

Analyzing the Effects of the Ebola Virus Disease Outbreak on Maternal and Child Health Services in the Health District of Beyla, Guinea

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Abstract: While more efforts were needed to enhance maternal and child health services in Guinea, the country experienced the worst and longest Ebola virus disease outbreak in 2014. The aim of this study was to analyze the effects of the 2014 Ebola virus disease outbreak on antenatal care visits, institutional deliveries and vaccine coverage among children aged 0 to 11 months in the health district of Beyla in Guinea. This was an ecological study based on aggregated data from the public health facilities of the district health of Beyla, that covered three distinct periods related to the Ebola virus disease outbreak: pre-Ebola (February 1st 2013 to January 31st 2014), intra-Ebola (February 1st 2014 to January 31st 2015) and post-Ebola (February 1st 2015 to December 31st 2015). Antenatal care visits, institutional deliveries and vaccination coverage of children aged 0 to 11 months significantly decreased during the intra and post-Ebola periods. The average of antenatal care visits (third visit or more) declined from 123% (pre-Ebola period) to 85% and 65% during the intra and post-Ebola periods respectively. Institutional deliveries declined from 40% to 35% then to 30% respectively ($p < 0.001$). Also, the average of vaccination coverage declined from 86% to 65% then to 56% respectively for BCG ($p < 0.001$), from 90% to 50% then to 52% for Pentavalent-3 ($p < 0.001$), and from 84% to 33% then to 48% for Oral Polio vaccine (third dose) ($p < 0.001$). Ebola virus disease outbreak led to persistent decrease in antenatal care visits, institutional deliveries and vaccination coverages among children aged 0 to 11 months in the district health of Beyla intra and post Ebola outbreak. Further studies, using qualitative research methods, that explore perceptions of communities and women will better guide health response during outbreak, strengthen health systems and prevent future Ebola outbreak in Guinea.

Keywords: Ebola, Antenatal Care Visits, Institutional Deliveries, Vaccination, Guinea

1. Introduction

Guinea is one of the countries in the world with high maternal and child mortality rates [1]. In 2012, maternal and child mortality rates in the country were 724 deaths per 100,000 live births and 67 infant deaths per 1000 live births respectively [2].

In a bid to achieve the Millennium Development Goals by 2015, efforts were made by Guinean Ministry of Health and

other health stakeholders to increase women and children access to health care services between 2005 and 2012 [3]. However, despite deliberate health interventions, access to health care services remain poor for women and children in Guinea. During this period, the proportion of women who received antenatal care from qualified health care workers (HCW) increased from 82% to 85% and institutional deliveries increased from 38% to 45% [2]. Also, the proportions of vaccination coverage of children aged 0 to 11

months for BCG (tuberculosis), the first dose of pentavalent and first dose of oral polio vaccine (OPV) were 76%, 82% and 85% respectively [4].

However, these achievements in maternal and child health indicators were compromised by the Ebola virus disease (EVD) outbreak in West Africa, which lasted from 2014 to 2016 and affected 3,811 people in Guinea resulting in 2,543 deaths [5]. Furthermore, health systems in affected countries were negatively impacted by the death of HCW, restriction of health services, and decline in health facilities attendance [6-8]. These limitations resulted in significant reduction of health care services [9, 10]. Maternal health services, including obstetric cares (deliveries and cesarean-section), would be among the most affected health services since the risk of exposure to blood and body fluids was higher during the delivery of such services. A study in the health district of Macenta in Guinea reported a 62% drop in the number of institutional deliveries during the outbreak [11]. In addition, vaccination activities could also experience a significant decline, because during the EVD outbreak, HCW were asked to avoid direct contact and use of needles during care wherever infection control measures were poor [12, 13]. The epidemic crisis could also interrupt the supply chain for vaccines, especially in remote areas. Delamou et al recently reported a significant decrease in the number of children vaccinated during the outbreak in the Forest Guinea region [14].

