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## Impact of Covid-19 on routine immunization among children under 5 years in the Mayo-Tsanaga and Logone & Chari Departments, Far North-Cameroon.

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### ABSTRACT

The Covid-19 pandemic has had a significant impact on routine childhood immunization. According to the World Health Organization (WHO), many countries have reported a decrease in vaccination coverage during the pandemic due to various factors such as movement restrictions, fear of contracting Covid-19 during medical visits, closure of healthcare facilities, and the reassignment of healthcare workers to Covid-19 response efforts. The Far North region of Cameroon consistently records cases of vaccine-preventable diseases, and as a result of this pandemic, there is a risk of an increase in these diseases. The objective of this research is to assess the impact of Covid-19 on routine immunization among children under 5 years old in the Mayo Tsanaga (MT) and Logone et Chari (LC) departments. The implementation of barrier measures could pose a significant risk of immunization abandonment among children under 5 years old. A cross-sectional analytical study was conducted in the MT and LC departments. This study was both retrospective and prospective. Data were collected through a questionnaire and a documentary review of existing data before the pandemic. We collected our data using the Kobo Collect software, and the analysis was performed using the R software. The proportion of fully vaccinated children is 53% with a 95% confidence interval [46.58%-60.29%]. It was observed that 4.65% with a 95% confidence interval [2.25%-8.38%] of children were under-vaccinated for Penta 3. The specific abandonment rate is 6.04% with a 95% confidence interval [3.25%-10.11%]. Covid-19 has had an impact on routine immunization in both departments of the study, leading to the failure to achieve the vaccination coverage objective.

**Keywords:** Covid-19, impact, routine immunization, children under 5 years, Far North, Cameroon.

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## INTRODUCTION

The Covid-19 pandemic has had a significant impact on routine childhood vaccination. According to the World Health Organization (WHO), many countries have reported a decrease in vaccination coverage during the pandemic, due to various factors such as movement restrictions, fear of contracting Covid-19 during medical visits, closure of healthcare facilities, and the reassignment of healthcare workers to Covid-19 response efforts [1]. This has led to an increase in the risks of vaccine-preventable diseases such as measles, polio, and diphtheria [2]. The World Health Organization (WHO) has issued a call to countries worldwide to maintain routine immunization services during the Covid-19 pandemic. The objective of this call is to ensure that populations continue to receive necessary vaccines to prevent vaccine-preventable diseases, despite the ongoing health crisis. The World Health Organization recognizes the crucial importance of routine immunization for public health and insists that it is essential not to neglect these services during the pandemic. However, it is also emphasized that appropriate measures must be put in place to protect both healthcare workers and patients from Covid-19 [3].

It is important to note that vaccination is essential for protecting children from preventable diseases and for maintaining public health. If you have concerns about vaccinating your child during the pandemic, it is recommended to consult your doctor or a healthcare professional for personalized advice.

In the Mayo Tsanaga and Logone & Chari departments where our study was conducted, few studies have been conducted to assess the impact of this pandemic on routine immunization among children. This study aims to evaluate the impact of this pandemic on routine immunization among children under 5 years old in these 2 departments.

## MATERIALS AND METHOD

### **Study design:**

This is a cross-sectional analytical study conducted on 249 parents with at least one child under 5 years old living in the Mayo-Tsanaga and Logone et Chari departments of the Far-North region of Cameroon.

The study population consisted of parents with at least one child under the age of five years. During the data collection period from April to June 2022, households hosting at least one child aged 0 to 59 months in the study sites and who agreed to participate were included. Contrary to parents whom consents were not obtained, who did not reside in one of the divisions, or who refused to participate. Data have been collected through a questionnaire and an interview guide.

### **Sampling:**

The calculated sample size is 246 children under 5 years old according to the Cochran formula ( $n = t^2 \times p \times (1-p) / m^2$ ) [4].

The Mayo-Tsanaga and Logone et Chari departments have 12 health districts. We surveyed 21 children in each of these health districts, making a total of 252.

### **Statistical methods:**

The questionnaire was edited in Excel and imported into Kobo Collect/ODK Collect, and then used for digital data collection on an Android phone. During data collection, a selection bias was identified, with three children aged 60 months mistakenly included in the study. These respondents were removed from the dataset, resulting in a sample size of 249 with usable data. Socioeconomic and demographic characteristics of parents were described, and data on access to health services in the context of Covid-19 was collected.

Data collection authorizations were obtained from the regional public health delegation of the Far North as well as the various health districts involved in the study.

## **RESULTS AND DISCUSSION**

### **Characteristics of the children interviewed.**

Regarding the characteristics of the surveyed children, it is noted that the median age is 39 months with an interquartile range of 26 to 46 months. 25% of the children in our sample are below 26 months of age, and 75% of the children are 46 months old at the time of the survey. The most represented age group is children aged 36-47 months, accounting for 39%, followed by children aged 48-59 months, accounting for 22.5%, and finally children aged 24-35 months, accounting for 22.1%. Table 1 below presents the central tendency parameters of the surveyed children. As for gender, 50.2% of the children are female, and 49.8% are male, resulting in a male-to-female sex ratio of 0.992.

