Acute flaccid paralysis indicators during the COVID-19 pandemic in Mozambique 2019 - 2020

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ABSTRACT

Introduction: During the state of emergency posed by the COVID-19 pandemic, one of the primary communications for the public health control and prevention measures was "stay at home". However, what happens to the indicators of diseases aimed at eradication when people stay at home? We aimed to evaluate the Acute Flaccid Paralysis (AFP) surveillance indicators and determine the polio vaccine coverage in Mozambique, 2019-2020. **Methods:** We conducted a cross-sectional study using secondary data extracted from the AFP surveillance system and the monthly vaccination summaries for January to June 2019 and January to June 2020 for these five Mozambique provinces: Cabo Delgado, Nampula, Niassa, Tete, and Zambezia. The surveillance indicators were compared based on the target group for AFP surveillance and considered adequate when the sample rate was ≥80%, detection rate ≥3 / 100,000 among those <15 years old, surveillance index ≥1.6, and ≥80 % of districts had one or more cases under investigation. Polio vaccine coverage was analyzed among those <15 years. **Results:** A total of 133 suspected AFP cases were reported in 2019 and 74 in 2020. Tete province reported the highest number of cases, with 86.6% (13/15) in 2019 and in 2020 (73.3%, 11/15). All areas reached the ≥80% sample rate in 2019 and 2020, except Cabo Delgado with 57% in 2019 and 100% in 2020. Tete province was the only one to reach the target detection rate of 4.9 in 2019 and 3.9 in 2020. Also for the surveillance index, the same province was above the target 4.9 in 2019 and 3.9 in 2020. The province of Cabo Delgado registered, in April 2019, a 118% coverage rate in the 3rd dose of polio and 61% in April 2020. In Nampula province, the vaccination coverage rate in April 2019 was 103% compared to 76% in 2020. **Conclusion:** The COVID-19 pandemic may have negatively influenced AFP surveillance and vaccination coverage in Mozambique, demonstrating the need to reinforce the AFP surveillance during the COVID-19 state of emergency.

Introduction

Since COVID-19 was declared a pandemic by the World Health Organization (WHO) in March 2020, many countries around the world implemented several public health measures to control and prevent the disease transmission; including social distancing, facemask use, suspension of school activities, restriction on population movements and others [1,2]. Although these measures reduce disease transmission and mortality, they may be associated with negative socio-economic impacts in providing access to essential health services, especially in the sub-Saharan Africa context [3,4].

On March 30, 2020, after the confirmation of the first 10 cases of SARV-COV-2, Mozambique declared a national state of emergency which lasted about six months and implemented public health response measures with a primary message of "Stay at Home"[5]. This strategy raised questions on how this measure would impact public health interventions, including the access to routine polio immunization services. The study was carried out to understand the impact of "the stay-at-home measure" on access routine polio immunization services by comparing 2020 data to that from the same period in 2019.

AFP syndrome surveillance among children aged <15 years by testing stool specimens for poliovirus laboratory confirmation is the countries principal strategy for detecting poliovirus circulation. The WHO recommended countries to strengthen and maintain communicable diseases´ surveillance systems during the COVID-19 pandemic; by monitoring their routine immunization programs and effectively interrupting their transmission cycles[6]. The WHO recommended countries to strengthen and maintain communicable diseases´ surveillance systems during the COVID-19 pandemic; by monitoring their routine immunization programs and effectively interrupting their transmission cycles [7].

Mozambique adopted the global polio eradication initiative in 1997.It stipulates that the surveillance system should aim to detect three cases of the penetrating virus per 100,000 children under the age of 15 every year [7] in order to achieve this goal. In 2018, Mozambique confirmed an outbreak of vaccine-derived poliovirus type 2 (cVDPV2) in Zambezia Province, where two genetically-linked cVDPV2isolates were detected from an acute flaccid paralysis (AFP) case and a community contact of the case [7, 8]. Previously, other polio outbreaks were reported in the country, indicating the country's vulnerability to polio re-infections.

In this particular period of the country´s vulnerability to a polio outbreak, we assessed surveillance performance indicators and determined polio immunization coverage during the first months of the COVID-19 pandemic in Mozambique.

Methods

Study settings and design

We conducted a retrospective cross-sectional study using secondary data analysis of AFP/Polio surveillance indicators and immunization coverage from January to June 2020, and the same period in 2019. Mozambique has a total of 11 provinces divided into 4 in the south, 4 in the centre and 3 in the north. The study took place in 45.4% (5/11) of the provinces, namely: Cabo Delgado, Nampula, Niassa, Tete and Zambezia. In these provinces, 26 districts were selected for the study (**Figure 1**).