However, the effect of the EVD outbreak on maternal and child health remain poorly documented in rural Guinea. A better understanding of this effect especially in the post-epidemic period would generate information to guide interventions to strengthen the health system in the post-Ebola period, particularly in improving maternal and child health. The aim of this study was to analyze the effects of the EVD outbreak on intra and post-epidemic coverages of antenatal care, institutional deliveries and vaccine coverage in children aged 0 to 11 months in the health district of Beyla in Guinea.

2. Methods

2.1. Setting

Guinea, located in West Africa, had more than 10 million inhabitants in 2014 [15]. Its population is predominantly rural (67%) with an illiteracy rate of 34% [2]. The public health system is composed of 38 health districts, 30 of which were affected by the EVD outbreak.

The health district of Beyla is located in the south-eastern part of the country at 1,020 km from the capital city along with a population of 326 000 inhabitants in 2014 [15]. The district reported 46 confirmed cases with 27 deaths (59%), including one health care worker [16]. Its public health system is composed of a district hospital, a Communal Medical Center, 15 health centers and 29 health posts [17]. The first suspected case of EVD in the district was recorded in August 2014 and the last in January 2015 [18].

2.2. Study Type and Period

This was an ecological study based on an aggregated data from the public health facilities of district over three distinct periods related to the EVD outbreak: pre-Ebola (February 1st, 2013 to January 31st, 2014), intra-Ebola (February 1st, 2014 to January 31st, 2015) and post-Ebola (February 1st to December 31st, 2015).

2.3. Study Population

All women aged 15 to 49 years who used antenatal and institutional care services and children aged from 0 to 11 months vaccinated through the extended program of immunization (EPI).

2.4. Sources, Data Variables and Data Collection

Data were extracted from the district health office monthly reports. For children aged from 0 - 11 months, data were collected on vaccines which include: oral polio (for poliomyelitis), pentavalent (for diphtheria, pertussis, tetanus, hepatitis B and Haemophilus influenzae type B), BCG (for tuberculosis), measles, and yellow fever.

For women aged 15 to 49 years old the following variables were considered: women who had three or more antenatal visits (ANC-3/4), institutional deliveries (normal delivery and caesarean section).

A standardized electronic Excel spreadsheet (version 2013) was prepared and used to collect information from the district health officer monthly reports. Data were collected between September 2015 and January 2016.

2.5. Analysis and Statistics

Data from the excel spreadsheet were analyzed using Microsoft office Excel (version 2013) and then OpenEpi (version 3.01). Results were presented using proportion (quarterly and annual trends) and the Pearson Chi-square test was used to compare the annual coverage of three distinct period. The significance level was set at $P < 0.05$.

Antenatal care and institutional deliveries coverages were estimated by using the annual proportion of expected pregnancy number at national level (0.045). Vaccination coverage was calculated by using on the annual proportion of children aged from 0 - 11 months at national level (0.04) [4]. For each coverage, the annual population of the district was considered. Caesarean section rate was determined by dividing the number of caesarean by the total number of institutional deliveries (normal deliveries + caesarean).

3. Results

3.1. Trends of Antenatal Care Coverage

During the pre-Ebola period, the quarterly coverage of ANC-3/4 in the health district of Beyla decreased from a peak of 146% (February – April, 2013) to 87% (November 2013 – January, 2014) (Figure 1).

