

# Epidemiological, Clinical Aspects and Outcome of Measles in a Low-Income Country in 2023

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## Abstract

**Introduction:** Measles remains a worrying health problem in sub-Saharan African countries. There have been measles outbreaks in Cameroon with the most recent occurring between October 2022 and September 2023. The Centre region of Cameroon was the most affected in the country and being at the frontline of the fight against this illness, we conducted this study in order to determine the epidemiological and clinical characteristics as well as the outcome of children who contracted the measles and were hospitalized at the Yaoundé Gynaeco-Obstetric and Pediatric Hospital. **Methodology:** We conducted a cross-sectional descriptive and prospective study for one year from October 2022 to November 2023 corresponding to the duration of the outbreak. We included all children admitted in the pediatric unit for measles and its complications during this period. **Results:** In total, 60 children were enrolled. Their caregivers were mostly their mothers who had a mean age of  $34.71 \pm 9.55$  years living in significant precarious conditions for the majority. The median age of children was 16 months (09 - 30 months). Twenty six percent of children (16) were less than 9 months. Girls were predominant (55%). Most children were not up to date with their routine EPI vaccination (80%) and most did not receive the measles and Rubella vaccine (76.67%). Clinical manifestations, included fever, conjunctivitis, and cough. Skin rash and catarrh (98.33% and 86.67% respectively) are the case definition signs of measles. The outcome was unfavorable for 4 children. One had a neurological disorder: coma and three presented with pneumonia and severe respiratory

distress (6.67%). Conclusion: Measles is still being a reality and claiming lives in our context, emphasis should be made on immunization coverage and if possible, advocacies should be formulated to decrease the age of measles vaccine administration.

## Keywords

Measles, Complications, Low-Income Countries

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## 1. Introduction

Measles is a highly contagious disease caused by the measles virus which belongs to the *Paramyxoviridae* family [1]. Measles can affect everyone but it is most common in children [2]. It is characterized by fever, cough and skin rashes and it can lead to severe complications such as otitis, pneumonia, encephalitis, which can lead to death [3] [4]. Having humans as the only reservoir and with the existence of a vaccine, strategies have been put in place to eradicate the illness since 1963 [2] [5]. For 16 years, there has been no endemic measles in the United States. However WHO-Afro zones and some European countries continued to be affected by outbreaks of this illness [3] [6] [7]. In sub Saharan Africa, measles continues to be an important public health problem due to the frequent occurrence of complications in children [8]. In 2021, an estimate of 128,000 people died of measles according to WHO reports. Most of these were children [1] [2]. In 2012 a global vaccine action plan approved by the WHO assembly set a goal for measles and rubella elimination by 2020 in at least 5 of the 6 WHO zones [3]. However there have been reports of outbreaks in China from 2015 to 2016, in the Philippines and Greece from 2018 to 2019 and recently in the WHO-Afro zones such as Democratic Republic of the Congo in 2019, Nigeria in 2020 and Cameroon in 2020 [3] [4] [9] [10] [11] [12]. Therefore, the goal of the 2012 global plan for eradication of measles and rubella is far from being achieved. WHO and UNICEF noted an increase in February 2022 in the number of measles cases and the risk of larger outbreaks [13]. Sub-optimal vaccinal coverage and pandemic disruption are the main reasons for these outbreaks [11] [13]. Symptoms of measles include fever, maculopapular skin rash, cough, coryza, conjunctivitis and we can have the Koplik's spot which appears 1 or 2 days before the rash [7].

Complications of measles include pneumonia, tracheitis, diarrhea, superimposed bacterial infections, subacute sclerosing panencephalitis and death. These complications are most common in young infants who are immunocompromised or undernourished particularly children with vitamin A deficiency [7].

In Cameroon, measles outbreak is still raging with the Centre region being the most affected [11]. The viral PCR test to confirm the measles was done for the first cases at the beginning of the outbreaks. It is under this context that we conducted a study during the most recent outbreak (2022 to 2023), which aimed at describing the epidemiological, clinical aspects and outcome of children af-

ected by measles and hospitalised at the Gynaeco-Obstetric and Pediatric Hospital of Yaounde.

## 2. Methodology

We conducted a hospital based cross-sectional descriptive and prospective study at the Gynaeco-Obstetric and Pediatric Hospital of Yaounde (YGOPH). It is a first category health facility on the health pyramid of Cameroon, specialized in mother and child healthcare. It is located in the city of Yaounde in the center region, making it a reference facility for the management of measles. Our study lasted for one year from October 1 2022 to September 30 2023 during the most recent Measles outbreak. We used a consecutive sampling. Every child hospitalized for measles at the YGOPH during the study period were included in our study.

After obtaining an ethical clearance and authorizations from the parents, we collected data using a questionnaire administered to parents and the children, we observed and collected data on the clinical manifestations, complications and outcome.