**Table 1: Characteristics of the surveyed children**

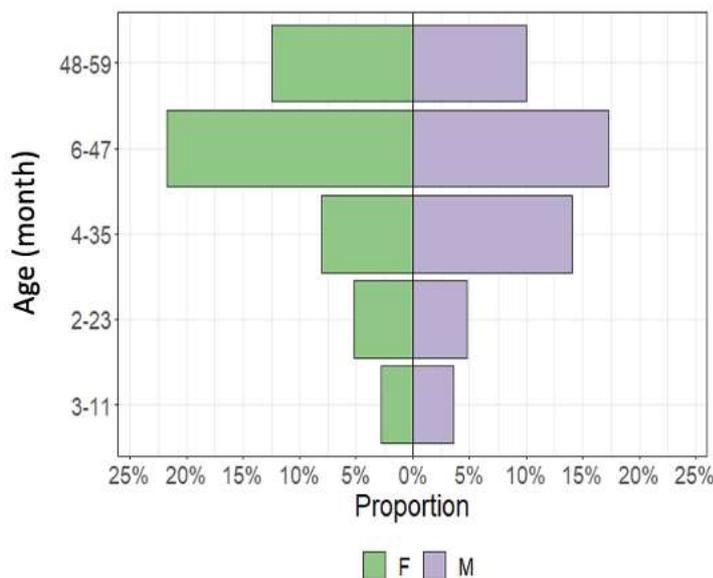
<b>Characteristics</b>	<b>N = 249<sup>1</sup></b>
<b>Child's gender</b>	
Female	125 (50%)
Male	124 (50%)
<b>Child's age in months</b>	
Median (EI)	38 (26 - 46)
Mean (ET)	35 (14)
Range	3, 59
<sup>1</sup> n (%)	

### **Sex ratio by age group**

The table 2 below shows the ratio by age group.

**Table 1: Sex ratio by age group**

Age group	Ratio (M/F)
3-11	1.286
12-23	0.923
24-35	1.750
36-47	0.796
48-59	0.806

**Age and sex of the children interviewed.****Figure 1: Proportion of age and sex of the children interviewed.**

The 36–47-month age group was the most represented in our study population and was mainly made up of girls (Figure 1).

**Assessing routine immunization coverage during the Covid-19 pandemic in the 2 departments.**

Our results show that the proportion of children under the age of two who have attended their vaccination appointment is 86%. Among these children, 2.2% interrupted their vaccination at the second contact, 4.7% at the third contact, 8.4% at the fourth contact, 31% at the fifth contact, and 53% of these children received all routine vaccines (Supplemental vaccines for children). It is also worth noting that 100% of the surveyed children had received at least the vaccines administered at the first contact.

The table 3 below describes children's vaccination by contact during the Covid-19 pandemic.

**Table 3: Characteristics of vaccinated children**

Characteristics	N = 249 <sup>1</sup>
<b>If it is a child under 2 years old, do they keep their vaccination appointments?</b>	
No	34 (14%)
Yes	215 (86%)
<b>If yes, what is the last vaccination the child took</b>	N = 249 <sup>1</sup>
Contact 2	5 (2,3%)

Contact 3	10 (4,7%)
Contact 4	18 (8,4%)
Contact 5	67 (31%)
Contact 6	115 (53%)
<sup>1</sup> n (%)	

### Estimated vaccination coverage

The proportion of fully vaccinated children is 53% 95% CI [46.58%-60.29%], we note that 4.65% 95% CI [2.25%-8.38%] of children are under vaccinated with Penta 3. The specific dropout is 6.04% CI95% [3.25%-10.11%].

**Table 4: Estimated vaccination coverage**

	Vaccination coverage	CI 95% <sup>1</sup>
Contact 1	100%	98%-100%
Contact 2	97.70%	94.65%-99.24%
Contact 3	95.30%	91.61%-97.74%
Contact 4	91.60%	87.09%-94.96%
Contact 5	69.00%	63%-75.82%
Contact 6	53%	46.58%-60.29%

<sup>1</sup>CI : Confidence interval -Wald (%)

It is important to recall the systematic vaccination performance in the two departments before the period of the Covid-19 pandemic to show the possible difference. Indeed, vaccination coverage in Penta 1 (contact 2) one year before the start of the Covid-19 pandemic was 89%, for Penta 3 (contact 4) at 80% and the proportion of children fully vaccinated at 73 .04%.

Our results show that the proportion of children under the age of two who kept their appointment is 86%. Among these children, there appears to be a decrease in routine vaccination rates as the number of contacts increases. In fact, only 2.3% of children kept their appointment at contact 2, while this percentage increased to 4.3% at contact 3, 8.4% at contact 4, 31% at contact 5 and finally 53% at contact 6 (fully vaccinated children). We also note that 100% of the children interviewed had received at least the vaccines administered at first contact.

This trend may be concerning because routine immunization is important to ensure the health and protection of children from preventable diseases. It is recommended to respect vaccination schedules to ensure optimal protection against these diseases.

