the disease can run deep, leading to abandonment of patients by family and friends [9].

Research has also mentioned significant neurological, ocular and psychological complications in patients compared to the general population [10].

At the current state of knowledge, we do not have sufficient data on the future of survivors in Guinea in terms of sequelae.

What could become of Ebola survivors four (4) years after the end of the epidemic in the Kankan and Faranah regions?

It is to provide plausible answers to this question that we find the relevance of the present study.

This information will not only contribute to improving patient care but also to set up a system for managing the sequelae of the disease [16].

## 2. Study Objectives

### 2.1. General Objective

Evaluate the sequelae among Ebola survivors in the Kankan and Faranah regions since the end of the epidemic in Guinea.

### 2.2. Specific Objectives

- 1) Describe the types of sequelae observed in Ebola survivors in Guinea, in the Kankan and Faranah regions since the end of the epidemic;
- 2) Determine the frequency of sequelae observed in Ebola survivors in Guinea, in the regions of Kankan and Faranah.

## 3. Methodology

### 3.1. Study Framework

The administrative regions of Kankan and Faranah served as a framework for the conduct of this study. They share common borders with the Republics of Côte d'Ivoire and Mali. These 4 regions are the nest to a significant number of Ebola survivors.

### 3.2. Type and Period of Study

This is a cross-sectional study with a descriptive and analytical purpose. It concerns Ebola survivors medically followed after their stay in epidemic treatment centres from 2016 to 2020.

### 3.3. Study Population

This is all Ebola survivors in the Kankan and Faranah regions, recorded from the national ANSS databases.

### 3.4. Selection Criteria

#### 3.4.1. Inclusion Criteria

All Ebola survivors from Kankan and Faranah, registered in the national ANSS database, with the ability to answer the study questions.

#### 3.4.2. Exclusion Criteria

All Ebola survivors who have not consented to participate in the study or who have incomplete information in the national ANSS database.

### 3.5. Study Variables

The variables are socio-demographic, epidemiological and clinical.

### 3.6. Sampling

The sampling was random and simple relating to Ebola survivors registered in the ANSS database.

### 3.7. Data Collection and Entry

Data were collected using a pre-tested questionnaire. The

“Epi data” software was used for data entry. For the study of the factors associated with sequelae, we used a logistic regression using the “SPSS” software. We made a descriptive analysis of the collected data and we compared certain indicators with those of the literature. Descriptive statistics were calculated to compile and explain the results, 95% confidence intervals were calculated for qualitative variables.

## 4. Ethical Considerations

The study was submitted for approval by the national ethics committee. Participation in the study was free, voluntary and without any constraint. All survivors were informed that they are free to participate in the study, refusal would have no prejudice on them. The data were collected anonymously and confidentiality was strictly enforced.

## 5. Results

Among a workforce of 135 survivors from the ANSS database, 91 individuals participated in the study, including 45 men and 46 women. The average age is 37.60 years with extremes of 8 years and 75 years the sex – ratio is 0.9.

**Table 1.** Socio-demographic characteristics of Ebola survivors in the administrative regions, Kankan and Faranah. 2016 – 2020.

Characteristics	Number (91)	Percentage
Age (year)		
Sex		
Female	46	50,5
Male	45	49,4
Residence		
Rural	66	72,5
Urban	25	27,5
Level of education		
Never went to school	53	58
Primary	25	27
Professional	1	1
Secondary	11	12
University	1	1
Total	91	100

Average age = 37.7; Extreme 8-75 years.

**Table 2.** Distribution of types of sequelae observed in survivors, administrative regions of Kankan and Faranah, Guinea, 2016 – 2020.

Types of sequelae	Number	Percentage
Ocular	15	5.3
Oto-Rhino-Laryngological	20	7.06
Musculoskeletal	47	16.6
Neurological	47	16.6
Psychiatric	55	19.43
Nephro-Urological	66	23.32
Genecology - obstetrics	33	11.6
TOTAL	283	100

**Table 3.** Univariate and multivariate analysis of the sequelae observed in Ebola survivors and the age, sex, residence, level of education of the administrative regions of Kankan and Faranah 2016 – 2020.

Sequels	Uni-varied			Multi-varied		
	OR	p- value	IC at 95%	OR	p – value	IC à 95%
Age	1,18	0,14	[0,01-0,86]	1,023	0,485	[0,960 -- 1,089]
Sex	0,10	0,03	[0,01-0,86]	2,358	0,339	[0,406 – 13,691]
Residence	1,36	0,71	[0,26-7,06]	2,842	0,355	[0,310 – 26,039]
Level of education	0,10	0,03	[0,01-0,86]	3,892	0,207	[0,472 – 32,100]

**Table 4.** Univariate and multivariate analysis of blood pressure abnormalities of survivors and age, sex, residence, level of education of the administrative regions of, Kankan and Faranah 2016 – 2020.

Blood Pressure Abnormalities	Uni-varied			Multi-varied		
	OR	p- value	IC at 95%	OR	P – value	IC à 95%
Age		0,37		0,977	0,196	[0,944 -1,012]
Sex		0,12	[0,81 - 5,16]		0,807	[0,313 – 2,468]
Residence		0,47	[0,51 - 4,24]		0,425	[0,480 - 5,706]
Level of education		0,60			0,129	[0,441 - 1,110]

**Table 5.** Univariate and multivariate analysis of urinary dipstick abnormalities of survivors and age, sex, residence, educational level of the administrative regions of, Kankan and Faranah. 2016 – 2020.