Variables of interest included sociodemographic characteristics of children included caregiver: age, monthly revenue, level of education; concerning children: age, sex, nutritional status, clinical manifestations of measles, complications and outcome.

Data was entered and analyzed using EPIINFO 7.2.5.0.

## 3. Results

During our study period, 60 children were admitted and followed up for measles for a median duration of 4 days with the maximum hospitalization duration being 10 days. The main caregiver was the mother (60%), most of them were less than 40 years old (73.33%) with a mean age of 34.71 years. The majority worked in the informal sector (85%) with a monthly salary of less than 50,000 FCFA for most of them (60%). The highest level of education reported was secondary level (53.33%). Most parents were cohabitating (44.19%) and the majority of them resided in Yaoundé (86.67%). **Table 1.**

The median age of children was 16 months (09 - 30 months) with a majority of them being less than 2 years old (71.67%). There were 5 children less than 6 months (8.33%), 11 (18.33%) children aged from 6 to nine months. Girls were predominant (55%) and only one child was orphan (01.67%). Most children were not up to date with their routine EPI vaccination (80%) and most did not receive the measles and Rubella vaccine (76.67%). However, the majority of children received Vitamin A supplementation (65%). **Table 2.**

Regarding the clinical manifestations, everyone presented fever, conjunctivitis, and cough. Most presented skin rash and catarrh (98.33% and 86.67% respectively), which are the case definition signs of measles. Other clinical manifestations were reported and their frequencies can be observed in **Table 3.** We

recorded 29 children (48.33%) who had pneumonia, Fifteen percent of our patients convulsed.

**Table 1.** Socio demographic characteristics of caregiver.

Characteristics	Frequency (N = 60)	
	n	Pourcentage %
<b>Caregiver</b>		
Mother	36	60.00
Father	20	33.33
Others	04	06.67
Mean age $\pm$ SD: 34.71 $\pm$ 9.55 Years		
<b>Age of care giver (years)</b>		
19 - 29	18	30.00
30 - 39	26	43.33
40 - 49	12	20.00
50 - 59	02	03.33
60 - 67	02	03.33
<b>Profession</b>		
Formal	09	15.00
Informal	51	85.00
<b>Monthly Revenue (Francs CFA)</b>		
0 - 50,000	36	60.00
50,000 - 100,000	17	28.33
100,000 - 200,000	02	03.33
+200,000	05	08.33
<b>Level of education</b>		
None	04	06.67
Primary	08	13.33
Secondary	32	53.33
University	16	26.67
<b>Marital statut</b>		
Single	08	18.60
Cohabitation	19	44.19
Divorce	02	04.65
Marriage	13	30.23
Widowhood	01	02.33
<b>Residence</b>		
In Yaounde	52	86.67
Out of Yaounde	08	13.33

Concerning the nutritional status of our children, 10 children (16.67%) presented an acute malnutrition with one presenting a kwashiorkor. Fifteen percent were underweight for their age. **Table 3.**

Concerning the outcome, it was favourable in 93.3% (56). Four deaths due to measles complications (6.67%) were noted. The children who died were aged from 6 to 24 months. One had a neurological disorder: coma, three had pneumonia with severe respiratory distress. **Table 4.**

**Table 2.** Characteristics of children.

Characteristics	Frequency (N = 60)	Percentage
	n	%
Median age (Q1 - Q3): 16 (09 - 30) Months		
Age of children Months		
0 - 5	5	8.33
6 - 9	11	18.33
10 - 23	27	45
≤ 24	43	71.67
>24 - 48	15	25.00
>48 - 72	01	01.67
>72	01	01.67
Sex of children		
Girls	33	55.00
Boys	27	45.00
Orphan		
Parents alive	59	98.33
Orphaned	01	01.67
EPI Vaccination up to date		
No	48	80.00
Yes	12	20.00
RR received		
No	46	76.67
Yes	14	23.33
Vitamin A received		
No	21	35.00
Yes	39	65.00

**Table 3.** Clinical manifestation.

Measles disorder	Investigated children N = 60			
	Present		Absent	
	n	%	n	%
<b>General state disorder</b>				
Fever	60	100	00	00.00
Dehydration	14	23.33	46	76.67
Acute Malnutrition	10	16.67	50	83.33
Chronic malnutrition	04	06.67	56	93.33
Under Weight	09	15.00	51	85.00
<b>Ocular disorder</b>				
Conjunctivitis	60	100	00	00.00
<b>Skin disorder</b>				
Skin rash	59	98.33	01	01.67
Pruritus	06	10.00	54	90.00
Enanthema	25	41.67	35	58.33
<b>Respiratory tract disorder</b>				
Cough	60	100	00	00.00
Laryngitis	06	10.00	54	90.00
Catarrh	52	86.67	08	13.33
Pneumonia	29	48.33	31	51.67
Pleural effusion	01	01.67	59	98.33
Purulent otitis	01	01.67	59	98.33
<b>Digestive tract disorders</b>				
Nausea	01	01.67	59	98.33
Vomiting	23	38.33	37	61.67
Abdominal pain	01	01.67	59	98.33
Diarrhoea	22	36.67	38	63.33
<b>Neurological disorder</b>				
Convulsion	09	15.00	51	85.00
Coma	03	05.00	57	95.00

