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# Infectious Diseases with Epidemic Potential: A Retrospective Study from 2005 to 2014 in The Infectious and Tropical Diseases Department of The Point G University Hospital in Bamako, Mali

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## ABSTRACT

***Aim:*** *To study the epidemiology of Diseases with Epidemic Potential (DEP) in hospitalization at the infectious and tropical diseases department of the Point G University Hospital in Bamako, Mali.*

***Methods:*** *We carried out a descriptive retrospective study of inpatients' charts in the department from 2005 to 2014. As diseases with epidemic potential, we targeted mmeningitis due to Neisseria meningitidis, measles, chickenpox, viral haemorrhagic fevers (VHF). All suspected or confirmed cases of diseases with epidemic potential from 2005 to 2014 were included in our study. Data were entered in and analyzed with SPSS version 20 software. We obtained the consent of the head of the department to collect and use the data.*

***Results:*** *We selected 58 out of 2, 546 patients (2.8%) identified during the study period. Measles was the most frequent with 58.6% (34/58) followed by meningitis N. meningitidis with 32.8% (19/58), viral haemorrhagic fevers with 5.2% (3/58) and chickenpox with 3.4% (2/58). The sex ratio of patients was 1.6 (36 males for 22 females). The mean age was 31.50 ± 10.60 years old for measles, 38.27 ± 11.64 years old for viral haemorrhagic fevers, 38.26 ± 16.03 years old for meningitis due to Neisseria meningitidis, and 39.98 ± 15.86 years old for chickenpox. All chickenpox cases three fourths (76.5%) measles cases were referrals. The hospital stay lasted from 7.67 ± 2.89 days for viral haemorrhagic fevers to 11.58 ± 13.27 days for meningitis due to Neisseria meningitidis. The most fatal disease with epidemic potential was meningitis with 68.4% death rate. None of our patients with chickenpox died at the hospital.*

***Conclusion:*** *Early management of these diseases with epidemic potential will significantly reduce their spread, morbidity and their mortality.*

## Keywords
Epidemiology, Diseases with epidemic potential, Bamako.

## Introduction
In the last decades, we have witnessed Progress in the fight against infectious diseases in terms of vaccination coverage, in particular through the Expanded Program on Immunization (EPI), disease control (global initiatives to fight HIV, tuberculosis and malaria for example) and improved hygiene, in particular by increasing access to drinking water sources. As a result, an increase in the life expectancy of the population has been noticed mainly due to the decrease in infantile mortality. For example, the surveillance of meningitis cases in 2013 in Mali was quite illustrative. The national health information system reported through a weekly bulletin and an annual report in 2013 [1]. Currently, noncommunicable diseases and injuries are emerging as the leading cause of morbidity and mortality world wide. Whereas in high- or middle-income countries more than 90% of premature deaths are due to noncommunicable diseases, infectious diseases are still the leading cause of premature deaths in low income countries with at least 70% of lost years of life. Epidemics are ubiquitous, but populations in low-income countries experience it the most [2]. Fragile health systems, insufficient investments in surveillance, in early detection and response, as well as weak international support for emergency response are all factors that hamper the identification and control of epidemics, resulting in excessive morbidity and mortality in low-income countries.

A key player in the management of these epidemics remain hospitals in low-income countries where the health system is often poorly organized. During an epidemic, patients, who should normally be managed in the peripheral health structures, often end up in the hospitals due to either the error in the referrals or the complication of the patients' conditions. These hospitals should then play an important role in the epidemiological surveillance, in particular by notifying cases of diseases with epidemic potential [2,3]. The Point G University Hospital is the third level of reference in the Malian health pyramid and houses the only infectious and tropical disease department in the country. This study was aimed to determine the frequency of diseases with epidemic potential, to describe the socio-demographic characteristics and to determine the morbidity and mortality indicators in these patients.