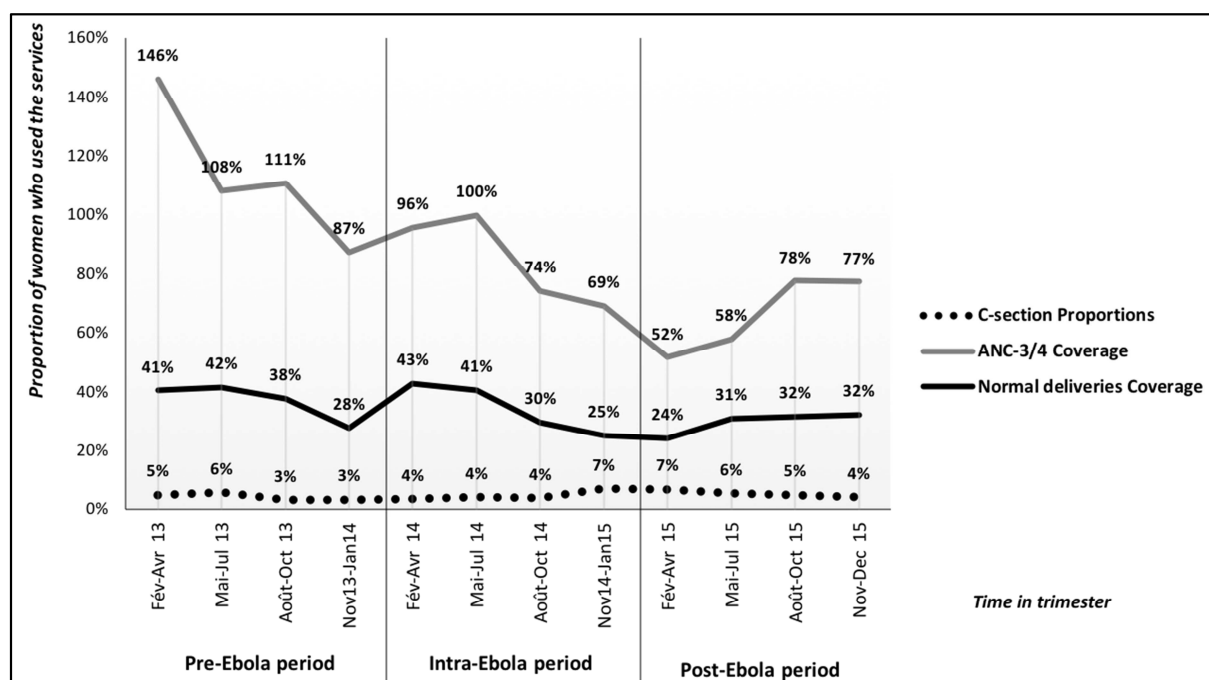


Figure 1. Quarterly trends of ANC-3/4, normal deliveries and Caesarean section coverage during the pre, intra and post-Ebola periods in the health district of Beyla in Guinea, 2013-2015.

C-section: caesarean section.

ANC-3/4: three or more antenatal care.

During the intra-Ebola period, it decreased from a coverage of 100% (May - July, 2014), to 69% in the last quarter (November 2014 – January, 2015). In the post-Ebola period, the trend was on the rise from 52% (February and April, 2015) to 77% (November and December, 2015).

The annual coverage of ANC-3/4 decreased from 123% in the pre-Ebola period to 85% and 65% during the intra-Ebola and post-Ebola period respectively. (Table 1).

Table 1. Comparison of maternal indicators coverage during pre, intra and post-Ebola periods in the health district of Beyla in Guinea (2013-2014 and 2015).

Indicators	Periods								
	Pre-Ebola	Intra-Ebola	P-value	Intra-Ebola	Post-Ebola	P-value	Pre-Ebola	Post-Ebola	P-value
	Feb 1 st , 2013 - Jan 31 st , 2014	Feb 1 st , 2014 - Jan 31 st , 2015		Feb 1 st , 2014 - Jan 31 st , 2015	Feb 1 st - Dec 31 st , 2015		Feb 1 st , 2013 - Jan 31 st , 2014	Feb 1 st - Dec 31 st , 2015	
Maternal health									
ANC-3/4 ^a	123%	85%	NA	85%	65%	< 0.001	123%	65%	NA
Normal deliveries	40%	35%	< 0.001	35%	30%	< 0.001	40%	30%	< 0.001
Caesarian-Section	5%	4%	0.251	4%	6%	0.003	5%	6%	0.063

Legend of table.

[a]: ANC-3/4: three or more antenatal care visits.

