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Evaluation of the Acute Flaccid Paralysis Surveillance System in the Dioila Health District, Mali, 2020 to 2024

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ABSTRACT :

Introduction: The main obstacle to polio eradication is the circulation of poliovirus types 2 and 3 derived from vaccine viruses contained in the oral polio vaccine. Given the lack of prior studies and the low reporting rates of acute flaccid paralysis cases, we initiated this assessment in the Dioila health district to identify the challenges related to case reporting from 2020 to 2024. **Materials and methods:** This was a cross-sectional study of cases of acute flaccid paralysis recorded in the linear registry of notifiable diseases at the Dioila reference health center from 2020 to 2024 and the results of a survey conducted in August 2025. Case definitions from the CDC guidelines were used. Analysis was performed using Epi Info 7.2.6 software. **Results:** Of the 32 reported cases of acute flaccid paralysis, males were predominant (62.5%), with a male-to-female ratio of 1.6. Data quality was met in 76.6% of cases, simplicity in 84.7%, and responsiveness in 82.7%. Community health centers reported only 9.3% of cases. Forms were used in 59.3% of cases, and 9.3% were investigated within 48 hours. **Conclusion:** Underreporting of acute flaccid paralysis remains a reality in the Dioila district. There is also under investigation of cases. Data recording and archiving remain a concern.

KEYWORDS: Evaluation, system, surveillance, acute flaccid paralysis, Dioila

I. INTRODUCTION

Acute Flaccid Paralysis (AFP) is a clinical syndrome defined by the rapid onset of muscle weakness and decreased tone [1]. This condition is of particular concern due to its potential association with poliovirus, a historical cause of paralysis [1]. Poliomyelitis is a highly contagious disease caused by a human enterovirus called poliovirus [2]. Polioviruses (genus Enterovirus) of serotypes 1, 2, and 3 are transmitted from person to person via the fecal-oral route [3]. The incubation period lasts from 7 to 14 days for paralytic cases, and the period of contagiousness varies from approximately 3 to 35 days [3]. The infection almost exclusively affects children [3]. Immunity is specific to the serological type and lasts a lifetime [3]. Although poliovirus is the most well-known cause of AFP, several other pathogens and diseases can lead to similar manifestations [1]. Enteroviruses, particularly non-polio enteroviruses such as EV-D68 and EV-A71, have been implicated in epidemics [1]. The incidence of AFP varies across the world, with higher rates in areas with insufficient vaccination coverage [1]. Since 1988, when the World Health Organization (WHO) resolution for the global eradication of polio was adopted, the incidence of poliomyelitis has decreased by 99% worldwide [4]. Globally, wild polioviruses types 2 and 3 have been eradicated, and wild polio type 1 persists as an endemic disease in Afghanistan and Pakistan [4]. The main obstacle to polio eradication is the circulation of neurovirulent polioviruses of types 2 and 3 derived from vaccine viruses contained in the oral vaccine [4]. Between December 2022 and December 2023, the WHO recorded 128 cases of acute anterior poliomyelitis (AAP) due to circulating vaccine-derived poliovirus type 1 (VDPV1) and 321 cases of VDPV2 worldwide, primarily in Africa [4]. In Africa, with the aim of eradicating all forms of poliomyelitis, the region is combating outbreaks caused by circulating

vaccine-derived poliovirus type 2 (cVDPV2) [5]. Twenty-one African countries reported poliovirus outbreaks in 2020, but response activities were disrupted by the coronavirus disease (COVID-19) pandemic [5].

