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EPIDEMIOLOGICAL PROFILE OF MEASLES IN THE SAN HEALTH DISTRICT FROM JANUARY 2021 TO DECEMBER 2023

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ABSTRACT

Introduction: The fight against diseases, especially those preventable by vaccination, is a priority for the world's health authorities. Measles remains one of the main causes of infant and child mortality despite the availability of a safe and effective vaccine. Prior to the introduction of mass vaccination in 1980, measles caused nearly 2.6 million deaths per year. **Method:** Our study was cross-sectional, descriptive and analytical. It took place from 01 to 31 January 2024 in the San health district. The study population was measles cases recorded in the surveillance database from January 2021 to December 2023. The data collected were entered and analysed using SPSS 25 software. **Results:** Of the 117 notified cases of measles, 65 were confirmed by the laboratory and 7 by epidemiological link. The majority of cases were female, and the 1 to 4 age group was the most affected in terms of suspicion and confirmation. The average age was 3.9 ± 3.8 years. Of the confirmed cases, 71% had not been vaccinated. The majority of cases occurred during the dry season, with April recording the highest number (16 cases). There was a statistically significant link between measles and the season. Overall vaccination coverage was 81.67% for VAR1 and 45.90% for VAR2. **Conclusion:** During the study period, measles occurred epidemically in the San district. The highest incidence was recorded in 2022, with a total of 44 confirmed cases. Good vaccination coverage and protective measures during the dry season could help to reduce the incidence of this disease.

INTRODUCTION

The fight against diseases, especially those preventable by vaccination, is a priority for the world's health authorities. Measles remains one of the main causes of infant and child mortality, despite the availability of a safe and effective vaccine. Before mass vaccination began in 1980, measles caused almost 2.6 million deaths a year (1).

In 2019, according to a WHO and CDC publication, there were 869,770 cases of measles worldwide, the highest level since 1996, with increases in all WHO regions (2).

Measles remains common in many developing countries, particularly in certain regions of Africa and Asia, where over twenty million people suffer from the disease every year. The vast majority (over 95%) of measles deaths occur in countries where per capita income is low and health infrastructure is fragile (3).

Faced with this highly contagious disease, where therapeutic options are still limited to symptomatic treatment, vaccination remains the main strategy for eliminating the disease. Between 2000 and 2016, vaccination reduced the global measles death rate by 84% (1).

In 2015, the WHO recommended that the administration of two doses of VAR to all children should become the norm for all national immunisation programmes. As routine coverage with the two VAR1 and VAR2 doses increases, campaigns may be spaced further apart, eventually ceasing altogether (4). By the end of December 2016, twenty-five Member States had introduced VAR2 into their routine vaccination schedules (5). Several studies had identified cases of measles occurring in vaccinated subjects, even those who had received one or more doses of measles vaccine.

In Mali, a study of notified cases of measles from 2009 to

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2018 found the highest incidences in 2009 (22.65/100,000 inhabitants) and 2010 (11.81/100,000 inhabitants), with a laboratory confirmation rate of 39.48% and an epidemiological link rate of 57.86%. In this study, the regions of Timbuktu, Gao and Mopti recorded the highest numbers of cases in 2009, and Bamako, Koulikoro and Mopti in 2010, where children under 5 years of age were the most affected, accounting for 50.9% of cases(6).In Mali, samples are taken at the CSCom peripheral level and sent through the chain of command to the Institut National de Santé Publique (INSP), which is the reference laboratory; after analysis, the results are sent to the CSRéf.

The epidemiological profile of measles varies considerably from one area to another, depending on the characteristics of the person, the place and the vaccination coverage of the locality. Knowledge of the specific characteristics of each locality plays a very important role in the fight against this disease. It provides guidance for decision-making on prevention and response to measles epidemics.Given the variability between localities in the characteristics of measles cases, we took the initiative of carrying out this study in the San health district in order to gain a better understanding of the epidemiology of this disease and thus contribute to its surveillance and eventual elimination.