3.2. Trends in Institutional Deliveries Coverage

Institutional deliveries coverage declined over the pre-Ebola period from 41% (February – April, 2013) to 28% (November 2013 and January, 2014) (Figure 1). The trend was similar during the intra-Ebola period, declining from 43% (February – April, 2014) to 25% during the quarter

(November 2014 – January, 2015). In the post-Ebola period, the trend increased from 24% (February – April, 2015) to 31% in the following quarter, then got stabilize around 32% until the end of 2015.

The annual coverage of institutional deliveries significantly decreased from an average of 40% in the pre-

Ebola period to 35% in the intra-Ebola period then to 30% in the post-Ebola period ($p < 0.001$) (Table 1).

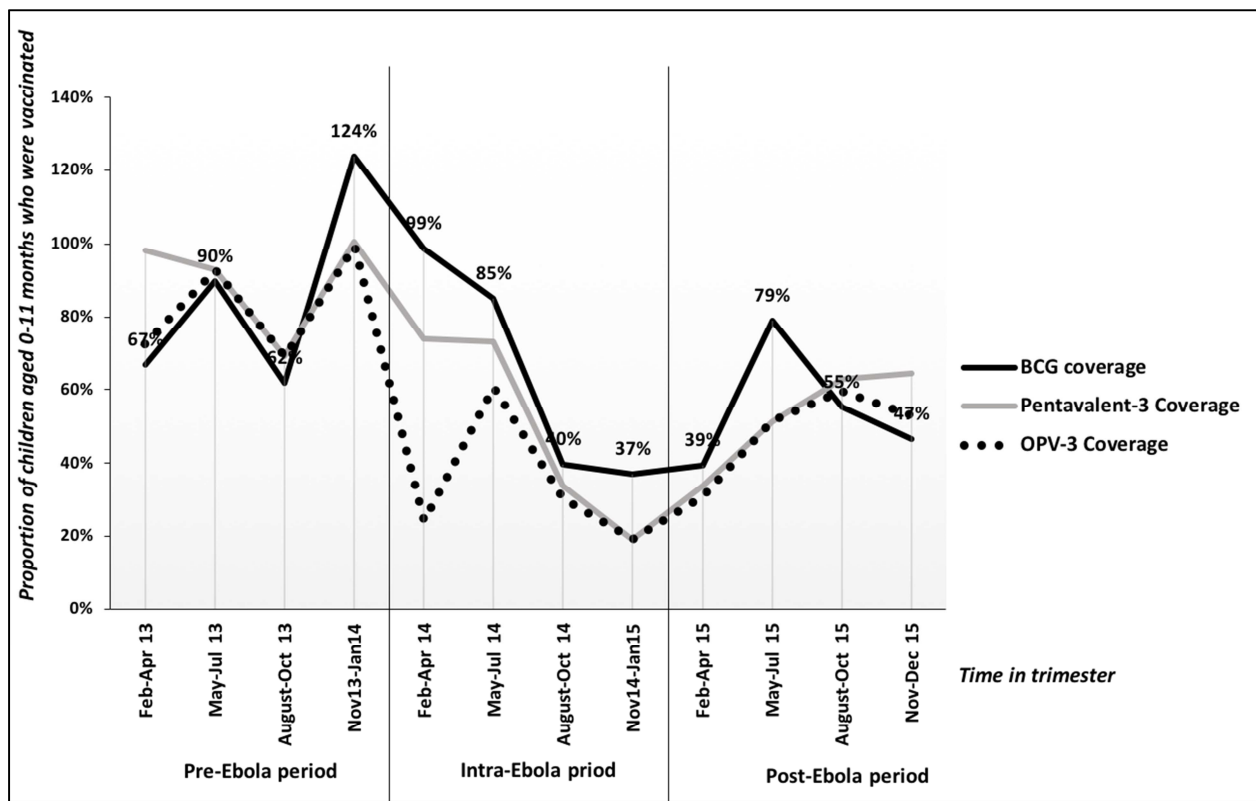
The proportion of caesarean sections remained relatively stable over the three distinct periods, between 3% and 6% in the pre-Ebola period, and between 4% and 7% during the intra- and post-Ebola periods (Figure 1).

