Mapping of routine coronavirus vaccination 2019 in Tshopo province, DR Congo during July to December (2021)

ABSTRACT

The new 2019 coronavirus (Covid-19), recently referred to as "SARS-CoV-2" by the International Committee on Virus Taxonomy, is a beta-coronavirus, homologous to the bat coronavirus and closely related to SARS-CoV. Apart from medical management of the symptoms of Covid-19, vaccination is one of the most effective means of providing lasting protection for humans.

This descriptive-cross-sectional study included 3,886 persons vaccinated in routine vaccination mode in the 2 sites: General Reference Hospital (RGH) of Makiso-Kisangani and the fiftieth anniversary hospital of Kisangani in the Makiso-Kisangani Urban Health Zone, from July to December 2021. It shows that men (59%) have adhered more than women (41%). People aged 18-54 were vaccinated (59%) more than those aged 55 and over (41%). 71 of those vaccinated (2%) had no co-morbidity.

An overall acceptance of 64.7% was observed, with a gradient of 77.8% among medical professionals, 52.2% among nurses and 37.2% among nursing assistants. 11.4% of vaccinated health professionals and 85% of vaccinated persons did not return for the second dose. The fiftieth anniversary hospital site recorded a drop-out rate of 93%. Minor IPD (0.3%) was observed among those vaccinated. Moderna was the most preferred/used vaccine (46%) and the General Reference Hospital of Makiso-Kisangani site was the most used/attended (66.5%). The wastage rate was 12% (all antigens combined) of which 2 antigens (Astra Zeneca & Moderna) stood out at 21% and 13% respectively > 10% (Standard).

The objective of this study is to present the mapping of vaccination in the province of Tshopo, DRC in the first half of the year (2021) of the introduction of vaccine against covid-19 in order to protect the population against this pandemic.

Keywords: *anti-coronavirus 2019, vaccination, routine, Tshopo, DRC*

Comment [s1]: Check the sentence 55 and over is more appropriate

1. INTRODUCTION

Coronavirus disease (COVID-19) is a disease caused by a new strain of coronavirus. Originally called "new coronavirus 2019" or "nCoV-2019", the disease has been renamed "coronavirus disease 2019" (COVID-19), "CO" for corona, "VI" for virus and "D" for disease. COVID-19 is a new virus in the same family as other viruses such as severe acute respiratory syndrome (SARS) and some common colds.

Symptoms may include fever, cough and shortness of breath. In the most severe cases, the infection can cause pneumonia or breathing difficulties. These symptoms are similar to those of influenza or the common cold, which are much more common than COVID-19.

The virus is transmitted by direct contact with respiratory droplets produced by an infected person (when they cough or sneeze). It is also possible to become infected by touching surfaces contaminated with the virus or by touching the face (eyes, nose or mouth). The COVID-19 virus can survive on surfaces for several hours, but simple disinfectants can kill it.

This being the case, the following advice should be carefully followed to prevent Covid-19 Wash your hands frequently, avoid close contact, keep a distance of at least 1 meter from other people, especially if they are coughing, sneezing or have a fever, avoid touching your eyes, nose and mouth, and follow the rules of respiratory hygiene, cover the mouth and nose with the bend of the elbow or with a handkerchief when coughing or sneezing, dispose of the handkerchief immediately afterwards in a closed waste bin, and wash hands with a hydro-alcoholic solution or with soap and water [1,2].

In any case, in addition to medical management of the symptoms of this viral disease, vaccination is one of the most effective ways to protect ourselves, our families and our communities [3].

Vaccines save millions of lives every year. The development of safe and effective vaccines against COVID-19 is a major step forward in our global efforts to stop the pandemic and return to our favourite activities with our loved ones. In the Americas, no major gender difference in the absolute number of cases has been reported in the region, with 50% of these cases occurring in women [4].

Comment [s2]: America

According to data made available on 31 December 2021 on the website since the start of the vaccination campaign in France, 52,914,262 people have received at least one injection (i.e. 78.5% of the total population) and 51,756,570 people now have a complete vaccination schedule (i.e. 76.8% of the total population). [5]

Compared to Asia (with 2.52 billion total vaccinations), Europe (631.39 million), North America (487.16 million), South America (254.18 million). The total number of people vaccinated in Africa is still low because of the logistical challenges associated with access to vaccines [6].