The reasons for these low rates of compliance with vaccination appointments for contacts 2, 3 and 4 are due to the fear of attending health establishments following the Covid-19 pandemic. It is essential to educate parents and caregivers about the importance of routine vaccination and address any concerns or questions they may have to encourage greater adherence to vaccination appointments.

The proportion of fully vaccinated children for our study sample is 53% 95% CI [46.58%-60.29%], we note that 4.65% 95% CI [2.25%-8. 38%] of children are under-vaccinated with

Penta 3. The specific dropout is 6.04% 95% CI [3.25% - 10.11%]. Our results show that Covid-19 has had a possible impact on routine childhood vaccination based on data collected before this pandemic and compared to our analyzed data.

According to the World Health Organization (WHO), in 2022, many countries reported a decline in vaccination coverage during the pandemic, due to various factors such as movement restrictions, fear of contracting Covid-19 during medical visits, the closure of health establishments, and the reassignment of health workers to the fight against Covid-19 [1].

The WHO recognizes in 2020 the crucial importance of routine immunization for public health and emphasizes that it is essential not to neglect these services during the pandemic. However, it is also emphasized that appropriate measures must be put in place to protect both healthcare workers and patients against Covid-19 [3].

The study carried out by Sow et al on “Impact of Covid-19 on routine vaccination in hospitals in Senegal” carried out in 2020, aimed to assess the impact of these prevention measures on routine vaccination in hospitals since the advent of this pandemic in Senegal. They conducted a retrospective cross-sectional study including data from 2018, 2019 and 2020 and the parameter studied was the number of vaccine doses administered for the different periods according to the expanded vaccination program. As results, they noted a reduction in the number of vaccines administered in 2020 compared to other years [5].

In the same direction, Nabila et al conducted in 2021 a cross-sectional study on “the Impact of the Covid-19 pandemic on the vaccination of children in Morocco: electronic survey of 103 pediatricians” whose objective was to show the extent of the relaxation of the rules. vaccination in times of Covid-19 and make recommendations aimed at restoring this change. As the results were obtained, 95% of pediatricians received questions arising from parents' fears regarding vaccination, 82.5% of parents hesitated to come to the office and 5.8% refused to be vaccinated during this period. About 22% of pediatricians stopped vaccinations completely and 72.8% postponed vaccinations for one month [6].

The same is true in the study presented by Tanang et al. in 2009 which shows that fully vaccinated children are less malnourished (14.4%) than unvaccinated or partially vaccinated children (16.0% and 16.6%). Unvaccinated children have a lower prevalence (16.8%) than those fully vaccinated (19.3%) or partially vaccinated (21.1%) in rural areas [7].

Although decreased cellular immunity may be present in protein-energy malnutrition, humoral immunity is generally normal. Except for vaccines that work by stimulating cellular immunity such as BCG, malnourished infants and children have a normal immune response to vaccinations without increased side effects. There is therefore no contraindication to vaccination in malnourished infants and children [8].

The study conducted in 2020 by Mohamed Alsuhaibani et al. on the impact of the Covid-19 pandemic on the routine vaccination of children in Saudi Arabia also noted a drop in attendance at vaccination services in the context of Covid-19. They found that around 23.4% of parents surveyed were more than a month late in vaccinating their child, with the main reason being fear of catching Covid-19 (60.9%) [9]. This pandemic quickly affected the systematic vaccination of children without their country of study. It is important to note that in cases of protein-energy malnutrition, although cellular immunity may be depressed, humoral immunity is generally normal. This means that the body's ability to produce antibodies to defend itself against infections is maintained. It should be noted, however, that some vaccines, such as the BCG vaccine, which work by stimulating cellular immunity, may cause different responses in malnourished infants and children. Similarly, the study conducted by Khan et al. in 2021 on the impact of the Covid-19 pandemic on the vaccination of children in a tertiary health center, we saw a drop of 87% in April, 67% in May and 33% in June in vaccination coverage after the appearance of Covid-19 pandemic [10].

## CONCLUSION

This study highlights the negative impact of the pandemic on routine vaccination. Parents have faced difficulty accessing health centers due to travel restrictions and fear of contracting the virus. This led to reduced attendance at follow-up consultations and nutrition programs, which had adverse consequences on children's health.

## COMPLIANCE WITH ETHICAL STANDARDS

We obtained authorization to collect data from the regional public health delegation of the Far North

## CONFLICTS OF INTEREST

All authors declared no competing interest and we received no funding's to realize this study.

## AUTHORS CONTRIBUTIONS

Ulrich DAMA, Pierre YASSA YONIENE, Alphonse TEDONGE ASOBOCHIA, Melkior Fobasso DZEUTA, François Anicet ONANA AKOA, Jean NDIBI ABANDA, Desire TCHOFFO, Viviane FOSSOUO NDOUNGUE designed the study, Ulrich DAMA, Alphonse TEDONGE ASOBOCHIA, Desire TCHOFFO and Pierre YASSA YONIENE analyzed the data and produced the first draft of the study. All authors extracted the manuscript and approved the final draft.

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