## Methods
### Study type and period
This was a 10 year descriptive retrospective study of the epidemiology of diseases with epidemic potential in hospitalization in the department of infectious and tropical diseases of the Point G University Hospital from 2005 to 2014. A disease with epidemic potential is an infectious disease, contagious or not, which appears in high numbers in a particular community or region during a given time [2].

### Study population
All inpatients during the study period for a disease with epidemic potential were included. Our targeted diseases with epidemic potential were meningitis due to *Neisseria meningitidis*, measles, chickenpox, viral haemorrhagic fevers.

### Inclusion criteria
All suspected or confirmed cases of these diseases with epidemic potential were included.

### Non-inclusion criteria
All other cases different from these targeted diseases with epidemic potential were not included into our study.

### Data collection and studied variables
The data were recorded from the inpatients' medical charts in the department of infectious and tropical diseases in Point G. The variables studied were: diagnoses of inpatients; their socio-demographic characteristics (age, gender, profession, and residence) and the morbidity and mortality indicators of the targeted diseases with epidemic potential.

### Data entry and analysis
The data were entered and analyzed with SPSS version 20 software. Categorical variables were described by frequencies, quantitative variables by the mean ± standard deviation.

### Ethical considerations
We obtained the consent from the data manager prior to data mining. The medical charts of inpatients were analyzed with confidentiality. Indeed, the identity of each patient was kept anonymous because the individual survey sheet only had a coded anonymous number, which was used for data entry. After exploitation, the medical charts were immediately put back in the secure recording place in the hospital.

## Results
### The frequency of diseases with epidemic potential in hospitalization in our study
Among the 58 cases of disease with epidemic potential, measles was the most frequent (58.6%) followed by meningitis due to *Neisseria meningitidis* (32.8%) and chickenpox (3.4%) (Table 1).

Meningitis due to *Neisseria meningitidis* was the disease with the most constant epidemic potential during the study period, with one (1) to seven (7) cases each year with the peak in 2011. In 2010, 29 of 34 cases of measles during the study were recorded. Only one (1) case in 2010 and another case in 2011 were recorded for chickenpox. Viral hemorrhagic fevers were limited to dengue with two (2) sporadic cases in 2008 and three (3) others in 2013 **(Table 2)**.

### Socio-demographic characteristics of inpatients with diseases with epidemic potential in our study
**Viral Hemorrhagic Fevers (VHF):** all patients were males. The age group of 26-35 years old represented 66.7% and the mean age was 38.27 ± 11.64 years old. Patients were singles in 66.7%. The cases of VHF came from Koulikoro, the 2nd region of the country and traders in 66.7%.

| Diseases with epidemic potential | Number of cases | % among diseases with epidemic potential N=58 | % among all inpatients N=2,546 |
|---|---|---|---|
| Measles | 34 | 58.6 | 1.3 |
| Meningitis due to *N. meningitidis* | 19 | 32.8 | 0.8 |
| Viral hemorrhagic fevers (VHF)* | 3 | 5.2 | 0.1 |
| Chickenpox | 2 | 3.4 | 0.1 |

**Table 1**: Frequency of diseases with epidemic potential in the infectious and tropical diseases department of the Point G University Hospital from 2005 to 2014.

*VHF: only dengue.

| Diseases with epidemic potential | Referrals | | | | Total | |
|---|---|---|---|---|---|---|
| | Yes | | No | | | |
| | N | % | N | % | N | % |
| Measles | 26 | 76.5 | 8 | 23.5 | 34 | 100.0 |
| Meningitis due to *N. meningitidis* | 7 | 36,8 | 12 | 63.2 | 19 | 100.0 |
| Viral hemorrhagic fevers (VHF)* | 2 | 66.7 | 1 | 33.3 | 3 | 100.0 |
| Chickenpox | 2 | 100.0 | 0 | 0,0 | 2 | 100.0 |
| Total | 37 | 63.8 | 21 | 36.2 | 58 | 100.0 |

**Table 2**: Diseases with epidemic potential sorted by mode of admission in the in the infectious and tropical diseases department of the Point G University Hospital from 2005 to 2014.