MATERIALS AND METHODS

Scope of the study

This study was carried out in the San health district using information available in the measles epidemiological surveillance database (linear list of cases). The San health district has one CSRéf and 31 functional health areas.

Presentation of the cercle of San

Located 424 km north-east of Bamako on the RN6, the San health district is one of eight (8) districts in the Ségou health region. It covers an area of 7262 km2 and is bounded

- To the north by the circles of Macina and Djenné
- To the south by the circles of Koutiala and Yorosso
- To the east by the Tominian district,
- To the west by the cercle of Bla.

Climate and vegetation

San has a tropical climate with a total rainfall of 730 mm. The hottest period of the year is from March to May, when the harmattan wind blows.

The vegetation gives the appearance of a clear forest of stunted deciduous shrubs with large, widely-spaced trees such as shea, baobab, néré and cailcedrat. .... The herbaceous cover is sparse and discontinuous between the large lateritic plates. Flooded areas have a grassy expanse without the large trees.

The economy

It is based on agriculture, livestock farming, fishing, crafts and trade. Agriculture is based on the cultivation of millet, rice, sorghum, maize and gardening. Livestock, mainly sheep, cattle, goats and poultry, is farmed by sedentary and semi-nomadic people. Fishing is practised on the Bani and the marigots.Trade is essentially based on weekly fairs.

Population and ethnic groups

In 2015 (according to the Direction Nationale de la Population) the SAN cercle had a population of 498,215, 50.6% of whom were women. The population is growing at an annual rate of 2.4%. This growth rate has been one of the highest since 1979. The population of the San cercle is made up of Bambara, Bwa, Marka, Minianka, Peulh, Dogon, Bozo, Dafing, Songhaï, and other West African peoples (Mossi, Samogo, Wolof, Ashanti).

Type of study

This was a descriptive and analytical cross-sectional study of measles cases.

Study period and location

Our study took place from 01 to 31 January 2024 in the San health district.

Study population

The study population consisted of measles cases recorded in the epidemiological surveillance database of the San health district from January 2021 to December 2023.

Inclusion criteria

Were included in the study all measles cases recorded from January 2021 to December 2023 in the epidemiological surveillance database of San health district.

Non-inclusion criteria

Not included in the study were all other diseases that did not meet the measles case definitions.

Sampling

This was done using the non-probability method and the technique used was for convenience. All 117 measles cases recorded from January 2021 to December 2023 were included in the sample.

Data collection tools and techniques

Data were collected using the linear list of measles cases. Recorded cases were transcribed onto a data collection form using Word version 2013.

Data management and analysis

The data collected were entered and processed on SPSS IBM version 25 software. The Pearson Chi-square test was used with a significance level of $p \leq 0.05$ for statistical analysis.

Variables to be studied

Dependent variable
cases of measles
Independent variables
sex
age
vaccination status
number of doses received
period of occurrence
health area of residence.

Ethical aspects

Before carrying out our study, we received authorisation from the chief medical officer of the San health district, who gave

his consent. For ethical reasons, data collection was carried out in accordance with the norms of confidentiality and anonymity. The data collected cannot be traced back to individuals.

RESULTS

In our study of the epidemiological profile of measles in the San health district, the results are presented in descriptive and analytical form:

Descriptive results

Sex and age of cases

Of the suspected cases, the female sex was the most represented with a rate of 57%. The sex ratio was 1.32. Suspected cases were mainly in the age group of 1 to 5 years with a rate of 65%.

Among the confirmed cases of measles, the female sex was also the most affected with 62% of cases, the sex ratio was 1.63. The age group of 1 to 4 years was the most represented with 64% of cases. The average age was 3.88 years ± 3.78.