According to WHO, Africa needs much greater access to COVID-19 vaccines to reach its goal of reaching 60% of its population by June 2022. The total number of vaccines administered in Africa is 63.16 million.

In the Democratic Republic of Congo (DRC), the coronavirus vaccination campaign was launched in April 2021. Through the COVAX initiative, UNICEF has ensured the ordering and transport of vaccines, injection materials and protective equipment. UNICEF ensures the quality of the cold chain and storage of the vaccines [7].

With more than 90 million people spread over some 2.3 million square kilometers, the scale of the COVID-19 vaccine roll-out challenge is clear. But reaching people with timely information about vaccinations in a country where most of the population does not have easy access to the Internet required creative thinking and the use of much more accessible technology. The sheer size of the country, one of the largest in Africa, is not the only challenge in rolling out the COVID-19 vaccine. Chronic poverty, limited essential service systems and infrastructure, outbreaks, recurrent armed conflict, massive displacement and lack of a steady supply of vaccine have meant that less than 1% of the population has been vaccinated as of mid-November 2021. But as the supply of COVID-19 vaccine has increased through the '' COVAX Facility '', a global partnership designed to achieve vaccine equity, it has been difficult to obtain timely information on where they can receive the vaccine. With this in mind, UNICEF and its partners launched an SMS (Short Message Service) pre-registration system to support the COVID-19 vaccination campaign [8].

Taking into account the situation report N° 304/2021 of 31/10/2021 and weekly report of the epidemiological week n°43/2021 on the epidemic of the coronavirus disease (Covid-19) in DRC, the distribution (of the available data) according to the types of vaccines is 88.552 primary vaccinated and 37.644 fully vaccinated with Astrazeneca; 12.101 primary vaccinated and 1.299 fully vaccinated with Moderna; 2.366 primary vaccinated and 323 fully vaccinated with Pfizer; and 85 vaccinated with Johnson - Johnson.

It should be noted in passing that since the introduction of the Moderna and Pfizer vaccines, a total of 168 cases of PID have been recorded, including 2 serious and 166 non-serious cases. Moreover, the majority of men received the vaccine (65%); the proportion of health professionals vaccinated was 15% [9].

In 2021, the Province of Tshopo with a total estimated population of 3.802.767 inhabitants implemented routine vaccination against Vaccine-19 on 2 July 2021 by setting up two vaccination sites in the chief town of the province belonging (all) to the Makiso-Kisangani Health Zone (376.760 inhabitants), the site of the General Reference Hospital of Makiso-Kisangani and the Hospital of the Fiftieth Anniversary of Kisangani.

Given the vastness and geographical complexity of Tshopo Province, after analysis of the routine vaccination data for CVD-19 during the annual review of primary health care activities organised in Simi-simi from 05 to 24 December 2022, it was reported that 3,886 people were vaccinated from July to December 2021[11].

But before that, the population's perception of COVID-19 remained a big barrier to vaccination (since 2018 with Poliomyelitis and in 2019 with Ebola) because of the infodemia fuelled by social networks. At first, the country's authorities showed no interest in being vaccinated, which created doubt and mistrust towards the vaccine. As a result, the population turned away from the vaccine, relying on traditional practices to combat COVID-19, and

there was a noticeable relaxation of compliance with barrier measures. Rumours such as: prayer alone or antibiotics can cure COVID-19; this epidemic can only affect the rich, foreigners or people travelling to Europe; the main purpose of this virus is to make the African population sterile in order to reduce its demography; the epidemic does not exist and the curfew introduced by the government is more political and security-related than health-related, have reinforced the population's scepticism towards vaccination [12].

In 2021, the anti-Covid-19 immunization data generated during the implementation of routine immunization activities were never posted in the DHIS2-DPS with Technical and Financial Partners; however, they are sources of major decisions.

Thus, we said to ourselves, there is not a clear relationship between the effective implementation of routine anti-covid-19 immunization sub-committee activities (Coordination - Planning - Finance, Technical, Logistics & Communication) and the number of people vaccinated since its implementation in the Province of Tshopo, on 2 July 2021.