*VHF: Only dengue.

**Meningitis due to *Neisseria meningitidis*:** Females were more affected with 52.6%. The 26-35 years old age group represented 42.1% with an average age of 38.26 ± 16.03 years old. Patients were singles in 59.9%, they were from Bamako in 84.2% and they were housekeepers in 47.4%.

**Measles:** Males were more represented with 64.7% or a sex ratio of 1.83. Patients younger than 16 years old represented 52.9% with an average age of 31.50 ± 10.60 years old. Patients were singles in 73.6%, they resided in Bamako in 79.4% and they were unemployed in 46.0%.

**Chickenpox:** All patients were males and singles. The age groups of 16-25 years old and 36-45 years old represented 50.0% each. The mean age was 39.98 ± 15.86 years old. The patients all resided in Bamako (Commune 2 and Commune 5 with 50.0% each) and they were farmers and students with 50.0% each.

## Hospital indicators of morbidity and mortality of cases of diseases with epidemic potential in our study

### Mode of admission

Referral to the department was the most frequent mode of admission of patients with diseases with epidemic potential (63.8%) as followed: all cases of chickenpox (100%) followed by 3/4$^{th}$ cases of measles (76.5%) (Table 3).

The delay in diagnostic during the hospital stay in the department.

The diagnosis of VHF was made before referral in the department, on average -1.33 ± 0.57 days. The diagnosis of measles was most quickly made in the department on average in 6.35 ± 3.35 days followed by meningitis due to *Neisseria meningitidis* on average in 9.87 ± 15.05 days. The diagnosis of cases of chickenpox took the longest time (Table 4).

| Diseases with epidemic potential | Delays in the diagnostic (in days) | | | | |
|---|---|---|---|---|---|
| | N | Min. | Max. | Mean | Standard deviation |
| Measles | 34 | 3.00 | 21.00 | 6.35 | 3.35 |
| Meningitis due to *N. meningitidis* | 19 | -1.00 | 60.00 | 9.87 | 15.05 |
| Viral hemorrhagic fevers (VHF)* | 3 | -2.00 | -1.00 | -1.33 | 0.578 |
| Chickenpox | 2 | 6.00 | 16.00 | 11.00 | 7.07 |

**Table 3**: Delays in the diagnostic of diseases with epidemic potential in the infectious and tropical diseases department of the Point G University Hospital from 2005 to 2014.

*VHF: Only dengue.

| Diseases with epidemic potential | Mean duration of hospital stay (in days) | | | | |
|---|---|---|---|---|---|
| | N | Min. | Max. | Mean | Standard deviation |
| Measles | 34 | 3 | 27 | 7.06 | 4.96 |
| Meningitis due to *N. meningitidis* | 19 | 2 | 60 | 11.58 | 13.27 |
| Viral hemorrhagic fevers (VHF) | 3 | 6 | 11 | 7.67 | 2.89 |
| Chickenpox | 2 | 6 | 19 | 12.50 | 9.19 |

**Table 4**: Duration of hospital stay for patients with diseases with epidemic potential in the infectious and tropical diseases department of the Point G University Hospital from 2005 to 2014.

*VHF: Only dengue.

| Patient Disease | Deceased | | Cured | | Abandoned/ transferred | | Total | |
|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % |
| Viral hemorrhagic fevers (VHF) | 0 | 0,0 | 3 | 100,0 | 0 | 0,0 | 3 | 100,0 |
| Meningitis due to *N. meningitidis* | 13 | 68,4 | 6 | 31,6 | 0 | 0,0 | 19 | 100,0 |
| Measles | 0 | 0,0 | 34 | 100,0 | 0 | 0,0 | 34 | 100,0 |
| Chickenpox | 0 | 0,0 | 2 | 100,0 | 0 | 0,0 | 2 | 100,0 |

**Table 5**: Distribution of cases of diseases with epidemic potential according to their method of discharge from hospital.