With the resumption of vaccination campaigns in July 2020, only nine countries reported outbreaks due to cVDPV2 in 2021, and 26 cases were recorded in 2022, compared to 534 cases in 2020[5]. In Mali, 56 cases of polio were detected in 2020 and 14 cases in 2023, including 3 in Bamako [6]. To eradicate poliomyelitis, Mali has adopted several strategies and actions to combat acute flaccid paralysis (AFP), such as: classifying AFP as a notifiable disease, implementing case-based syndromic surveillance to identify all cases of AFP in children under 15 years of age, and confirming the presence or absence of poliovirus by analyzing stool samples from AFP cases in accredited laboratories, the implementation of environmental monitoring, the strengthening of the routine expanded immunization program (EPI), mass vaccination campaigns with the use of the nVPO2 vaccine. In the Koulikoro region, 43 cases of AFP were reported in 2023 and 58 cases in 2024 [7]. The Dioila district adapted national strategies and strengthened passive (or systematic) and active surveillance (AS) of AFP through the implementation of community-based surveillance, training of center technical directors (CTDs) on the Integrated Disease Surveillance and Response (IDSR) guide, and the creation of two (2) priority 1 sites, two (2) priority 2 sites, and 45 priority 3 sites. In the absence of a prior study, given the arrival of several new Technical Directors of Centers (TDCs) and the low notification of AFP cases despite these strategies, we instituted our evaluation over the period from 2020 to 2024 in order to look for the difficulties related to notification.

II. MATERIALS AND METHODS

2.1. Study Setting: Dioila Health District, with an area of 7,256 square kilometers (km²) and a projected population of 430,078 inhabitants in 2025, is located in the Koulikoro Health Region. It is bordered to the north by the Fana District, to the south and west by the Bougouni District, and to the east by the Fana and Kignan Districts. It covers ten rural communes and 36 functional health areas, including 6 with medical facilities, 6 private health facilities (all involved in epidemiological surveillance), 153 community health worker sites, 167 rural maternity wards, and 625 community health workers. The epidemiological surveillance target for acute familial poverty is 206,437 children aged 0 to 15 years, representing 48% of the population.



Figure 1: Map of the Dioila health district 2024

2.2. **Study type:** We conducted a descriptive cross-sectional study.

2.3. **Study period:** The study was conducted from August to November 2025. It covered data from January 2020 to December 2024.

2.4. **Study population:** The study population included:

- Cases of acute flaccid paralysis (AFP) recorded in the linear registry of notifiable diseases (MADO);
- Healthcare workers involved in epidemiological surveillance.

2.5. Critères d'inclusion et de non-inclusion :

2.5.1. **Inclusion criteria:** The following were included in this study:

- All cases of AFP recorded in the Dioila linear registry of notifiable diseases (MADO) with less than 10% missing information from January 2020 to December 2024;
- Healthcare workers involved in epidemiological surveillance in the district's health facilities.

2.5.2. Exclusion criteria: The following were not included in this study:

- All cases of acute flaccid paralysis (AFP) recorded in the Dioila health district's MADDO registry with more than 10% missing information from January 2020 to December 2024;
- Staff members who refused to complete the questionnaire.

2.6. Sampling: The following procedure was used to identify the sample within each group:

- An exhaustive sampling was conducted for all recorded AFP cases with less than 10% missing information in the linear registry during the period;
- **At the district level:** three individuals were interviewed: the Chief Medical Officer, the epidemiological surveillance officer, and the EPI officer;
- **Au niveau CScCom:** the DTC or vaccinator was interviewed;
- Convenience sampling was used to select three practices where the sponsor or regular prescriber was interviewed based on their availability.

2.7. Sample size calculation:

- All cases of acute flaccid paralysis (AFP) recorded in the linear registry with less than 10% missing information during the period;
- At the district level: 3 (three);
- At the community health center (CScCom): 36 (thirty-six);
- At the doctor's office: 3 (three).