Description of suspected measles cases

Of the 117 suspected measles cases, 94% were sampled and sent to the laboratory for biological analysis. The 7 cases that were not sampled were confirmed through an epidemiological link.
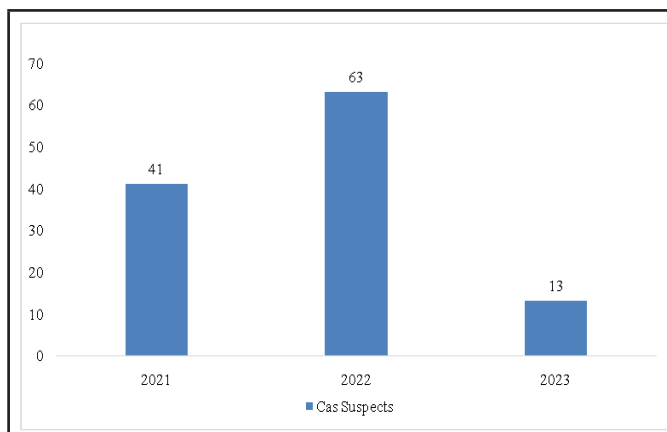

Figure 1: Number of suspected measles cases notified in San health district from January 2021 to December 2023.The highest number was recorded in 2022 (63 cases).
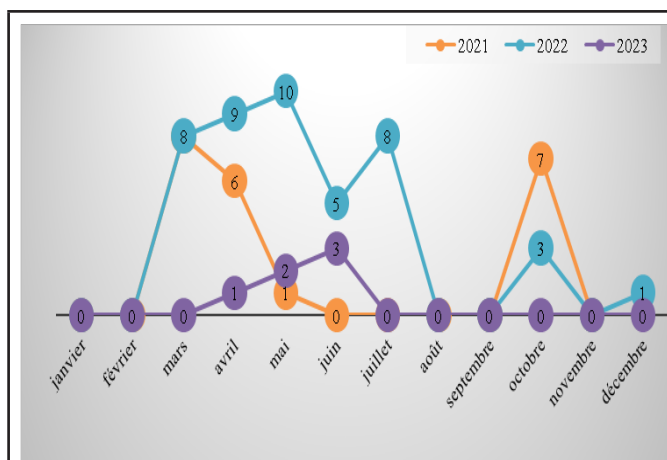

Figure 2: Distribution of confirmed measles cases by month in the San health district from January 2021 to December 2023.

The measles epidemic threshold was reached during these periods (3 confirmed cases per month). The highest numbers of cases were recorded in April and May.

Table I. Breakdown of laboratory-confirmed cases by period in the San health district from January 2021 to December 2023.

Period	Number	Percentage
Dry season	53	81.5
Rainy season	12	18.5
Total	65	100.0

The majority of measles cases occurred during the dry season (81.53%).

3.1.3. Rate of VAR1 and VAR2 vaccination coverage in the San health district from January 2021 to December 2023.

Figure 3: Trends in VAR1 and VAR2 vaccination coverage in the San health district from January 2021 to December 2023

The highest coverage rate for VAR1 was recorded in 2022, at 84.33%, and for VAR2 in 2023, at 51.36%. These rates are below the national target of 95%. However, there is an increasing trend in the VAR2 rate from 2021 to 2023.

Vaccination status of suspected measles cases in the San health district from January 2021 to December 2023

Table II. Vaccination status of suspected measles cases in the San health district from January 2021 to December 2023.

Vaccination status	Number	Percentage
Vaccinated	31	26,5
Not vaccinated	80	68,4
Unknown	6	5,1
Total	117	100,0

of the 117 suspected cases of measles, 68.4% had not been vaccinated and 5.1% had unknown vaccination status.

Course and outcome of measles cases

Table III. Outcome of confirmed measles cases in San health district from January 2021 to December 2023.

Patient outcome	Number Percentage	Number Percentage
Alive	71	98,62
Deceased	1	1,38
Total	72	100,00

of the 72 confirmed cases of measles (laboratory + epidemiological link), one death was recorded, giving a case fatality rate of 1.38%.