### Duration of hospital stay

The duration of hospital stay was shorter for patients with VHF (7.67 ± 2.89 days) and longer for patients with meningitis due to *Neisseria meningitidis* (11.58 ± 13.27 days) (Table 5).

### Mortality rate of diseases with epidemic potential

Meningitis due to *Neisseria meningitidis* was the only disease with epidemic potential with cases of death, its case fatality was high with 68.4% in our study.

## Discussion

Diseases with epidemic potential are most often studied in the general population. A study in a hospital setting may seem inappropriate. However, one of the interests of such study on these diseases in the hospital would be to evaluate the role of the

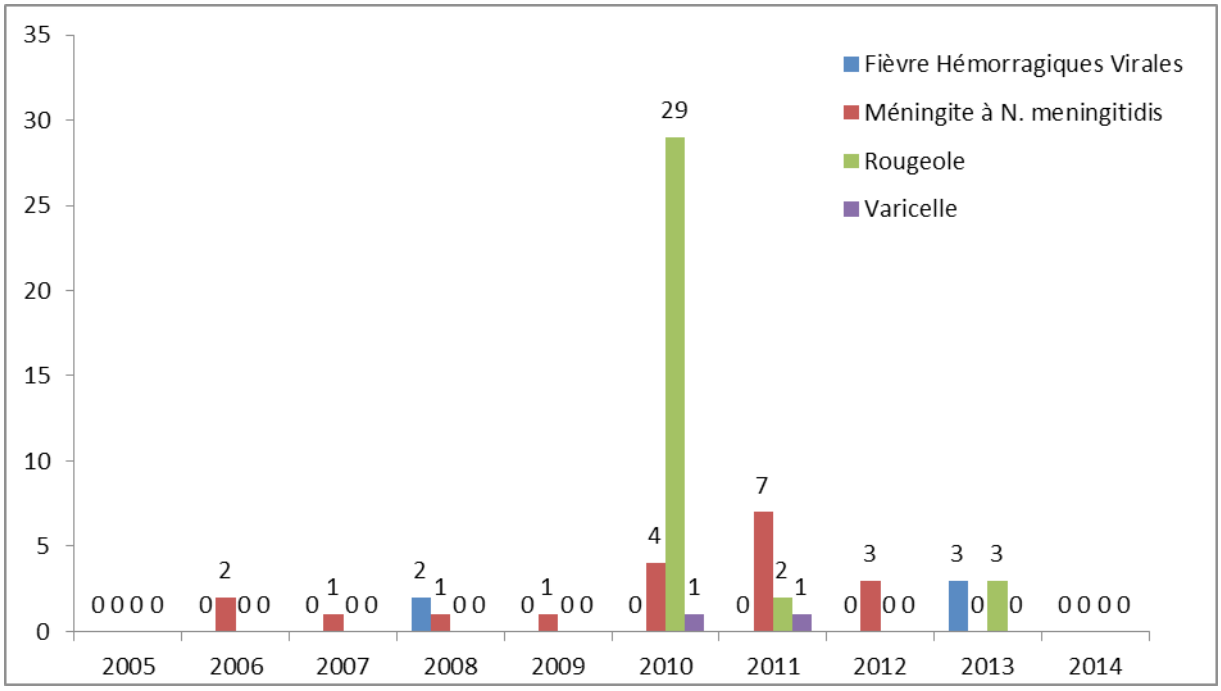


**Figure 1:** Annual frequency of diseases with epidemic potential in the infectious and tropical diseases department of the Point G University Hospital from 2005 to 2014.
Measles= rougeole; Meningitis= Méningites; Viral Hemorragic Fever = Fièvres hémorragiques virales et Chickenpx=varicelle.

hospital in their epidemiological surveillance. As a limitation, our study retrospective in design and based on the inpatient records that did not systematically include a mention on the mandatory reporting of cases. Nevertheless, cases were mentioned in the monthly report made by the department within the framework of the national health information system. Another limitation was that epidemiological investigation was not systematically done on each suspected or confirmed patient. Notion of contamination and effort to search possible contacts of the patients were mention for some patients. Our study made it possible to describe the epidemiological characteristics of these diseases encountered in the hospital.