2.8. Operational definitions

- **Epidemiological surveillance:** epidemiological surveillance consists of the systematic and continuous collection, analysis, evaluation and dissemination of health data for the purposes of planning, implementation and evaluation of disease control measures [2].
- **AFP surveillance:** is a case-based system that enables the detection and reporting of AFP syndrome in children under 15 years of age, and the analysis of stool samples from all AFP cases for poliovirus [2].
- **Data quality:** data quality reflects the completeness and validity of the data recorded in the public health surveillance system [8].
- **Representativeness:** a public health surveillance system that is representative accurately describes the occurrence of a health problem over time and its distribution in the population according to location and person [8].
- **Simplicity:** the simplicity of a public health surveillance system refers to both its structure and its ease of use. Surveillance systems should be as simple as possible while still achieving their objectives [8].
- **Acceptability:** acceptability reflects the willingness of individuals and organizations to participate in the surveillance system [8].
- **Responsiveness:** responsiveness reflects the speed between steps in a public health surveillance system [8].

2.9. Data collection technique: data was collected through a literature review of the linear registry of notifiable diseases (MADDO).

Interviews were conducted face-to-face or electronically to administer the questionnaire to staff involved in monitoring PFAs at the CSRéf, the thirty-six CScComs and three medical practices.

2.10. Data collection tools:

The linear case list, notification forms, and survey form were used for data collection.

2.11. Variables studied

The variables of interest were established based on specific objectives.

2.12. Data management and analysis plan:

2.12.1. Data entry: data from the linear registry of AFP cases and the results of the survey conducted with healthcare providers were recorded in an Excel spreadsheet.

2.12.2. Descriptive data analysis: for the descriptive analysis, we calculated the mean with the standard deviation or the median with the range for quantitative variables and the frequency for qualitative variables.

2.13. Ethical and deontological considerations: we obtained approval from the local health authorities. Anonymity was required for the staff who participated in this study. Information relating to the patients' identities was not collected. The data was compiled and stored on a computer used only by the administrator. This computer is password-protected.

III. RESULTS

A total of thirty-two cases of AFP were reported and recorded in the MADDO linear registry from 2020 to 2024. Males were predominant, representing 62.5% of cases, with a sex ratio of 1.6. The 1-4 year age group was the most frequent, accounting for 68.8% of cases. The mean age was 3.3 years \pm 1.9. Forty (40) health facilities participated in the study. All of these facilities have national technical guidelines (NTGs) for vaccine-preventable diseases (VPDs) and means of transporting samples. The Dioila Central and N'Golobougou health areas were the source of 15.6% of cases each, and nineteen (19) health areas reported no cases during the study period. Data quality was 76.6%, simplicity 84.7%, and responsiveness 82.7%. The contribution of Community Health Centers (CSComs) to notification was low, accounting for only 9.3% of cases. Inadequate case investigation and archiving of notification forms remain a concern.

Table I: Distribution of AFP cases according to vaccination status in the Dioila health district from 2020 to 2024

Vaccination status	Frequency	Percent
Vaccinated	24	75,0
No vaccinated	2	6,3
Unknown	6	18,8
Total	32	100,0

The majority were vaccinated, ie. 75%.

Data quality

Table II: Analysis of the data quality of the AFP surveillance system in the Dioila health district from 2020 to 2024

Items	Yes	No	Percent
Training in epidemiological surveillance	34	8	81,0
Use of PFA monitoring forms	19	13	59,3
Concordance between the data from the media	17	15	46,8
Linear register completion with at least 90% of items completed	32	1	96,9
Filling out notification forms at least 90% of items completed	19	0	100
Average			76,8

The quality of data from the PFA monitoring system in the district was 76.8% satisfactory.

Representativeness of the data

Table III: Distribution of cases according to the location of notification in the Dioila health district from 2020 to 2024

Place of notification	Frequency	Percent
Banco CCom	1	3,1
Dioila CSRéf	29	90,6
Wacoro CCom	2	6,3
Total	32	100,0

Only the Banco and Wacoro health areas made notifications during the period and 90.6% of cases were notified by the CSRéf.

Data acceptability

Table IV: Concordance between notification, investigation within 48 hours and sampling of AFP cases in the Dioila health district from 2020 to 2024

Structures concerned	Cases reported	Cases investigated	Cases taken
CSRéf	32	2	32
CCom	3	1	3
Private structure	0	0	0

All cases notified during the period were sampled. Only 9.3% of the notified cases were followed up with an investigation within 48 hours.