Provinces were selected based on the number of suspected AFP cases reported by each province during the COVID-19 pandemic period (2020) compared to the previous period. In the period under review, 74 cases were reported in 2020 compared to 133 cases in 2019.

Data sources

We collected AFP surveillance performance indicators data from AFP surveillance records routinely collected from the provincial health directorate's disease surveillance program and for vaccination coverage we used the monthly summary logbooks of the Expanded Immunization Program (EIP). WHO AFP surveillance indicators guidelines were used to analyze the minimum performance standards (**Table 1**) [8]. The WHO Regional Office for Africa (AFRO) recommended that for countries to attain a minimum operational non-polio AFP rate of 2/100,000 in children less than 15 years and that 80% of reported cases of AFP have two stool samples

taken at 24-hour intervals and within 14 days of the onset of paralysis [8]. The administrative routine immunization coverage was extracted from the Expanded Immunization Program (EIP) registration logbook for each province. Polio vaccination coverage includes administration of the oral polio vaccine (OPV)[8].

Study variables

The study variables were defined using the standard WHO surveillance indicators (population <15, expected cases reported, adequate samples, detection rate, adequate sampling rate and month for vaccination coverage), to assess the effects of the COVID-19 pandemic on AFP surveillance systems. The percentages calculated when reporting data in AFP surveillance reports were also used.

Description of the operation of the surveillance system and data flow of Polio surveillance

Polio surveillance begins at the health center. When cases are suspected in the community or in the health unit, an investigation is carried out by filling in the case investigation forms in triplicate, taking a clinical history and then taking two stool samples from the suspected case and three samples from contacts.

After the investigation, the information is sent to the district along with the stool samples, which in turn sends it to the province and this to the central level. The information and samples are sent from the health unit to the central level in an average of three days. After arriving at the central level, the samples are sent to the South African regional laboratory within an average of four days, making a total of seven days for the information and samples to be sent from the health unit to the South African regional laboratory (**Figure 2**).

Data analysis

We analyzed data using Statistical Package for the Social Sciences (SPSS) version 20 (IBM, Australia) to generate descriptive statistics. We created the graphs using Microsoft Excel 2016 and map using QGIS 3.30 software. The annual population estimates were derived from historical census data, projected birth rates, and population structure assumptions (percentage of population under one year). Data on primary polio and the second dose of polio were excluded, as they are not used to monitor the vaccination program[8].

Results

Cases and indicators of AFP surveillance

A total of 207 suspected AFP / Polio cases were reported during the study period, with 133 cases reported from January to June 2019 and 74 during the same period in 2020.

In Cabo Delgado province, 47.3% (9/19) of districts reported AFP suspected cases during the first half of 2020. The province recorded an increase in the detection rate from 1.5/100.000 to 2.7/100.000 inhabitants from 2019-2020; the surveillance index also increased from 0.9 to 2.7 2019-20. The rate of AFP suspected cases with adequate samples increased from 57% in 2019 to 100% in 2020 (**Table 2**).

For Niassa province, we observed a decrease in suspected cases reported, from 23 in 2019 to 6 in 2020. Regarding notification by district in this province, 68.8% (11/16) of the suspected cases were reported in 2019, while in 2020 it was 31.3% (5/16). A reduction in the detection rate was observed from 5.3/100.000 to 1.4/100.000 from 2019-2020. The same reduction was observed in the surveillance index (5.3 in 2019 to 1.4 in 2020). In both years, the rate of adequate sample was 100%.

In the province of Nampula, there was a decrease in the total number of suspected cases, notified (29 in 2019 to 10 in 2020), notification by district of this province, 47.8% (11/23) in 2019 to 26.0% (6/23) in 2020. The detection rate decreased from 2.5/100.000 in 2019 to 0.3/100.000 in 2020, and the surveillance index decreased from 2.5 in 2019 to 0.3 in 2020. The adequate sample rates remained at 100% in both years.

In the province of Zambezia, there was a decrease in the total number of suspected cases notified (43 in 2019 to 18 in 2020), notification by district of this province, 77.2% (48/62) in 2019 to 40.9%(18/44) in 2020); detection rate (4.3/100.000 to 1.7/100.000 in 2019-2020); surveillance index (4.3 in 2019 to 1.5 in 2020) and the adequate sample rate (93% in 2019 to 89% in 2020).