Analytical results

We carried out statistical tests to determine the link between measles and the factors (sex, age, number of doses of VAR received and period of occurrence).

To do this, we took only cases tested in the laboratory and with an available result. The Pearson chi2 test was used with a significance level of $p \leq 0.05$.

Table IV. link between measles and the factors and the factors sex, age, period of onset and number of doses of VAR received

Factors	Positive	Négative	Total	
Sex				Khi2 = 1,264 p = 0,313
Male	25	11	36	
Female	40	10	50	
Total	65	21	86	
Age range				Khi2 = 0,051 p = 0,405
Less than 5 years	42	13	55	
More than 5 years old	23	8	31	
Total	65	21	86	
Period				Khi2 = 11,80 p = 0,0005
Dry season	53	9	62	
Rainy season	12	12	24	
Total	65	21	86	
Vaccination status				Khi2 = 1,062 p = 0,405
Not vaccinated	45	13	58	
1 dose or more	16	8	24	
Total	61	21	82	

DISCUSSION

The general aim of our study was to describe the epidemiological profile of measles in the San health district from 1 January 2021 to 31 December 2023. During this period 117 suspected cases of measles were reported by the CSCom, the CSRéf and the Clinique Colombe. Of these, 65 cases were confirmed by the laboratory and 7 cases through an epidemiological link. All age groups were affected, particularly children aged 1 to 4, with a predominance of female cases. The cases occurred throughout the year, with high transmission during the dry season, especially in April and May, when peaks are observed. The urban health areas were the most affected, particularly the San Central area.In terms of vaccination status, the majority of measles cases were unvaccinated, although some vaccinated subjects had developed the disease and other cases had an unknown vaccination status. The coverage rates for VAR1 and VAR2 were relatively lower than the national targets. The case fatality rate during this period was 1.38%.The tests carried out did not find any statistically significant link between sex, age and the number of doses of VAR received and the occurrence of measles. Only a statistically significant association was found with the period.

Difficulties and limitations: We did not encounter any major difficulties in carrying out the study, but it does have some limitations:- Our study did not allow us to describe the distribution of cases according to the vaccination coverage of the health areas.

The lack of information on certain laboratory results and the unknown vaccination status of some children.

Descriptive results

Notification of suspected cases

This depends on knowledge of the standard definitions at all levels of the community and health environment, and on the performance of the surveillance system in place. In our study, 14 CSCom, the CSRéf and the Clinique Colombe had reported cases. The cases notified by the CSRéf came mainly from the San central area, where it is based. The average duration between the onset of symptoms and notification was 3.6 days ± 2.27 days. This result is comparable to that of a similar study carried out in Burkina Faso by YANOGO. PK, which showed that 93.02% of patients consulted a doctor in less than 5 days (7). OUATTARA S also found an average waiting time of 2.62 days ± 1.69 in commune VI of Bamako (8).

Sex

In our study, 62% of cases were female. The F/H ratio was 1.63. This result is comparable to that of MAHAMUD A et al who found 56.9% (9). It is contrary to that of DIARRA MM who found the male sex to be in the majority with 60.4% (10). The analysis did not find a statistically significant link between sex and the occurrence of measles p = 0.313.

Age

The 1-4 age group was the most affected with 54.16%. This trend was noted in the study by SANOGO FB (3) and AWORABHI-OKI et al (11) who obtained respectively 40.77% and 64.1% for the same age group. In contrast, ZACKIA CH found a predominance of cases in the 5 to 9 age group, i.e. 32% in Morocco in 2013 (12). This difference can be explained by the success of vaccination in the under-5 age group in Morocco, resulting in a diversion of cases towards older subjects who are beginning to lose their immunity. The same observation has been made in several developed countries, including France from 2011 to 2018, where the median age of measles cases varied between 9 and 17 years depending on the period (12). Period of onset :