Abnormalities Urine dipstick	Uni-varied			Multi-varied		
	OR	p- value	IC at 95%	OR	P – value	IC à 95%
Age	1,38	0,17	[0,08 - 4,50]	1,013	0,411	[0,983 – 1,044]
Sex	3,17	0,03	[0,02 - 6,17]	1,223	0,649	[0,515 -2,903]
Residence	1,24	0,22	[0,70 - 4,50]	1,748	0,260	[0,661 - 4,620]
Level of education	4,89	0,02	[0,01 - 6,17]	1,307	0,236	[0,839 - 2,035]

## 6. Discussion

Our cross-sectional study had the main objective of evaluating the future of Ebola survivors in terms of sequelae from 2016 to 2020 in the regions of Kankan and Faranah. In total, 91 Ebola survivors out of a total of 135 participated in our study, of which 50.5% were women and 49.4% men. The other survivors (44 individuals) were unreachable for probable change of residence or change of telephone addresses. The average age was 37.60 years with extremes of 8 years and 75 years. The sex-ratio was 0.9. In our series, 58% of survivors have never been to school, followed by 27% who have a primary level and 12% who have a secondary level. Survivors who reached professional and university level accounted for 1% respectively. This could be explained by the fact that the school enrolment rate is low in rural areas in Guinea. Our results are contrary to those found by Mohammed A et al [11] who reported that 66.7% of the participants were women and 65.8% had a higher education level. Nevertheless, we were able to record through support from the President of RENASEG (National Network of Ebola Healers) one (1) case of death in a 65-year-old survivor residing in the Kankan prefecture; died in 2019 following a stroke.

A study carried out in 2014 in Guinea by Kerber R et al [4] reported mortality according to age groups, with 90% of deaths occurring in subjects aged 74 and over; 40% of deaths occurred in subjects aged 10 – 19 years. Mayr Huber EA et al [12], in their article, reported that survival was associated with challenges such as suffering sequelae, social and economic consequences, and psychological distress. Regarding the types of sequelae found in the survivors, we found a predominance of urological (23%) and psychiatric (19%) sequelae, followed by neurological (17%), musculoskeletal (17%) and gynaecological sequelae. obstetrics (12%). Our results are contrary to those of Kibadi K et al [5] who, in a study carried out in the Democratic Republic of Congo, reported a predominance of ophthalmological sequelae. On the other hand, Epstein L et al [8] noted a predominance of musculoskeletal sequelae. It appears from our mixed analysis that there is no association

between place of residence ( $p= 0.71$ ) and age ( $p= 0.14$ ) with regard to the occurrence of sequelae in survivors. However, there is an association between sex, level of education and the occurrence of sequelae in survivors ( $p = 0.03$ ). The possible reasons for this situation could be explained by the fact that, in general, women are much more exposed to developing sequelae than men. It is the same for individuals who have no level of education to be exposed to sequelae, because very often they do not have all the information on the disease, consequently, they have a certain tendency to neglect certain aspects related to this disease. The multivariate analysis also showed us that there is no association between residences, sex, age, and level of education with regard to the occurrence of sequelae in survivors. Survivors residing in rural areas (66%) were more affected than those residing in urban areas (34%); the age groups most affected were respectively those of 40-49 years (33%) and 30-39 (22%).

In the univariate analysis, it appears that there is no relationship between residences ( $p = 0.47$ ), age ( $p = 0.37$ ), sex ( $p = 0.12$ ) and level of education ( $p=0.60$ ) as to the appearance of blood pressure abnormalities in Ebola survivors. Similarly, the multivariate analysis showed that there is no relationship between residences, sex, age, and level of education regarding the appearance of blood pressure abnormalities. Regarding the urinary dipstick examination which was systematically carried out in all participants. Residents in rural areas were much more affected with 78% of cases compared to 22% of cases among residents in urban areas; the female sex was more affected (60%) than the male sex (40%). Also, survivors who had never been to school were more represented with 72.5% followed by those with primary level with 27.5%. The univariate analysis shows that there is a link between gender ( $p = 0.03$ ) and level of education ( $p = 0.02$ ) with regard to the occurrence of urine dipstick abnormalities. This could be explained by the fact that in practice, women, due to the anatomy of the female genitourinary system, are generally more exposed to infections than men and that the lack of sufficient knowledge on the modes of transmission and preventing kidney failure and urinary tract infections may be an important risk factor. On the other hand, the multivariate analysis showed that there is no relationship between the prefectures, the

residences, the sex and the levels of education regarding the occurrence of abnormalities of the urinary dipstick in the survivors.

## 7. Conclusion

This cross-sectional study allowed us to assess the future of Ebola survivors in terms of sequelae from 2016 to 2020 in the administrative regions of Kankan and Faranah. Neurological, vascular, urogenital, musculoskeletal and psychiatric sequelae were the most recorded. It would be relevant to deepen studies on Ebola survivors and to maintain their follow-up in order to shed more light on this potentially epidemic and destructive disease.

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