The objective of this study is to present the mapping of vaccination in the province of Tshopo in the first half of the year (2021) of the introduction of the covid-19 vaccine in order to be able to direct the actions of the vaccination service providers towards the most disadvantaged category (ies) with the major concern of protecting them against this pandemic.

2. METHOD

2.1. Study environment

This study was carried out in the Province of Tshopo, one of the 26 provinces of the DR Congo. In terms of health, it contains a public Provincial Health Division (DPS) with 23 health zones, all of which were involved in our study.

2.2. Type of study & sampling

We conducted a descriptive cross-sectional study. The analyses focused on 3.886 people vaccinated in routine vaccination mode in the 2 vaccination sites of the Makiso-Kisangani urban health zone (Makiso-Kisangani general reference hospital and the Hôpital du Cinquantenaire in Kisangani) selected by the EPI (Expanded Programme on Immunization) at the central level, from July to December 2021[11].

The data were collected at these two vaccination sites where the target persons were pre-registered and vaccinated during the period of our study, of which 1,301 persons were vaccinated using fixed, advanced and mobile strategies.

2.2.1. Sample selection criteria:

2.2.1. Inclusion criteria:

Any person aged 18 years and over

2.2.2. Exclusion criteria:

Anyone under 18 years of age; pregnant women; breastfeeding women; anyone with an allergy to any of the routine vaccination antigens.

2.2.3. Variables in our study.

1. Completeness of routine immunization reports against 19-covid
2. Proportion of routine Covid-19 immunization activities carried out by sub-commission
3. Gender: number of men and women vaccinated;
4. Age: number of people vaccinated < 55 years (18 - 54 years), number of people vaccinated ≥ 55 years;
5. Comorbidity: number of people > 55 years vaccinated with comorbidity and number of people < 55 years vaccinated with comorbidity; ered and shared with the hierarchy (in Excel format): EPI Office & Coordination Kisangani.

For the processing of these data, we used the percentage calculation below:

P= (Fo x 100)/Ft

Legend

- % = percentage
- Fo = observed frequency
- Ft = total frequency

3.RESULTS

3.1. ROUTINE ANTI-COVID-19 VACCINATION DATA.

Table I. Completeness of routine anti-covid-19 vaccination reports in Tshopo Province, 2021.

Names of immunization sites	Expected number of reports	Number of reports received	%
Makiso-Kisangani general reference hospital	175	175	100
Fiftieth anniversary hospital	175	175	100
Total	350	350	100

The completeness of the reports was 100% in both vaccine sites.

Table II. Proportion of activities carried out by routine immunization sub-commission anti-covid-19 in Tshopo Province, 2021.

Sub-committees	No. of planned activities	No. of activities carried out	%
Coordination-Planning-Finance	18	4	22.2
Technique	12	4	33.3
Logistics	11	3	27.2
Public Relations	13	2	15.3
Total	54	13	24.0

Table II shows that none of the sub-committees of the topics designed for routine immunization reached 80%.

Table III. Gender distribution of people vaccinated against covid-19 during routine immunization in Tshopo Province, 2021.

Names of immunisation sites	Gender		Total	%
	Male	Female		
Makiso-Kisangani general reference hospital	1609	976	2585	66.5
Fiftieth anniversary hospital	685	616	1301	33.5
Total	2294	1592	3886	100.0
%	59.0	41.0		

In favour of routine immunization, men (59%) were more likely than women (41%) to participate and the Makiso-Kisangani general reference hospital was the immunization site that received more people vaccinated (66.5%) than the Fiftieth anniversary hospital (33.5%).

Table IV. Age distribution of people vaccinated against covid-19 during routine vaccination in Tshopo Province, 2021.

Names of immunization sites	Age		Total	%
	Under 55 years old	Over 55 years old		
Makiso-Kisangani general reference hospital	1295	1290	2585	66.5
Fiftiethanniversary hospital	999	302	1301	33.5
Total	2294	1592	3886	100.0
%	59%	41%	100%	

In our study series, people aged 18-54 were vaccinated (59%) more than those aged 55 and over (41%).

Table V. Distribution of people vaccinated against covid-19 with comorbidity during routine vaccination in Tshopo Province, 2021.