3.3. Trends in Vaccination Coverage

During the pre-Ebola period, BCG coverage increased from 67% (February – April, 2013) to a peak of 124% between the quarter (November 2013 - January 2014) (Figure 2). In the intra-Ebola period, it fell from a coverage of 99%

in the quarter (February – April, 2014) to 37% in the quarter (November 2014 – January, 2015). After the outbreak, it increased from 39% (February and April 2015) to 79% in the

following quarter, before falling to 47% during the last quarter (November – December, 2015) (Figure 2).



Pentavalent-3: third dose of Pentavalent vaccine; BCG: Bacille Calmette-Guerin; OPV-3: 4th dose of polio vaccine.

Figure 2. Quarterly trends of BCG, Pentavalent-3 and OPV-3 coverage during pre, intra and post-Ebola periods in the health district of Beyla in Guinea, 2013-2015.

The average coverage of BCG significantly decreased from 86% in the pre-Ebola period to 65% in the intra period and then to 56% in the post-Ebola period ($p < 0.001$) (Table 2).

Table 2. Comparison of child health indicators coverage during pre, intra and post-Ebola periods in the health district of Beyla in Guinea (2013-2014 and 2015).

Periods	Pre-Ebola			Intra-Ebola			Post-Ebola		
	Feb 1 st , 2013 - Jan 31 st , 2014	Feb 1 st , 2014 - Jan 31 st , 2015	P-value	Feb 1 st , 2014 - Jan 31 st , 2015	Feb 1 st , 2014 - Jan 31 st , 2015	P-value	Feb 1 st , 2013 - Jan 31 st , 2014	Feb 1 st , 2014 - Jan 31 st , 2015	P-value
Child health									
BCG	86%	65%	< 0.001	65%	56%	< 0.001	86%	56%	< 0.001
Pentavalent-3 ^b	90%	50%	< 0.001	50%	52%	< 0.001	90%	52%	< 0.001
OPV-4 ^c	84%	33%	< 0.001	33%	48%	< 0.001	84%	48%	< 0.001

[b]: Pentavalent-3: third dose of pentavalent vaccine.

[c]: OPV-4: fourth dose of polio vaccine.

NA: Not applicable.

In the pre-Ebola period, the coverage of the third dose of the pentavalent vaccine waved across quarters between 98% and 101% (Figure 2). During the intra-Ebola period, it drastically dropped from 74% in the quarter (February – April, 2014) to 19% in the quarter (November 2014 – January, 2015). In the post-Ebola period, the coverage had a positive trend ranging from 34% between (February and

April, 2015) to 65% (November - December, 2015). The annual coverage of the third dose of pentavalent vaccine significantly decreased from 90% in the pre-Ebola period to 50% in the intra-Ebola period and to 52% over the post-Ebola period ($p < 0.001$) (Table 2).

During the pre-Ebola period, the coverage of the fourth dose of polio vaccine also waved between 73% in the quarter

(February – April, 2013) and a peak of 99% in November 2014 - January 2015 quarter (Figure 2). While the intra-Ebola period, it increased from 24% (February and April 2014) to 61% (May – July, 2014) before falling back to its lowest coverage (19%) over the quarter November 2014 - January 2015. During the post-Ebola period, polio vaccine coverage had a positive trend ranging from 31% (February – April, 2015) to 47% (November – December, 2015). The annual coverage of the fourth dose of polio vaccine significantly decreased from 84% over the pre-Ebola period to 33% during the intra-Ebola period and to 48% the post-Ebola period ($p < 0.001$) (Table 2).

4. Discussion

Our study aimed to analyze the effect of the 2014 Ebola virus disease outbreak on maternal and child health (MCH) in rural Guinea.

The findings show a decline in antenatal care (ANC) visit coverage, institutional deliveries and vaccination of children (aged 0 to 11 months) during and even after the Ebola outbreak. Delamou et al and Camara et al also reported similar effects of Ebola outbreak on maternal and child health services in Forest Guinea, urging efforts to improve post Ebola health services [11, 14]. The decline in health service utilization may be explained by the health workers and communities' fear of contracting Ebola virus disease and thus, restricting provision of health care services. Moreover, the fact that all the focus was on the fight against the outbreak may have also played a role [9, 19]. Thus, qualitative studies exploring community perceptions of the Ebola outbreak would contribute to better understanding of the persistence of low utilization of maternal and child health services in the post-Ebola period and to guiding recovery interventions.

