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Original article

Ebola outbreak in Conakry, Guinea: Epidemiological, clinical, and outcome features

Épidémie d'Ebola à Conakry, Guinée : aspects épidémiologique, clinique et évolutif

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Abstract

Objectives. – The authors studied the epidemiological, clinical, and outcome features of the Ebola virus disease in patients hospitalized at the Ebola treatment center (ETC) in Conakry to identify clinical factors associated with death.

Materials and methods. – A prospective study was conducted from March 25 to August 20, 2014. The diagnosis of Ebola virus infection was made on real-time PCR.

Results. – Ninety patients, with a positive test result, were hospitalized. Their mean age was 34.12 ± 14.29 years and 63% were male patients. Most worked in the informal sector (38%) and in the medical and paramedical staff (physicians 12%, nurses 6%, and laboratory technicians 1%). Most patients lived in the Conakry suburbs (74%) and in Boffa (11%). The main clinical signs were physical asthenia (80%) and fever (72%). Hemorrhagic signs were observed in 26% of patients. The comparison of clinical manifestations showed that hiccups ($P = 0.04$), respiratory distress ($P = 0.04$), and hemorrhagic symptoms ($P = 0.01$) were more frequent among patients who died. Malaria (72%) and diabetes (2%) were the most frequent co-morbidities. The crude case fatality rate was 44% [95% confidence interval (33–54%)]. The average hospital stay was 7.96 ± 5.81 days.

Conclusion. – The first Ebola outbreak in Conakry was characterized by the young age of patients, discrete hemorrhagic signs related to lethality. Its control relies on a strict use of preventive measures.

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Keywords: Ebola; Guinea ZEBOV; Conakry

Résumé

Objectifs. – Cette étude avait pour objectifs de décrire les aspects épidémiologique, clinique et évolutif de la maladie à virus Ebola chez les patients hospitalisés au centre de traitement d'Ebola (CTE) de Conakry ainsi que d'identifier les facteurs cliniques associés au décès.

Matériel et méthodes. – Il s'agissait d'une étude prospective réalisée du 25 mars au 20 août 2014. Le diagnostic d'infection à Ebola reposait sur la PCR en temps réel.

Résultats. – Quarante-vingt-dix patients testés positifs ont été hospitalisés. La moyenne d'âge était de $34,12 \pm 14,29$ ans et 63 % étaient des hommes. La majorité évoluait dans le secteur économique informel (38 %) et dans le corps médical et paramédical (12 % de médecins, 6 % d'infirmiers et 1 % de laborantins). Les patients provenaient essentiellement de la banlieue de Conakry (74 %) et de la préfecture de Boffa (11 %). Les principaux signes cliniques étaient l'asthénie physique (80 %) et la fièvre (72 %). Les signes hémorragiques ont été retrouvés chez 26 %. Le hoquet ($p = 0,04$), la détresse respiratoire ($p = 0,04$) et les signes hémorragiques ($p = 0,01$) étaient plus présents chez les patients décédés. Le paludisme (72 %)

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et le diabète (2 %) étaient les principales comorbidités. La létalité a été de 44 % [intervalle de confiance 95 % (33–54 %)]. La durée moyenne d'hospitalisation était de $7,96 \pm 5,81$ jours.

Conclusion. – Cette première épidémie à Conakry était caractérisée par le jeune âge des patients, des signes hémorragiques discrets mais associés à la létalité. Son contrôle passe par une application stricte des mesures de prévention.

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Mots clés : Ebola ; Guinea ZEBOV ; Conakry

1. Introduction

The Ebola and Marburg viruses are currently some of the most virulent pathogens for humans. They cause a disease characterized by acute fever, inconstantly associated with an hemorrhagic syndrome, with a rapidly fatal outcome for 90% of those patients with the most severe presentations [1]. However, all clinical presentations included, the case-fatality rate of Ebola infections is variable and was estimated between 55 and 76% in the various outbreaks reported since 1976 [2]. The extremely rapid outcome of the disease, the high mortality rate, and the absence of specific treatment and vaccine make these viruses a major problem for public health in populations of Sub-Saharan Africa [3].

Ebola virus, previously confined to Central Africa, was recently identified in West Africa. The first Ebola outbreak was officially notified in Guinea on March 21, 2014. The disease has since spread to other neighboring countries. The virological investigation identified Ebola Zaire (ZEBOV) as the causative agent. The sequencing of the full genome and a phylogenetic analysis proved that the Guinea ZEBOV was different from the ZEBOV strains found in the Democratic Republic of Congo and Gabon [4].

Our objectives were to describe the epidemiological, clinical, and outcome features of the Ebola virus disease (EVD) in patients hospitalized at the Conakry Ebola treatment center (ETC) and to identify the clinical signs and symptoms associated with death.

2. Materials and methods

2.1. Population and study site

We included patients presenting with an Ebola virus infection confirmed by RT-PCR [4,5] performed through the Guinea “hemorrhagic fever project” laboratory who were managed at the Donka Teaching Hospital ETC in Conakry. The ETC was opened on March 2014 by the Donka Department of Infectious and Tropical Diseases, in collaboration with MSF Belgium, and is fully devoted to the treatment of patients infected with the Ebola virus.