Names of immunization sites	Co-morbidity		Total	%
	With	without		
Makiso-Kisangani general reference hospital	64	2521	2585	66.5
Fiftieth anniversary hospital	7	1294	1301	33.5
Total	71	3815	3886	100.0
%	1.8	98.2		

Table V shows that 98.2% of vaccinated persons (3815) have no comorbidity.

Table VI. Distribution of people vaccinated against covid-19 during routine immunization by occupational category in Tshopo Province, 2021.

Names of immunization sites	Professional categories				Total
	Health agents	%	Others	%	
Makiso-Kisangani general reference hospital	222	8.5 %	2363	91.4 %	2585
Fiftieth anniversary hospital	220	16.9 %	1081	83.05 %	1301
Overall total	442	11.3 %	3444	88.6%	3886

Of all the professional categories, health workers (11.4%) are the least vaccinated than the others.

Table VII. Distribution of persons fully vaccinated against covid-19 during routine immunization in Tshopo Province, 2021.

Vaccination site names	Number of people vaccinated	Number of doses received		Taux d'abandon
		Dosage 1	Dosage 2	
Makiso-Kisangani general reference hospital	2585	2585 (66.s5%)	500 (12.9 %)	81%
Fiftieth anniversary hospital	1301	1301 (33.5%)	97 (2.5%)	93%
Total	3886	3886 (100%)	597 (15.4%)	85%

In our study as a whole, 85% of vaccinated people have not yet come forward for dose 2 and the highest drop-out rate was observed in the Fiftieth anniversary hospital site (93%).

3.2. MAPI SURVEILLANCE.

Table VIII. Distribution of Post-Vaccine Adverse Events observed in people vaccinated against covid-19 during routine immunization in Tshopo Province, 2021.

Vaccination site names	MAPI			Overall total	%
	Minor	Serious	Total		
Makiso-Kisangani general reference hospital	10	0	10	2585	0.4%
Fiftieth anniversary hospital	0	0	0	1301	0.0%
Total	10	0	10	3886	0.3%
%	0.3%	0.0%	0.3%		

It should be noted that minor PIDs were observed in the order of 0.3% in the entire vaccinated population and the Fiftieth anniversary hospital did not report any cases (0%).

3.3. ANTI-COVID VACCINE MANAGEMENT 19

Table IX. Distribution of people vaccinated against covid-19 by vaccine type during routine immunization in Tshopo Province, 2021.

Vaccination site names	TYPES OF VACCINES RECEIVED					Total	
	Astra Zeneca	Moderna	Pfizer	Sinovac	Johnson & Johnson		%
Makiso-Kisangani general reference hospital	297	836	837	179	436	2585	66.5%
%	11%	32.3%	32.4%	6.9%	16.9%	100%	
Fiftieth anniversary hospital	91	947	122	51	90	1301	33.5%
%	7%	72.8%	9.4%	3.9%	6.9%	100%	
General overview	388	1783	959	230	526	3886	100%
%	**10%**	**46%**	**25%**	**6%**	**14%**	**100%**	

Among the series of vaccines received in the Makiso-Kisangani health zone, Moderna (46%) was the type best appreciated/consumed by the 3,886 people vaccinated.

Table X. Distribution of wastage rates by vaccine type received during routine immunization in Tshopo Province, 2021.

NAMES OF SITES OF VACCINATION / Quantity used		WASTAGE RATES BY VACCINE TYPE					
		Astra Zeneca	Moderna	Pfizer	Sinovac	Johnson & Johnson	Total
Makiso-general reference hospital	Doses used	350	1080	924	186	483	3023
	Doses administered	297	836	837	179	436	2585
Loss rate		**15%**	**23%**	**9%**	**4%**	**10%**	**14%**
Fiftieth anniversary hospital	Doses used	140	975	132	52	90	1389
	Doses administered	91	947	122	51	90	1301
Loss rate		**35%**	**3%**	**8%**	**2%**	**0%**	**6%**
General overview	Doses used	490	2055	1056	238	573	4412
	Doses administered	388	1783	959	230	526	3886
Overall loss rate		**21%**	**13%**	**9%**	**3%**	**8%**	**12%**

In the batch of vaccines made available at 2 vaccination sites in the Makiso-Kisangani health zone, the wastage rate obtained was 12% (all antigens combined). Only 2 antigens (Astra Zeneca & Moderna) were distinguished by wastage rates above 10% (standard).