Our study showed that ANC visit coverage decreased by more than half (58%) in the post-Ebola period, compared to pre-Ebola level. This finding represents a major setback to the country's effort to increase access of pregnant women to health services, especially in rural areas where obstetric complications are common, often due to lack of follow-up during pregnancy [20]. Decrease in ANC visit coverage during the post-Ebola period could serve as an indicator to predict the risk of pregnancy complications and maternal deaths following Ebola virus disease outbreak in the health district of Beyla, which is one of the most remote districts in the country, and probably facing access to obstetric care challenges [21].

Furthermore, half of children who benefited from vaccination before the Ebola outbreak were deprived of it during the Ebola outbreak period and more than 30% continued to lack access during the post-Ebola period. The vaccination campaigns as well as the routine activities (facility-based and outreach strategies) might have been interrupted during the outbreak because of community resistance and hostilities and/or a probable dysfunction of the vaccines supply chain.

In addition, the use of needle for some vaccines such as pentavalent could, because of fear, prevent both users and providers from receiving or administering such vaccines. The drop in the vaccination coverage among children, especially in rural areas such as Beyla has a great implication. After several years of efforts to improving child health in the country through vaccination activities, it is urgent and essential to catch-up on the vaccination of children who missed out the opportunities during the Ebola outbreak. Therefore, sustaining the routine vaccination activities regardless of any epidemic context would help to stay in line with target 4 of the Sustainable Development Goals [3].

The retrospective nature of our study was its main limitation. The Ebola outbreak context could have affected the quality of the health data reporting system, hence, affecting the quality of data we used in the study. Nevertheless, this study has the advantage of using data from all the public health facilities of the health district of Beyla over a period of three years; this allows a better comparison of the study variables.

5. Conclusion

This study showed the impact of the Ebola virus disease outbreak on maternal and child health services in the health district of Beyla. The results highlighted that the outbreak led to a steady decline in antenatal care coverage, institutional deliveries and vaccination of children aged 0 to 11 months. Therefore, the study calls for efforts to strengthen and maintain the health system along with maternal and child services being resilient and responsive during future outbreaks. There is also need for qualitative investigations exploring the community perceptions to help better guide and revitalize health programs in Guinea.

Conflict of Interest

All the authors do not have any possible conflicts of interest.

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References

- [1] WHO | World Health: World Health Statistics data visualizations dashboard 2019. Monitoring health for the SDGs. [Internet] [cited 2019 May 22]; Available from: <http://apps.who.int/gho/data/node.sdg.tp-1?lang=en>
- [2] Institut National de la Statistique, INS; Ministère du Plan et de la Coopération Internationale. Annuaire Statistique 2016. Conakry, Guinée; 2017. [Internet] [cited 2019 May 22]. Available from: http://www.stat-guinee.org/images/Publications/INS/annuelles/INS_annuaire_2016.pdf