**Table 4.** Outcome of Measles in the study population.

Evolution	Frequency	Percentage
Median admission duration: 4 days (3 - 6) days		
<b>Admission duration</b>		
≤4 days	37	61.67
>4 days	23	38.33

**Continued**

Outcome		
Favourable	56	93.33
Unfavourable	04	6.67
Circumstances of death		
Coma	01	25
Severe Respiratory distress	03	75
Deaths	04	100

**4. Discussion**

Cameroon is facing an outbreak of measles. According to the report of the center of emergencies of Cameroon on the 26 November 2023, 6054 cases of measles were confirmed with 31 deaths due to measles since the beginning of the year 2023 and the Center region is the most affected. Knowing that measles can lead to complication that can end up being fatal, we studied the epidemiological and clinical characteristics of children who were hospitalized for measles at gynaeco-obstetric and pediatric hospital of Yaounde in the center region, which is a reference center.

We collected 60 cases of measles who were hospitalized. Knowing that all non-complicated cases were treated at home.

Our data confirm that measles continues to be an important public health problem and especially during epidemics causes significant morbidity and complications.

Concerning our patients hospitalized, most of their parents lived in a significant level of precariousness (60%) and this could explain the exposure of their children to measles. Because measles is a highly contagious disease.

Most children (71.67%) affected were aged below two years, 16 children (26.6%) affected were less than 9 months. we noticed five (8.33%) less than 6 months and these findings were similar to those reported by Domai *et al.* in Philippines [9] and Gianniki in Greece [12] or Sindhu in India [14]. Those cases of children aged less than 6 months were relevant.

This could be explained by the vaccination policies in Cameroon, which target 9 months to start vaccination against measles. It is expected that maternal measles IgG antibodies cover children below these ages. It would be relevant to start vaccination earlier as illustrated by Martins *et al.* in Guinea-Bissau [15]. Maybe the beginning of vaccination at 6 months or less can help to reduce the cases for the population of 6 - 9 months. Advocacies towards partners should be done to reduce the age of administration of measles and rubella vaccines.

There was a predominance of girls in our study and this could be explaining by the predominance female population in our context. These findings did not concord with those reported by Gianniki *et al.* in Greece, who found no sex related difference, Boushab *et al.* in Mauritania and Wang *et al.* in China where boys were predominant. For the latter this difference could be explained by the

context too, where boys population are predominant [4] [8].

It should be noted that most affected children (80%) were not up to date with their EPI immunization status as well as with their Measles and Rubella vaccination status (76.67%). This could be explained by the fact that we have a low immunization coverage of routine EPI vaccines. Or vaccination is free of charge in our country. Intensive community sensitization has to be done to understand why parents are not bringing children to vaccination and to encourage parents to take their children for vaccination following EPI calendar.

Regarding their clinical manifestations, most of them presented with the case definition signs of measles (body rash, conjunctivitis, cough and catarrh) and the enanthema was found in 41.67% of our study population. Respiratory disorders represented the main accompanying manifestations with pneumonia being the leading manifestation. these results concord the findings reported by Sindhu *et al.* in India [16], Hassan *et al.* in Somalia [17] Boushab *et al.* in Mauritania [8] Domai *et al.* in the Philippines [9]. This is explained by the early targets of the virus which are the alveolar macrophages and the dendritic cells located in the lungs [1].

Concerning the Outcome, it was unfavorable for 4 cases (6.67%). Their complications were marked by Coma, for one case, severe respiratory distress for three. The reported fatality rate was similar to the findings of Boushab *et al.* in Mauritania who reported a fatality rate of 8% [8]. However, it was higher than that reported by Hassan *et al.* in Somalia who found a fatality rate of 1.8% [17]. This shows that measles cases need to be detected early and managed adequately especially in our context.

## 5. Weakness

Our study was done in only one hospital therefore the generalization of our results should be taken with caution.

## 6. Conclusion

Measles remains a reality, and continues to claim children's lives in our context. The 2022 to 2023 outbreak clearly shows that the goal of elimination of measles in 2020 was not achieved. Therefore, there is an urgent need to review strategies put in place. Studies should be done to determine the duration of maternal protection of children against measles and advocacies should be formulated to reduce the age of vaccination against measles.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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