In our study, 81.53% of measles cases occurred during the dry season from September to May. April recorded the highest number of cases, with a cumulative total of 16. This trend was confirmed by a study carried out in Nigeria by AWORABHI-OKI et al (10), where peaks were observed between February, March and April. The study of the epidemiological profile of measles in Mali by BARRY D et al (6), based on 10 years' data, also showed that the period of occurrence was the dry season, with peaks in April. In contrast to this situation, an epidemic broke out in Dakar in 2019 at the height of the rainy season, from June to December, recording 767 confirmed cases of measles (7). This peculiarity was linked to low rainfall in the Dakar region according to SECK I (13). In our study, the link between the period (season) and the occurrence of measles was statistically significant with p = 0.0005.

Vaccination coverage rate

The overall coverage rate for the study period was 81.67% for VAR1 and45.90% for VAR2. These rates represent coverage among children within the EPI target, and are below the national target of 95%. Fewer cases of measles were recorded in 2023 due to the increasing coverage of VAR2 and the gradual reduction in drop-out cases. The high number of cases in 2022

can be explained by the low VAR1 and VAR2 vaccination coverage recorded in 2021. These results show that achieving good vaccination coverage is essential in the fight against this disease.

Vaccination status and number of doses received

In our study, most of the suspected cases (68.4%) had not been vaccinated. This result is contrary to that of OUATTARA S, where only 26% had not been vaccinated (8). This difference could be explained by vaccination coverage, which is generally higher in large towns than in rural areas for reasons of accessibility.

In our study, 71% of confirmed measles cases had not received any dose of VAR and none had received 2 or more doses. This result is similar to that of SECK I, where 88.5% had received no dose of VAR 13). A study carried out in Lebanon showed that 9.66% of measles cases had received at least 2 doses of VAR (14). However, statistical analysis in our study showed no statistically significant link with the occurrence of measles p = 0.405. TRAORE G found the same situation in the Kalaban-coro health district in 2022 with p = 0.440 (15).

Patient outcome

In our study the case fatality rate was 1.38%. The study by SECK I in Dakar in 2009 during an epidemic recorded no deaths out of 767 confirmed cases (13). OUATTARA S reported 3 deaths out of 39 confirmed cases in the VI district of Bamako, giving a case-fatality rate of 7.69% (8). The study by LEE CT et al found a proportion of deaths of 0.13% and 2.31% in its two epidemic waves (15). Measles-related deaths are due to complications, and these generally occur in unvaccinated subjects or those in poor health. The prognosis also depends on early management and the quality of care administered. These results show that measles cases are well managed in our study area.

Confirmation rate

In our study, 60% of cases tested were positive. The study by OUATTARA S reported that 81.6% of cases tested were negative in Bamako commune VI (8). This difference proves that providers in our study area are well aware of the symptoms of measles.

According to the type of confirmation, 90.27% of cases in our study were confirmed by the laboratory and 9.73% through an epidemiological link. SECK I found 30% confirmed by the laboratory and 70% confirmed by an epidemiological link (13). These differences may be explained by the extent of the disease, which was generally isolated cases with fewer contacts in our study and an outbreak in the SECK I study (13), which recorded 767 confirmed cases over 7 months.

CONCLUSION

During the period under review, measles was epidemic in the San health district, with 117 suspected cases. The central San CSCom and the CSRéf reported the highest number of cases. Of the suspected cases, 65 were confirmed by the laboratory and 7 cases were confirmed through an epidemiological link. Children under the age of 5 were the most affected, especially in the 1 to 4 age group, with females predominating.

The highest incidence was recorded in 2022, with a total of 44 confirmed cases. The majority of cases occurred during the dry season, with peaks in April and May. However, there was a statistically significant link between the occurrence of measles and the period of the year. The urban health areas (San central and Lafiabougou) were the most affected in terms of both suspected and confirmed cases.

The low coverage of VAR1 and VAR2 represents a threat to the resurgence of measles cases, but an evaluation of the EPI and an analysis of the determinants of measles will be necessary in the San health district.

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