The same decrease was observed in Tete Province, where the total suspected cases were 38 in 2019 and 24 in 2020; the notification of suspected cases decreased from 85.7% (24/28) in 2019 to 73.1% (38/52) in 2020; the same for detection rate that decreases from 4.9/100.000 in 2019 to 3.9/100.000 in 2020; and the surveillance index from 4.9 in 2019 to 3.9 in 2020. The adequate sample rate was 100% for both years.

Polio routine immunisation administrative coverage

Figure 3 shows the vaccine coverage by province. In January 2020, low OPV1 coverage rates were observed in 62.0% Cabo Delgado and 80% Nampula provinces. The low coverage was also observed for the OPV3 coverage rates in 63% of Cabo Delgado provinces, Nampula, 74%, and Zambezia 87%. In all provinces, a decline in OPV3 coverage rates was observed from February.

In the two years under study, Niassa province reached the coverage of OPV1 goal in all the selected months. In January 2019, Niassa province had a low OPV3 coverage with 89.0% and 100% in 2020; the coverage goal was reached in all the selected months.

Discussion

During the study period, was observed a decline in AFP/polio suspected case notification and a low detection rate in Niassa, Nampula, Zambezia, and Tete. This might have reflected some challenging conditions due to the imposed restrictions by the declaration of a state of emergency due to COVID-19. These restrictions may have influenced the population's behavior to seek healthcare and healthcare providers' attention from conducting all the regular and ongoing health programs including routine surveillance activities.

The lowest rate of adequate samples achieved in the two-year period´s analysis was in Cabo Delgado province in 2019 since the province did not reach the Ministry of Health's target (80.0%). This challenge may be related to the military insecurity in that region, which may have negatively influenced access to health services, sample referral system, and subsequent influence on the samples' quality. According to the World Health Organization (WHO), in other Sub-Saharan African settings, conflicts and violence are related to the risk of vaccine-derived polio cases, interrupting epidemiological activities, thus influencing the occurrence of poor health indicators[8].

In 2020, all provinces complied with the established targets for adequate sample rates compared to the same period in 2019, showing in a certain way that the surveillance system had adapted to the reality of the country where attention was mainly focused on the COVID-19.

Regarding the surveillance index in 2019 compared to the same period in 2020, all provinces reached the target established by the ministry of health except Cabo Delgado, which was affected by the cyclone Kenneth in 2019, and this may have influenced. In 2020 there was a variation in the surveillance index; possibly healthcare professionals may have reduced their efforts in surveillance due to the emergency measures imposed given the prevention and control of COVID-19 in the country.

A decline in administrative vaccination coverage levels for Cabo Delgado, Nampula, Zambezia, and Tete was also observed. These variations were more evident from February to May 2020, the period that the state of emergency due to COVID-19 was announced, and the Government imposed restrictions including the population's movement restriction [9]. This situation may be due to the restricted attendance at the health units (suspension of external consultations), the lack of information regarding the continuity of vaccination services or the fear of becoming infected [10].

The WHO reported that mandatory disease surveillance systems were negatively affected due to the COVID-19 pandemic, and several countries had postponed their immune-preventable immunization programs among children [7]. As a result, the countries must strengthen the surveillance of AFP to prevent future outbreaks. Additionally, as AFP is a highly transmissible disease, it is also essential to implement public health measures to enable the populations to adhere to immunization campaigns13.

Conclusion

Our assessment demonstrates a decline in AFP cases reporting during COVID-19 country's emergency state, and it underlines the need to strengthen disease surveillance and vaccine programs during the country's emergency state. The fear of exposure to COVID-19, physical distancing, and limitations in public transport could reduce vaccination coverage, widening the existing gaps in healthcare. Ensuring health provision and improving access to infectious diseases and immunization programs should become a key strategy during emergency states. Countries at risk for polio outbreaks need to implement more innovative strategies for social communication on the importance of immunization.

What is known about this topic

- It is crucial to strengthen the AFP surveillance system, and vaccine services must be maintained during emergencies
- Evaluating the indicators is essential it allows measuring the AFP/polio surveillance activity's performance

What this study adds

- AFP suspected cases declined in some Mozambican provinces during the health emergency period in Mozambique
- Creating key strategies for the population at risk to adhere to routine immunization during the pandemic period is important to mitigate the impact of COVID-19 on polio program

Competing interests

The authors declare no competing interest.