2.2. Data collection

The medical staff collected the patient data prospectively from March 25 to August 20, 2014: age, sex, occupation,

home location, comorbidities, symptoms, treatments administered during the hospital stay, and outcome.

Working in the economical informal sector was defined by as having an occupation without any fixed wage: workers, merchants, and farmers.

Recovery was defined as the absence of clinical signs and a negative RT-PCR result for Ebola virus.

2.3. Statistical analyses

We collected socio-demographic, and clinical data, as well as data relative to death. We analysed indicative variables using the Chi² test or the Fisher exact test and continuous variables using Student's *t*-test and Mann-Whitney's test. The level of significance was set at 5%. The data was analyzed with SPSS Version 17.0 (SPSS Inc., Chicago, IL, USA).

3. Results

Ninety patients infected by Ebola virus were hospitalized in the ETC during the study period. The number of admissions varied from week to week with peaks at the 3rd, 16th, and 10th weeks with respectively 12, 10, and 8 cases (Fig. 1). The mean age was 34 ± 14 years, with 57 male patients (63%). Most patients worked in the informal economical sector ($n = 34$, 38%) or were medical and paramedical staff (physicians $n = 11$; 12%, nurses $n = 5$; 6% and laboratory workers $n = 1$; 1%). Most patients were from the Conakry suburbs ($n = 67$, 74%) and from Boffa ($n = 10$, 11%). The socio-demographic characteristics of patients are listed in Table 1. The mean time from symptom onset to hospitalization was 6 ± 3 days.

The most frequent clinical signs were asthenia (80%), fever (72%), nausea/vomiting (60%), diarrhea (34%), and myalgia (23%). Fourteen percent of patients presented with respiratory distress and 26% with hemorrhagic signs (Table 2). Hiccups ($P = 0.04$), respiratory distress ($P = 0.04$), and hemorrhagic signs ($P = 0.01$) were significantly more frequent in patients who died than in survivors in a univariate analysis (Table 3). Malaria ($n = 65$; 72%) and diabetes ($n = 2$) were the most frequent comorbidities.

The case fatality rate was 44% [95% confidence interval (33–54%)]. Twenty of the 39 patients who died presented with hypovolemic shock, 13 with septic shock, and 6 with cardiovascular collapse.

The therapeutic management included rehydration (oral rehydration solution, Ringer's lactate), vitamin therapy, antibiotic prophylaxis for the prevention of bacterial infections (ceftria-

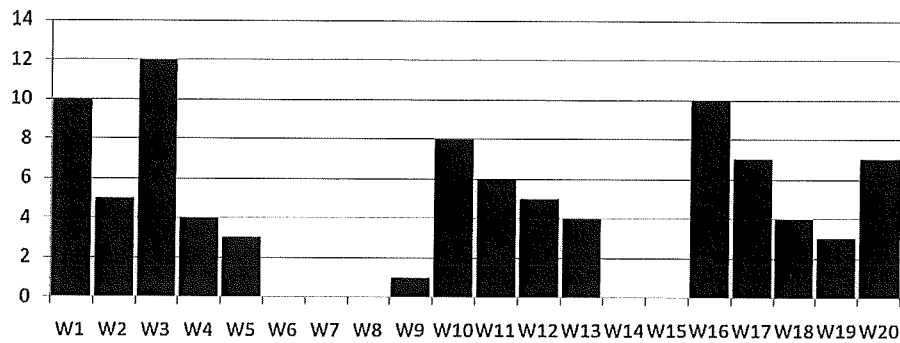


Fig. 1. Weekly distribution of the 90 cases of Ebola, March–August 2014, Conakry, Guinea.
Distribution hebdomadaire des 90 cas d’Ebola, mars–août 2014, Conakry, Guinée.

Table 1
Socio-demographic features of 90 patients infected by Ebola, March–August 2014, Conakry, Guinea.
Données sociodémographiques des 90 cas d’Ebola, mars–août 2014, Conakry, Guinée.

Features	Number (n = 90)	Percentage
Sex		
Male	57	63
Age range		
1–20	11	12
21–40	53	59
41–60	24	27
61 and more	2	2
Occupation		
Informal sector	34	38
Pupils/Students	14	16
Medical/paramedical occupation	17	19
Formal sector	10	11
Housewives	12	13
Jobless	3	3
Home		
Kaloum	1	1
Conakry suburbs	67	74
Coyah	3	3
Dabola	2	2
Boffa	10	11
Sino-Guinean Hospital	7	7.8

Table 2
Clinical data for the 90 patients infected by Ebola, March–August 2014, Conakry, Guinea.
Données cliniques des 90 cas d’Ebola, mars–août 2014, Conakry, Guinée.

Clinical symptoms	Number (n = 90)	Percentage
Fever	65	72
Headaches	47	52
Asthenia	72	80
Myalgia	21	13
Arthralgia	12	6
Hiccup	6	7
Nausea/emesis	54	60
Abdominal pain	24	27
Diarrhea	31	34
Respiratory distress	13	14
Hemorrhage	23	26

Table 3
Distribution of the 90 cases of Ebola infection, according to the outcome and clinical symptoms, March–August 2014, Conakry, Guinea.
Répartition des 90 cas d’Ebola en fonction de l’évolution et des signes cliniques, mars–août 2014, Conakry, Guinée.