4. DISCUSSIONS

4.1. Gender

In our study, men (59%) joined more than women (41%) in the Makiso-Kisangani HZ. Certainly, it is remembered that the notion of gender equity in the 'Horizon 2030 Initiative' is taken with a grain of salt. However, gender-related factors may influence confidence and reluctance towards vaccines.

Furthermore, some literature has shown that men, women and different gender groups are at different risks with regard to COVID-19 and its consequences. While men who contract acute forms of COVID-19 have more severe complications and higher mortality rates, the data indicate that women are more likely to experience long-term symptoms of the disease ("protracted COVID-19 symptoms"); and to add that in some cases,

women's reduced access to reliable information, lack of experience, limited decision-making power and dependence on men in the household, but also on those perceived to be in positions of responsibility (e.g. teachers, healers, etc.), may make them more vulnerable to the disease. Men's adherence to the immunization service is not always as high as it should be.

The adherence of men to the vaccination service in our study series may be explained by the fear of dying based on what was experienced and heard from Covid-19. This category of people (men) are more exposed (bars, markets, hospitals, ports, schools, stadiums, etc.) than women (dependent on men's decisions in the majority of cases in Africa) and it is they who seek food to support their families in our province of Tshopo in the Democratic Republic of Congo.

4.2. Age

Notwithstanding, it is important to highlight the impact of Covid-19 on age in terms of economic well-being (considerable reduction in income and quality of life), mental health (physical distancing measures which can have devastating effects and the risk is particularly pronounced among those who often live alone and whose digital inclusion is less good), response (the participation of older people in the response not only as victims but also as health workers, carers and providers of essential services), life and death (the mortality rate of older people as a result of COVID-19 is five times higher than average.

It is estimated that 66% of people aged 70 or over have at least one condition that puts them at increased risk), abuse and neglect (the essential health care services on which older people often depend are under pressure. Nearly ½ of Covid-19 deaths in Europe occurred in long-term care facilities. Older women often care for family members who are even older than they are, increasing their risk of contracting the virus) and vulnerability (in 2017, 1 in 6 older people were victims of abuse. In the context of confinements and reduced care, violence against older people has been on the rise) [14].

Our study series shows that people aged 18-54 were vaccinated (59%) more than those aged 55 and over (41%).

This age group (18-54 years) accepted to be vaccinated because they were aware of the risks of the disease and also because they had experience of a long-term illness in the community.

On the other hand, low uptake may be explained by low perception of disease risk, lack of reliable information on the merits of vaccines and vaccination, and lack of trust in the government [15].

In July 2020, among the 728 people (36%) who did not wish to be vaccinated, the most frequently cited reasons for not doing so were: vaccine safety (67%); preference for other means of prevention such as barrier measures (33%); and anti-vaccination behaviour in general (18%). Conversely, in this same group, the reasons for not doing it were: "information proving the efficacy and safety of vaccines" (39%), "protection of my family and friends" (21%) and 34% declared: "no reason would make me change my mind" [16].

4.3. Comorbidity

People with underlying medical conditions are at greater risk of developing a severe form of COVID-19. There is therefore a need to develop protective strategies that target this population group.

It is important to note that a large proportion of this at-risk population is not exclusively composed of people aged 55 and over (in the case of our study). Indeed, a significant proportion is of working age (15-64). It is therefore necessary to take into account this distribution of risks in the population to avoid duplication in the prioritization process, as well as to ensure the continuity of essential services [17].

In our study, 2% of vaccinated persons, i.e. 71 out of 3,886 persons, were found to have no comorbidity. It is obvious that this category of people agrees to be vaccinated, otherwise, once they have Covid-19, they risk developing a serious form of the disease that could lead to hospitalization or even death.

4.4. Occupational categories

The study by the Study Group on the Risk of Exposure of Health Care Workers to Infectious Agents assessed the theoretical acceptance of vaccination against Covid-19 and its determinants among 3,556 health care workers [18].