## Viral Haemorrhagic Fevers (VHF)

Our series recorded three (3) cases all males including two (2) referrals. The age group of 26-35 years old was the most frequent with 66.7%.

The mean age was 38.27 ± 11.64 years old, which was younger than that of FOKAM V who reported an average age of 45 years old with 66.66% of females [4]. Mali like other West African countries has recorded cases of Ebola virus disease (EVD) with eight (8) cases in total including seven (7) confirmed and one (1) probable resulting in six (6) deaths. The last patient treated left the treatment center cured on December 2014 (date of the 2nd negative Ebola test). From that date, if no case had been reported within 42 days, the epidemic would be considered over in Mali [6]. EVD cases were managed at the National Disease Control Support Center (CNAM), Bamako, Mali. The infectious and tropical diseases department at the Point G University Hospital only responsible for training health workers across the country. In addition, the department helped to establish a patient sorting system at the entrance to the hospital during the EVD epidemic, which continues to operate today and could be an asset to avoid hospitalization of highly contagious cases at the Point G University Hospital.

Dengue and yellow fever are vector-borne and less contagious diseases, nevertheless they require measures such as contact tracing and mass vaccination (yellow fever) to contain an epidemic. We recorded two uncomplicated cases of dry dengue, all males, who were hospitalized in the department in 2008 and one case of yellow fever in a 5-year-old child in 2013. The diagnosis of these conditions must be rapid as well as their management because they are relatively very contagious and fatal. The low frequency of cases of these hemorrhagic fevers in our series could be due to the absence of their systematic search due to the weakness of the technical platform for laboratory diagnosis. A thesis that began to systematically search for Crimean-Congo hemorrhagic fever in hospitals in Nouakchott found nine (9) cases in 2009. Mali shares similarities with this country in terms of microbial ecology [7].

## Meningitis due to *Neisseria meningitidis*

In our study, 19 cases of meningitis were observed, including seven (7) referrals. A varying annual number of meningitis cases was observed with the peak recorded in 2011 and to a lesser extent in 2013. Female predominance with a sex ratio (M / F) = 0.9 was found while a Moroccan study found a male predominance with a sex ratio of 2 [8].

Our average age of 38.26 ± 16.03 years old was higher than that reported by the SANOU study in Burkina Faso on meningococcal

meningitis, which was 36.97 years old with the extremes of 15 and 93 years [9]. This difference could be explained by the duration of the study, which was 10 years in our case versus only 13 months for SANOU. This meningococcal meningitis by its epidemic potential does not spare any age group and is more serious especially in children under 5 years old. KEITA Y in Mali had also found that all age groups were affected by the infection, patients were mostly aged 0 to 11 months (43.3%) [10]. DIFFO SIAKWA CV reported that the mean age of its patients was 60 ± 10 months old, with a median age of 69.35 months, and the extremes of 1 and 172 months old [11].

AZHER E et al. found an average age of théier patients to be 4.5 years old and the peak frequency is between 6 and 14 years old. All these studies show that children are more affected by meningococcal meningitis and this can be explained by the immaturity of the immune system but often also by the virulence of the germs involved [8]. The over all mortality rate of meningococcal meningitis in the Burkina Faso series was 30.2%. It is lower than our 68.4%. This high mortality in our series would be due to immunosuppression HIV infection. In fact, nearly 78% of inpatients in the department are immunocompromised patients living with HIV infection [12]. These findings in the infectious and tropical diseases department of the University Hospital Point G may reflect the peaks in cases of meningococcal meningitis epidemics in the general population recorded in 2011 and in 2013. Young children can be affected, but they are increasingly protected by vaccination against meningitis. On the opposite side, adults, especially those with HIV immunosuppression, could be a vulnerable population for these infections.