Data simplicity

Table V: Analysis of the simplicity of the AFP surveillance system in the Dioila health district from 2020 to 2024

Items	Yes	No	Percent
IDSR guide availability	6	34	15,0
Ease of understanding of the PFA DTN	40	2	95,2
Clarity of the case definitions	42	0	100,0
Simplicity of filling out the notification form	40	0	100,0
Simplicity of the data submission procedure	36	5	87,8
Simplicity of filling out the weekly tracking table	39	0	100,0
Simplicity of filling out the MADO notebook	34	1	97,1
Simplicity of the procedure for sending stool samples	34	7	82,9
Average			84,7

La simplicité du système de surveillance des PFA dans le District était satisfaite à 84,7%.

Reactivity

Table VI: Analysis of the responsiveness of notification actions and the availability of means of transmission of AFP in the Dioila health district from 2020 to 2024

Items	Yes	No	Percent
Sample taken within 14 days of the onset of the illness	31	1	96,9
Case investigated within 48 hours of notification	3	29	9,3
Availability of functional means of transport	42	0	100,0
Availability of working telephone	42	0	100,0
Internet connection availability	38	4	90,5
Access to DHIS2	42	0	100,0
Average			82,7

The responsiveness of the PFA surveillance system in the district was ensured at 82.7%.

Study Limit

The difficulty of accessing data sources (linear case register, notification forms, investigation reports), poor archiving of primary materials, and insufficient financial resources also influenced the study.

IV. DISCUSSION

During this study, males represented 62.5% of cases with a sex ratio of 1.6. This male superiority had also been found by Bosalo et al, in the Province of Lomami (Democratic Republic of Congo) in 2025 and by Goni M et al in Niger in 2023 in which males represented respectively 50.4%[9] and 55.2%[10]. The 1-4 year age group was the most frequent, representing 68.8% of cases. The mean age was 3.3 years \pm 1.9. Our results are similar to those of Goni M et al in Niger in 2023, where the 0-4 year age group dominated at 92%, and the mean age was 4.09 years (SD = 1.2 years) [10]. In this study, 75% of children had been vaccinated, lower than the result of the study by CAMARA M et al in the Faranah region (Guinea Conakry) in 2022, which found 97% [11]. This result can be explained by a problem with the archiving of vaccination cards, but also by the fact that our childminders are not in the habit of bringing vaccination cards to consultations. Only the Banco and Wacoro health areas submitted reports during the study period. 90.6% of cases were reported by the Reference Health Center (CSRéf). Our study did not allow us to examine the timeliness of sample collection and submission to the laboratory due to a lack of suitable data sources.

The simplicity of the system was met by 84.7% of respondents. In our study, 100% found the case definition of AFP easy. This is identical to the result of Sylla S.S. et al. in the Mamou district (Guinea Conakry) in 2022, who also found 100% [12]. In the 2023 study by FOFANA et al. in the Beyla health district (Guinea Conakry), only 51% of health workers were familiar with the case definitions of AFP [13]. Our result can be explained by the fact that the majority of workers received training in epidemiological surveillance and also attended briefings during active surveillance visits. In our study, 100% of reported cases underwent stool sampling. This is higher than the results of Sylla S.S. et al. in the Mamou district (Guinea Conakry) in 2022, who found 98.3% of cases to be collected within three days [12]. Stool sampling was performed in 96.9% of cases within 14 days of the onset of illness, which is higher than that of Camara et al., who found 73.3% [11].

V. CONCLUSION

Underreporting of PFA remains a reality in the Dioila district. Despite the existence of a clear and simple definition, training for most stakeholders, and the limited contribution of community health centers and clinics to the reporting process, the underinvestigation of reported cases is still limited. Furthermore, there is a noticeable underinvestigation of reported cases. Data recording and archiving remain a concern.

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