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BRIEF REPORT

The vaccination against COVID-19 in Morocco: a success story in progress

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Abstract

Coronavirus disease 2019 is a respiratory sickness that may spread between persons. It is caused by a novel coronavirus that produces an outbreak in Wuhan, China and spread all over the world to become a pandemic. From the appearance of the first case of the new coronavirus in Morocco, Moroccan authorities has spared no effort to promote the health of Moroccans, ahead of that of the country's economy. On 22 January 2021, 2 million doses, of AstraZeneca COVID-19 vaccine were delivered to Morocco, with a view to vaccinating 1 million Moroccans in a first phase. On 28 January, the campaign started and the King of Morocco was the 1st Moroccan to be vaccinated against the coronavirus. On 27 February 2021, Morocco has received 1 million doses from the Chinese laboratory Sinopharm and 6 million doses of the AstraZeneca vaccine allowing Morocco to vaccinate several audiences and the general public over the age of 60, and the most vulnerable. Thereafter, the COVID-19 vaccine doses administered per 100 people in 31 March 2021 were 115.89 in Israel, 84.01 in the United Arab Emirates, 52.53 in the United Kingdom, 44.93 in the United States, 45.04 in Bahrain, 21.66 in Morocco, 16.44 in Germany, 8.32 in China, 4.72 in India, and 0.44 in South Africa. Also, the population fully vaccinated against COVID-19 in 01 April 2021 were 55.51% in Israel, 22.12% in the United Arab Emirates, 20.08% in Chile, 16.77% in USA, 15.25% in Serbia, 15.14% in Bahrain, 10.21% in Morocco, 8.94% in Hungary, 8.23% in Turkey, 7.29% in UK, 3.07% in Russia, 2.39% in Brazil, 1.70% in Uruguay, 0.70% in India, and 0.45% in South Africa. This allows Morocco to figure in the top 10 countries fully vaccinated against COVID-19 despite the lack of resources and belonging to developing countries. Finally, our study gives an example to other countries to benefit from the Moroccan experience. Nevertheless, vaccination is only one element of a comprehensive COVID-19 strategy, it must be accompanied by measures to reduce circulating infection and keep them low.

Keywords

COVID-19; Morocco; Vaccination; Pandemic

Coronavirus disease 2019 (COVID-19) is a respiratory sickness that may spread between persons. It is caused by a novel coronavirus that produced an outbreak in Wuhan, China and spreads all over the world to become a pandemic [1–3].

The symptoms associated with COVID-19 are fever, cough, and fatigue, congestion, rhinorrhea, olfactory dysfunction, sore throat and diarrhea [4, 5].

COVID-19 is primarily transmitted through respiratory droplets, which are released when a person sneezes, coughs, or talks. Furthermore, when a person touches a contaminated surface or object, and then touches his mouth, nose, or eyes may get infected [6, 7].

As of 02 April 2021, 130.24 million confirmed cases and 2.84 million deaths were recorded all over the world, while 497.257 confirmed cases and 8.835 deaths were noted in Morocco [8].

Furthermore, from the appearance of the first case of the new coronavirus in Morocco, Moroccan authorities launched a special COVID-19 fund (more than 3.8 billion US dollar (USD) in contributions), initiated the National monitoring and response plan against Coronavirus infection whose objectives were (1) prevent the introduction into the national territory of COVID-19; (2) Detect cases early and contain their spread; (3) Organize a national response adapted from the health system; and (4) Strengthen infection prevention and control measures in hospitals.

Also, Moroccan authorities advanced orders for chloroquine and supported citizens who were working in the informal economy (more than 5 million households helped).

Later, the first Moroccan to be vaccinated was the king of Morocco, aged 57, in the palace of Fez, showing the example in front of the camera and thus giving the top start of the vaccination campaign for 35 million Moroccans on Thursday, 28 January 2021. At the same time, the health authorities

and the government had to reassure citizens and answer their questions in order to dispel the doubts and rumors surrounding the delivery of doses, the number of doses or the effectiveness of the vaccines chosen [9].

While Morocco was among the first countries to announce the date of the launch of the anti-COVID-19 vaccination campaign in the 2nd and 3rd week of December 2020, the delay in delivery has long fueled the controversy in the country.

Speculations have sometimes come close to the infodemic, certain conspiracy theories have made the rounds of the Web very quickly. On social networks, several Moroccan Internet users were sharing Fake News relating to vaccines and their potential harms.

In fact, many factors could contribute to vaccine hesitancy such as fake news in social medias, low level of education and economic status, and insufficiency in population awareness programs.