An overall acceptance of 64.7% was observed, with a gradient ranging from 77.8% among medical professions, 52.2% among nurses and 37.2% among nursing aides.

Of all the professional categories, health workers (11.4%) were the least vaccinated in our study series. This low proportion of people vaccinated can be explained by the widespread strike of health workers that was observed throughout the country during the implementation of routine vaccination in the provinces. We had to work more with doctors and nurse trainees during this period.

4.5. Completed vaccinations and drop-out rates.

Given the limited supply of vaccine and the high disease burden, some countries may consider delaying the administration of the second dose as a pragmatic approach to getting the first dose to as many people as possible. However, there are no data on the long-term effectiveness of a single dose of COVID-19 vaccine(s) [17].

In our overall study, 85% of vaccinated individuals have not yet presented for dose 2, and the highest drop-out rate was observed among individuals who attended the Fiftieth anniversary hospital site (93%).

However, according to the Guidelines in force in DR Congo in 2021, in the event of Astra Zeneca's failure, one could receive Pfizer or Moderna. By 2022, the revised Guidelines provided for receipt of any other type of vaccine to complement Pfizer, Moderna & Sinovac [19].

4.6. Monitoring of PFDs.

As with any vaccine, side effects may occur. The most common side effects are injection site pain, fatigue and headache. Other common side effects may include fever, chills, muscle aches and joint pain. These side effects usually occur the day after or two days after vaccination and disappear within one to three days [20].

The same view was expressed by World Vision (2022), which states that "People may experience mild side effects, such as body aches or headaches, when receiving a COVID-19 vaccine, but fully vaccinated people are 72-96% less likely to contract COVID-19 than someone who is not vaccinated, and 80% less likely to die from the new Omicron variant." [21].

In our study series, it is worth noting that minor PAD was observed in the order of 0.3% in the overall vaccinated population. This is more reassuring to the confidence of clients who have long observed what might happen after vaccination against Covid-19. Curiously, no deaths or hospitalizations were observed after vaccination against Covid-19 in our two pilot sites in the province of Tshopo

4.7. Covid-19 vaccine management.

Among the series of vaccines received in the Makiso-Kisangani Health Zone, Moderna (46%) was the type of vaccine best appreciated/consumed by the 3,886 people vaccinated and the General reference hospital of Kisangani site was the best used/attended (66.5%). Vaccine uptake at an immunization site can depend on several reasons, namely; the reputation of the health staff (reception, respect for the time of the immunization sessions, availability of vaccines and other immunization inputs, client-health staff dialogue, etc). On the side of the beneficiary/vaccinated person, he/she has understood the merits of vaccination, he/she has imitated the model set by his/her community leader sometimes, there is also the notion of professional constraints (whoever will have access to such and such a post or access to the trip than the one who is vaccinated/availability of a digitalized vaccination card/QR code), etc.

In addition, in the batch/package of vaccines made available at 2 pilot sites in the Makiso-Kisangani Health Zone, the wastage rate obtained was 12% (all antigens combined) and only 2 antigens (Astra Zeneca &

Moderna) stood out with wastage rates of 21% and 13% respectively > 10% (Standard). This situation is linked to unused vials of vaccine in the two pilot vaccination sites in Tshopo province.

5. CONCLUSION AND SUGGESTIONS

The vaccination of eligible people was made effective in the Province of Tshopo in the Democratic Republic of Congo on 2 July 2022 thanks to the involvement of the political and administrative authorities in collaboration with the Global Alliance for Vaccines and Immunization (GAVI) under the COVAX Facility.

The acceptance of all sexes with or without comorbidity aged 18 years and over to be vaccinated (3886 people), the availability of vaccines and other inputs (100%) without however putting aside the strong sensitization through local radio stations (n= 05), churches of all persuasions (n=36), schools, universities and secondary and higher institutes (n= 05).

In the long run, we will welcome the mass vaccination campaigns that will be organized to boost the protection of the population of the Tshopo province and we would also like to see the data generated posted on the DHIS2 in order to sell to the whole world the efforts made by all those involved in routine vaccination. Effective sensitization in all the towns in Tshopo will be important to maximize the uptake of the vaccine.

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