## Measles

Our work recorded 34 cases of measles with 64.7% males, 23 of which were referrals. We found that the age group under 16 years old was the most affected with 52.9%. We did not find any work done in adult patients with measles in the sub-region. OUATTARA SN, in Mali, reported that the age group most represented was that of 0 to 5 years old, with 62.5% males [13]. As for DOUTCHI et al. in Niger, they noted that the median age of patients was 3.5 years old (range of 6 months old and 15 years old) as well as male predominance with 51% and over all mortality of 2.52. % [14]. Finally, DJADOU et al. in Lomé published an average age of 37.4 ± 10.6 months old with a sex ratio of 2.4. How ever, a total of 20 children (53%) had a history of measles vaccination [15]. All the authors deplore the problems of access to health care, the breaks in vaccines and the cold chain explain the low rates of vaccination coverage against measles and consequently the resurgence of epidemic centers. Despite the fact that vaccination remains the only means of prevention against measles.

LEVY-BRUHL D explained the reasons for the occurrence of the measles epidemic, which raged in France between 2008 and 2012. During this period, 23,600 cases of measles were declared, of which nearly 1,500 reported cases presented with serious pneumonia, 34 cases with a neurological complication (31 cases of encephalitis, one case of myelitis and two cases of Guillain-Barre) with 10 deaths including seven (7) occurred in subjects with a contraindication to vaccination due to immunosuppression [16].

## Chickenpox

Finally, the study revealed two (2) cases of chickenpox, all referrals and males. One case was recorded in each age group 16-25 years old and 36-45 years old. The mean age was 39.98 ± 15.86 years old. Chickenpox evolves through seasonal epidemics that occur in France at the end of winter and in spring. A predominantly mild childhood disease that exposes 50% of children to infection before 5 years old and 90% before 12 years old. In contrast, people from tropical countries are less likely to have contracted the disease during childhood and are more susceptible in adulthood [5].

In France, the study by KHOSHNOOD et al. showed that between 1 and 8 years old, the seropositivity rate drops from 15% to 89% [17]. The cases observed are before 5 years old (59%) and especially before 10 years old (89%).

Varicella is a highly contagious condition. The attack rate in a receptive subject is 86.6% after intra-family contact, 10 to 35% after less intimate contact within a community [5]. The complication rate is 3% in the 0-14 age group and 6% in those 15 and over. These are primarily secondary skin infections (26%) followed by secondary respiratory infections (23%) and ear, nose and throat (ENT) complications (24%) [5]. The most serious complications more often affect adults, most of whom die. Chickenpox is particularly feared in particular in immunocompromised subjects such as AIDS and in pregnant women. In France, vaccination has so far been adopted with restrictive recommendations according to the Opinion of the Superior Council of Public Hygiene of France [18]. Due to the vaccination, from 105 deaths per year on average before the vaccination period, mortality from chickenpox in the USA fell to five (5) cases in 2001 and six (6) in 2002 according to Nguyen et al. [19]. Chickenpox cases were referrals in our study because the health professionals at the referring health structures dreaded complications of the cases.

## Conclusion

We recorded 2.8% with diseases with epidemic potential i.e. 58 patients out of 2,546 inpatients from 2005 to 2014. Patients were males in 62.1% (36/58), and unemployed in 31.0% (18/58). Chickenpox and measles cases were almost if not all referrals. The hospital stay lasted 7.67 ± 2.89 days for cases of viral haemorrhagic fevers and 11.58 ± 13.27 days for cases of meningitis due to *Neisseria meningitidis*. The most frequent and most fatal diseases with epidemic potential were measles and meningitis due to *N. meningitidis* with 58.6% (morbidity) and 68.4% (mortality), respectively.

The diagnoses of viral haemorrhagic fever and meningitis due to *Neisseria meningitidis* must be made quickly to avoid complications and spread.