- [3] Nations Unies. Rapport 2015. Objectifs du Millénaire pour le développement. [Internet] [cited 2017 Apr 5]. Available from: http://www.un.org/fr/millenniumgoals/reports/2015/pdf/rapport_2015.pdf
- [4] Institut National de la Statistique INS; Ministère du Plan et de la Coopération Internationale. Enquête Démographique et de Santé et à indicateurs multiples (EDS-MICS-IV) 2012. [Internet] [cited 2019 May 22]. Available from: <https://dhsprogram.com/pubs/pdf/FR280/FR280.pdf>
- [5] World Health Organization. Ebola Situation Report - 30 March 2016. Ebola [Internet] 2016 [cited 2017 Apr 4]. Available from: <http://apps.who.int/ebola/currentsituation/ebola-situation-report-30-march-2016>.
- [6] Brodin Ribacke KJ, Saulnier DD, Eriksson A, von Schreeb J. Effects of the West Africa Ebola Virus Disease on Health-Care Utilization - A Systematic Review. *Front public Heal* 2016; 4: 222.
- [7] Ly J, Sathananthan V, Griffiths T, Kanjee Z, Kenny A, Gordon N, et al. Facility-Based delivery during the Ebola Virus Disease Epidemic in Rural Liberia: Analysis from a Cross-Sectional, Population-Based Household Survey. *Kruk ME, editor. PLoS Med* 2016; 13: 1002096.
- [8] Elston JWT, Moosa AJ, Moses F, Walker G, Dotta N, Waldman RJ, et al. Impact of the Ebola outbreak on health systems and population health in Sierra Leone. *J Public Health (Oxf)* 2015; 158.
- [9] Sylla Thiam AD, Camara S, Carter J, Lama EK, Ndiaye B, Nyagero J, et al. Challenges in controlling the Ebola outbreak in two prefectures in Guinea: why did communities continue to resist? *Pan Afr Med J* 2015; 22.
- [10] McMahon SA, Ho LS, Brown H, Miller L, Ansumana R, Kennedy CE. Healthcare providers on the frontlines: a qualitative investigation of the social and emotional impact of delivering health services during Sierra Leone's Ebola epidemic. *Health Policy Plan* 2016; 31: 1232–9.
- [11] Camara BS, Delamou A, Diro E, Béavogui AH, El Ayadi AM, Sidibé S, et al. Effect of the 2014/2015 Ebola outbreak on reproductive health services in a rural district of Guinea: an ecological study. *Trans R Soc Trop Med Hyg* 2017; 1–8.
- [12] Delamou A, Beavogui AH, Kondé MK, van Griensven J, De Brouwere V. Ebola: better protection needed for Guinean health-care workers. *Lancet (London, England)* 2015; 385: 503–4.
- [13] Centers for Disease Control and Prevention C. Recommendations for Managing and Preventing Cases of Malaria in Areas with Ebola | Ebola Hemorrhagic Fever | CDC. 2015.
- [14] Delamou A, Ayadi AM El, Sidibe S, Delvaux T, Camara BS, Sandouno SD, et al. Effect of Ebola virus disease on maternal and child health services in Guinea: a retrospective observational cohort study. *Lancet Glob Heal* 2017; 5: 448–57.
- [15] Présidence de la République, Secrétariat Général du Gouvernement. Décret D/2015/229/PRG/SGG portant publication des résultats définitifs du troisième recensement général de la population et de l'habitation réalisé du 1er Mars au 02 Avril 2014; 2015.
- [16] Coordination Nationale de lutte contre Ebola. Rapport de la Situation Epidémiologique Maladie à Virus Ebola en Guinée, 2016 (Coordination Ebola no. 702).
- [17] Direction Préfectorale de la Santé (DPS) de Beyla. Rapport de la situation sanitaire de Beyla, 2015 (DPS-Beyla no. 34).
- [18] Professeur René Migliani. Situation de l'épidémie de fièvre hémorragique à virus Ebola en Guinée. Bilan des données disponibles le 24 mai 2015; Available from: http://reliefweb.int/sites/reliefweb.int/files/resources/situation_epidemie Ebola guinee_24_mai_2015.pdf
- [19] Delamou A, Hammonds RM, Caluwaerts S, Utz B, Delvaux T, WHO, et al. Ebola in Africa: beyond epidemics, reproductive health in crisis. *Lancet (London, England)* 2014; 384: 2105.
- [20] Mselle LT, Kohi TW. Healthcare access and quality of birth care: narratives of women living with obstetric fistula in rural Tanzania. *Reprod Health* 2016; 13: 87.
- [21] Kyei-Nimakoh M, Carolan-Olah M, McCann T V. Access barriers to obstetric care at health facilities in sub-Saharan Africa—a systematic review. *Syst Rev.* 2017 Dec 6; 6 (1): 110.