Symptoms	Died n = 39		Cured n = 51		P
	n	%	n	%	
Fever	29	44.6	36	55.4	0.069
Headaches	18	38.3	29	61.7	0.31
Myalgia	13	61.9	8	38.1	0.04
Arthralgia	7	58.3	5	41.7	0.26
Hiccup	5	83.3	1	16.7	0.04
Emesis	24	44.4	30	55.6	0.79
Abdominal pain	10	41.7	14	45.2	0.11
Diarrhea	17	54.8	14	45.2	0.11
Respiratory distress	9	69.2	4	30.8	0.04
Hemorrhage	15	65.2	8	34.8	0.01

xone, cefixime, metronidazole), and acetaminophen. The average hospital stay was 8 ± 6 days; it was 11.5 ± 5 days for survivor patients and 3.5 ± 2.5 days for those who died ($P < 0.001$).

A negative RT-PCR was required to confirm the cure and allow ETC patients to be discharged. RT-PCR was performed every 48 hours in clinically recovered patients before they could leave the ETC. Only one control RT-PCR was needed for 44% of patients considered as clinically cured, three RT-PCR were required for 37%, four RT-PCR for 13%, five RT-PCR for 3%, and six RT-PCR for 2%.

4. Discussion

We report the epidemiological, clinical, and outcome status of patients infected by Ebola virus relying on data collected during 5 months at the Conakry ETC, the only Ebola referral center in Conakry during that period. This study may have limitations due to the selection of patients and their management in a specific centre, but it provides fundamental data for the management of patients during the outbreak.

The real incidence was probably much higher than the number of cases we reported, because of the under-notification of EVD cases to the Conakry ETC, due to lack of knowledge about the disease, and misunderstanding of the outbreak control measures. The suggested public health interventions are also

sometimes misinterpreted by communities, leading to denial, mistrust, and rejection.

Our study was the first of its kind in Guinea to address this issue. It highlighted the urban nature of the Guinea outbreak. Most previous Ebola outbreaks occurred in rural areas; the current outbreak began in rural areas in Guinea but quickly reached the capital Conakry because patients and their contacts traveled there, most of the time to search for better health care. The Ebola outbreaks that occurred in 1995 in the Democratic Republic of Congo and in 1996 in Gabon were both rural [6,7].

Our results show that nearly 19% of patients admitted to the ETC for Ebola virus infection were healthcare workers. This could be explained by a weak compliance to WHO recommendations for preventive measures. It could also be explained by the fact that the healthcare workers are currently exposed to a virus and a disease they are not familiar with. Moreover, patients who come to the hospital may be those with the most severe presentations and a very high viral load in blood, increasing the risk of transmission. Therefore, efforts should be made at all levels of the healthcare system to obtain the required equipment and especially to apply protective measures in all healthcare facilities of the country.

Ebola virus human infection initially presents with nonspecific symptoms such as fever, vomiting, and severe diarrhea. In previous outbreaks, 25% of patients presented with a visible hemorrhage, which is consistent with our study [8]. These symptoms do not necessarily suggest Ebola infection for physicians working in regions that are endemic for malaria and salmonella infection, which can promote the spread of EVD. This stresses the importance of a careful differential diagnosis and laboratory confirmation for patients with such symptoms. Digestive signs were the most frequent in our series and in that of Bwaka [9]. Hemorrhagic signs remained infrequent. The same author reported no fever on admission in 10% of the 103 analyzed patients. Fever was reported in only 72% of our patients: this could be explained by the non-adequate assessment of temperature in epidemic settings with work overload for healthcare personnel.

The case-fatality rate was lower in our patients than in previous case-series: 88% during the Zaire outbreak in 1976, and 90% in Congo - Brazzaville in early 2003. The better prognosis in our patients may be explained by their management in the ECT, probably leading to an improved outcome. However the previously reported death rate of 89% associated with ZEBOV proves the very high pathogenicity of the virus [10]. There is currently no prophylaxis or etiological treatment for Ebola virus infection. Accordingly, the current treatment is only supportive [8].

5. Conclusion

This first outbreak in Conakry was mainly characterized by the young age of predominantly male patients, working in the

informal economical sector, or in medical and paramedical occupations. The main clinical factor statistically associated with lethality was hemorrhage. More efforts are needed to both prevent new cases and improve the outcome of those infected, in order to finally be able to put the outbreak to an end.

Authors' contributions

M. Barry (designed the study, wrote the article, performed the statistical analysis, proofread the article), F.A. Traoré (designed the study, wrote the article, performed the statistical analysis, proofread the article), F.B. Sako (performed the statistical analysis, proofread the article), D.O. Kpamy (performed the statistical analysis), E.I. Bah (proofread the article), M. Poncin, S. Keita (proofread the article), M. Cisse (proofread the article), A. Touré (performed the statistical analysis, proofread the article).

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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