Authors' contributions

BN, DB, and FM, were responsible for data collection, analysis, and interpretation. EC, Neusa Fataha and SN were responsible for data collection and analysis. AB and CF as supervisors. JM was an advisor during the elaboration of the study and fieldwork protocol. ER and CB provided critical revision on the manuscript.

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Tables and figures

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Figure 2. Description of the operation of the surveillance system and data flow of Polio surveillance

Figure 3: Vaccination coverage of Polio 1st and 3rd dose by month in each province, 2019-2020

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Table 1: Definition of AFP Surveillance Indicators, 2019		
Indicators	**Indicator description**	**Target**
Notification/province	Number established for reporting AFPcases per district in a period	At least one case per province
Adequate sample rate	The number of adequate samples from suspected AFP cases arriving at the laboratory in good condition by the total number of observed cases multiplied by 100	≥80%
Detection rate	Number of reported cases of PARA by the total population at risk (<15) multiplied by 100,000 inhabitants	≥2/100000
Surveillance Index	Non-polio AFP rate multiplied by proportion of adequate stool	≥ 1.6

Table 2: Notified cases and indicators of AFP surveillance, 2019-2020								
Province	**Notified (number of cases per year/ total of cases)**		**Detection rate**		**Surveillance Index**		**Adequate Samples (%)**	
	2019	2020	2019	2020	2019	2020	2019	2020
	n (%)	n (%)						
Cabo Delgado	NI	16	NI	2.7	NI	2.7	NI	100
Niassa	23 (79.3)	6 (20.6)	5.3	1.4	5.3	1.4	100	100
Nampula	29 (74.3)	10 (25.6)	2.5	0.3	2.5	0.3	100	100
Zambezia	43 (70.4)	18 (29.5)	4.3	1.7	4	1.5	93	89
Tete	38 (61.2)	24 (38.7)	4.9	3.9	4.9	3.9	100	100
NI - No Information								