## References


1. Djilla M, Konake M, Kayentao K, et al. Evaluation du système de surveillance épidémiologique de la méningite dans le district sanitaire de la commune VI de Bamako de 2011 à 2013. MALI SANTE PUBLIQUE. 2014; 2: 25-27.
2. Mondonge V. La lutte contre les maladies à potentiel épidémique. Aperçu sur les épidémies en RD Congo en. 2007.
3. Cuzin L, Delpierre C. Épidémiologie des maladies infectieuses. EMC (Elsevier SAS, Paris), Maladies infectieuses. 2005; 8.
4. Fokam Vg. Issues des cas suspects et des personnes contacts de la maladie à virus Ebola au chu du point G de Bamako, Thèse, Med, Bamako. 2015; 264.
5. Haut Conseil de la Santé Publique(HCSP). Rapport : « Recommandations vaccinales concernant la varicelle » Commission spécialisée Sécurité Sanitaire (Séance du 05 juillet 2007).
6. https://www.santepubliquefrance.fr/content/download/51374/1113230
7. Ould Mohamed A. La fièvre hémorragique de Crimée-Congo dans un service de médecine interne du Centre Hospitalier National de Nouakchott: Etude portant sur 9 observations. Thèse, Méd, Dakar. 2009.
8. AZHER E. Les méningites purulentes chez l'enfant. Thèse, Med, Marrakech. 2014; 17.
9. SANOU A. Méningites Bactériémies (MB): aspects épidémiologiques, cliniques, bactériologiques et évolutifs. A propos de, 179 cas dans le, service de médecine interne du Centre Hospitalier Universitaire Souro Sanou de Bobo Dioulasso (CHUSS) de mars 2002 à avril 2003. Thèse, Med, Ouagadougou. 2004; 60.
10. Keita Y. Méningites bactériennes chez les enfants âgés de 0 à 15 ans hospitalises dans le service de pédiatrie du CHU-Gabriel Touré de janvier à décembre 2008. Thèse Med Bamako. 2010; 110.
11. Diffo Siakwa Cv. Epidémiologie des méningites à l'hôpital mère-enfants de Marrakech. 2013; 75.
12. Cissoko Y, Traore F, Dicko Ms, et al. Profile of Pathologies Diagnosed in Patients Hospitalized in a Ward of Infectious Diseases at the Era of HIV in Bamako, Mali West Africa. J Infect Dis Epidemiol. 2019; 5: 066.
13. Ouattara Sn. Évaluation de la surveillance épidémiologique de la rougeole, de la fièvre jaune, de la paralysie flasque aigue, du tétanos maternel et néonatal dans la région Sikasso. Thèse Med Bamako. 2012; 113.
14. Doutchi M, Ould Mohamed, Sayadi S, et al. Campagne de vaccination contre la rougeole en période de pic épidémique dans une zone à forte prévalence de malnutrition au Niger: cas du district sanitaire de Mirriah (Zinder). Pan African Médical Journal. 2017; 27: 240.
15. Djadou Ke, Wateba Im, Tchagbélé Ob, et al. Aspects actuels de la rougeole dans le service de pédiatrie au CHR de Tsévié (CHR-T). 2013; 1: 2.
16. Levy-Bruhl D. L'épidémiologie des maladies à prévention vaccinale en 2017. Succès et échecs de la politique vaccinale en France. 2017; 178.
17. Khoshnood B, Debruyne M, Lancon F, et al. Seroprevalence of varicella in the French population. Pediatr Infect Dis J. 2006; 25: 45-46.
18. Avis du Conseil Supérieur d'Hygiène Publique de France (section des maladies transmissibles) relatif à la vaccination contre la varicelle. Séance du 19 mars 2004. BEH. 2004; 28: 127-129.
19. Nguyen Hq, Jumaan Ao, Seward Jf. Decline in mortality due to varicella after implementation of varicella vaccination in the United States. N Engl J Med. 2005; 352: 450-458.