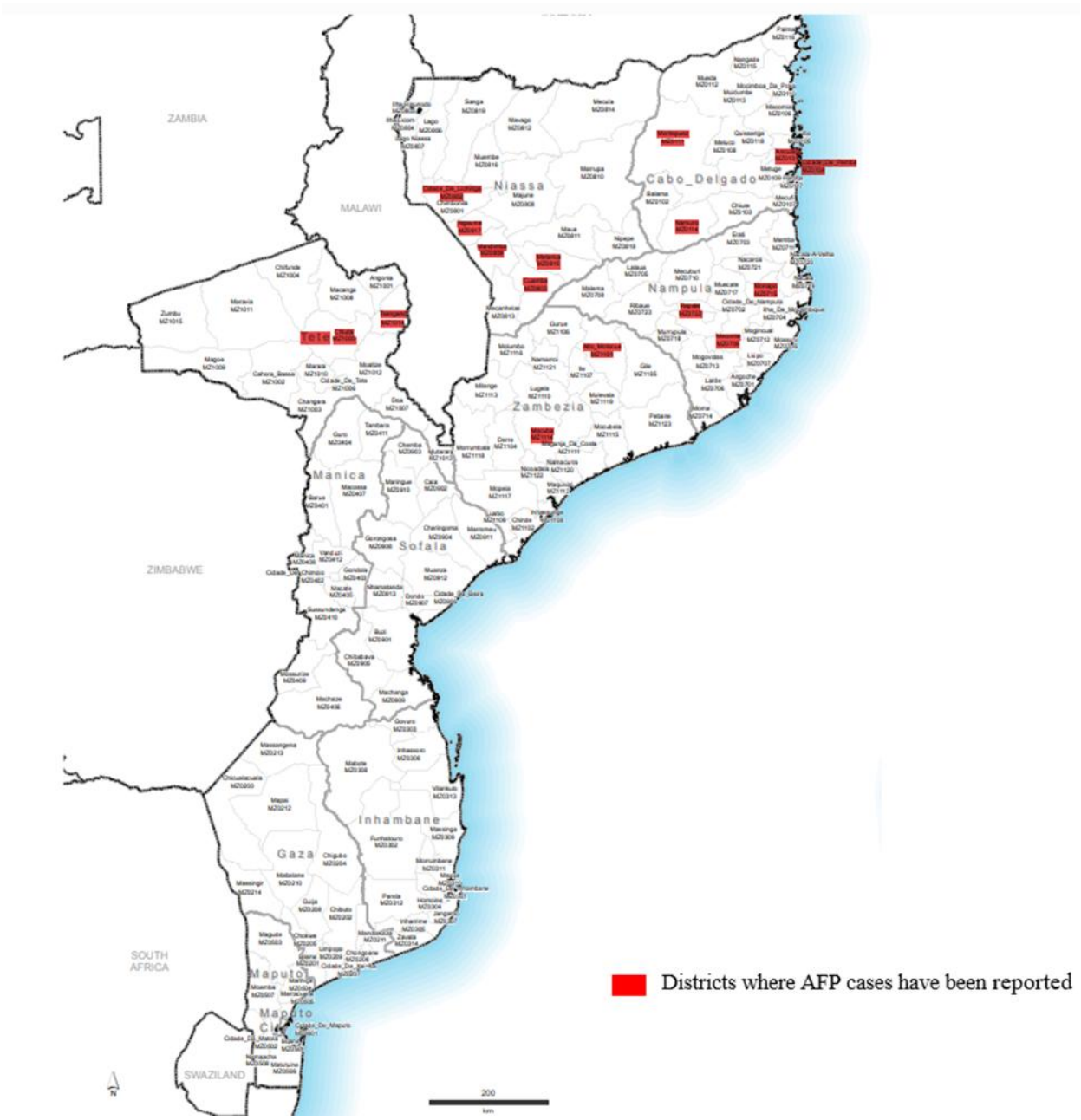

Figure 1: Map of districts and provinces assessed for AFP surveillance indicators and immunization coverage, 2020

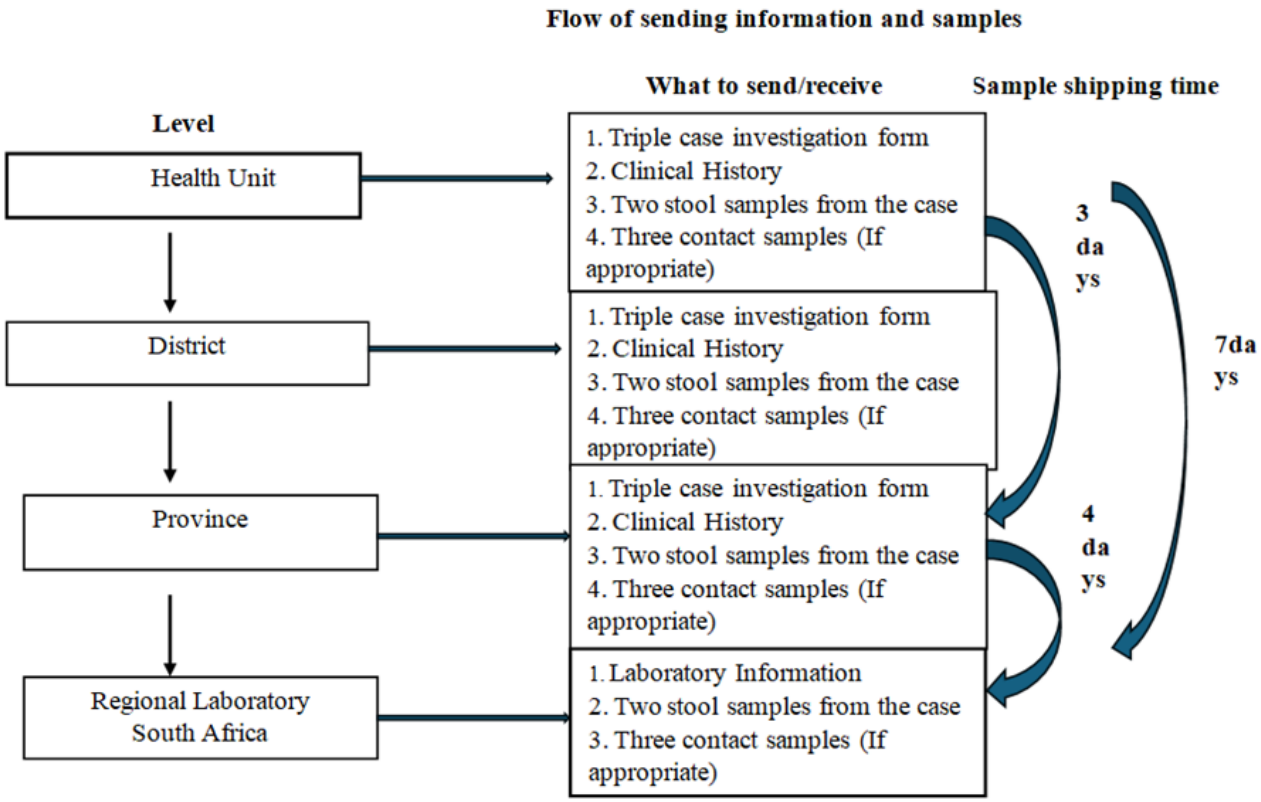

Figure 2: Description of the operation of the surveillance system and data flow of Polio surveillance

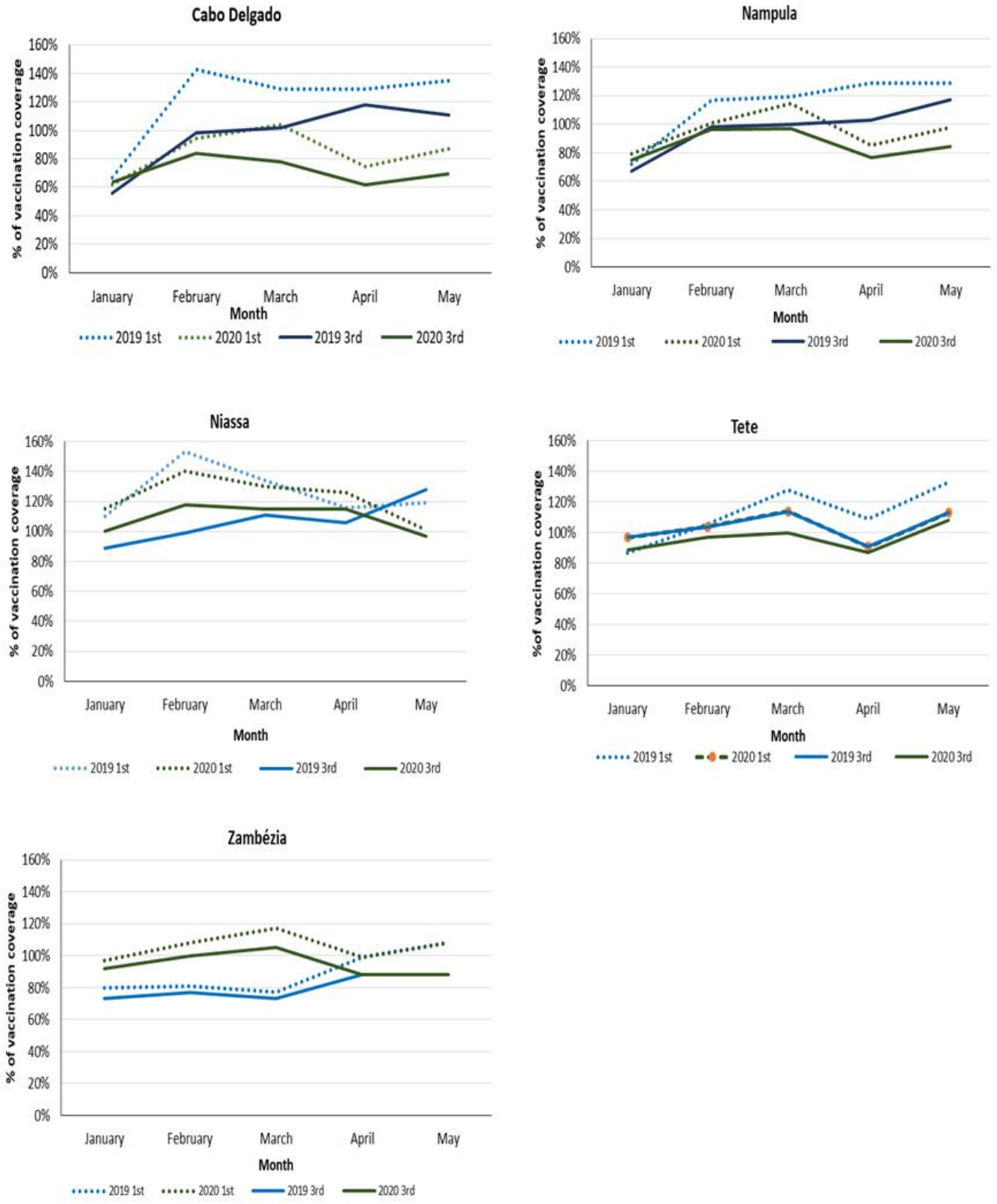

Figure 3: Vaccination coverage of Polio 1st and 3rd dose by month in each province, 2019-2020