Actually, in psychoanalysis, during great periods of epidemic, collective hysteria is favorable to occur. People share the same troubles, the same impulses and the same phobias. Denial is a natural defense mechanism; it is up to the health authorities to reassure the crowds and explain to them in simple terms the role of the vaccine and the importance of herd immunity [10].

Thereafter, the health authorities explained that Morocco has always worked in anticipation, except that the supply of vaccines is dependent on international authorizations. At the same time, production capacity remains below international demand and the scarcity of vaccines on a global scale would have led to strong speculation, not to mention that producing countries have [9].

The kingdom had indicated at the end of December having ordered 65 million doses of the British AstraZeneca and Chinese Sinopharm vaccines, it is these latter which arrived first and almost simultaneously in several cities of the kingdom.

Indeed, CoronaVac or Chinese Sinopharm vaccines is an inactivated vaccine containing inactivated severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which was tested in several studies for its safety, tolerability and immunogenicity [11, 12].

ChAdOx1 nCoV-19 vaccine (AZD1222) or AstraZeneca COVID-19 vaccine was developed at Oxford University and consists of a replication-deficient chimpanzee adenoviral vector ChAdOx1, containing the SARS-CoV-2 structural surface glycoprotein antigen (spike protein; nCoV-19) gene [13]. It has an acceptable safety profile and has been found to be efficacious against COVID-19 [14]. Also, ChAdOx1 nCoV-19 is tolerated in older adults and younger adults and has similar immunogenicity across all ages [15].

It should be noted that since Morocco participated in the clinical trials of the Chinese Sinopharm vaccine, it was among the first countries to be delivered. Actually, a part of phase III clinical trials of the Sinopharm Wuhan vaccine was conducted in Morocco and included people aged 60 and over. The results have shown good tolerance in this population [16].

Morocco also will receive 1.88 million doses of the Covax vaccine from Pfizer and has already signed agreements to acquire the vaccine from Moderna [17].

The delayed supply of these ARN messenger vaccines may explain the fact that they are not yet used in Morocco. Additionally, Covax vaccine must be stored at around -70 °C and transported in special boxes which needs important logistical capacities especially to reach outlying areas [18].

Thus, in turn to reassure, it was well explained to citizens that all COVID-19 vaccines used in Morocco have obtained authorization from the health authorities and also demonstrated their effectiveness with no potential side effects, as evidenced by preclinical and clinical data [19].

Furthermore, the vaccination campaign is free for all citizens and foreigners living in Morocco [20]. It would take place gradually and would benefit all Moroccan citizens and residents whose age varies between 18 and over 75 which the objective is to achieve quickly collective immunity in order to protect the population against this pandemic.

Even the most dubious are gradually being convinced. Previously, large numbers of Moroccans were skeptical of official government communication regarding delivery delays and questioned the ability of the Ministry of Health to follow through on the promise of a national vaccination campaign.

In Morocco, a country of 35 million inhabitants where the state of health emergency has been in effect since mid-March 2020, the health crisis has had a disastrous impact on the country's economy, where a curfew has been imposed.

The operation of vaccination is financed by the COVID-19 Special Fund, a fund which should, in addition to the vaccination campaign, cover all the sectors affected by the health crisis. Especially since the pandemic affects above all cities with high urban density, such as the economic capital Casablanca and the popular city of Salé, adjacent to Rabat [9].

Once the vaccines arrived, the link to the official vaccine site quickly circulated on the Internet: www.liqahcorona.ma/fr. The health ministry supported this phase with a large communication campaign to raise awareness, explain, and answer citizens' questions through national TV channels and social networks [20].

In addition to the website, and to multiply the appointment request channels, Moroccans can also send by SMS their Card Identity Number (CIN number) or the number of their residence card to the toll-free number 1717 [20].

Additionally, the vaccination campaign initially concerns areas where the level of COVID-19 contamination is high. The vaccine is distributed progressively by targeting initially people aged over 75, health professionals aged 40 and over, teaching staff aged 45 and over, public authorities and members of the military. Then, people aged over 60 years, health professionals and teaching staff aged respectively less than 40 and 45 years will be vaccinated. After that, people with chronic diseases, and aged over 50 will be targeted. The process will be continued until 80% of the Moroccan population will be vaccinated. Once the first dose of the vaccine is administered, the beneficiary should take the second dose on the date specified by the health authorities. After taking the two doses, the vaccinated can download the vaccination certificate on the platform of the official website of the vaccination campaign. It should be remembered that two million doses, produced by the British laboratory AstraZeneca and sent from India, were delivered to Morocco earlier, on 22 January 2021, with a view to vaccinating 1 million Moroccans in a first phase. To date and

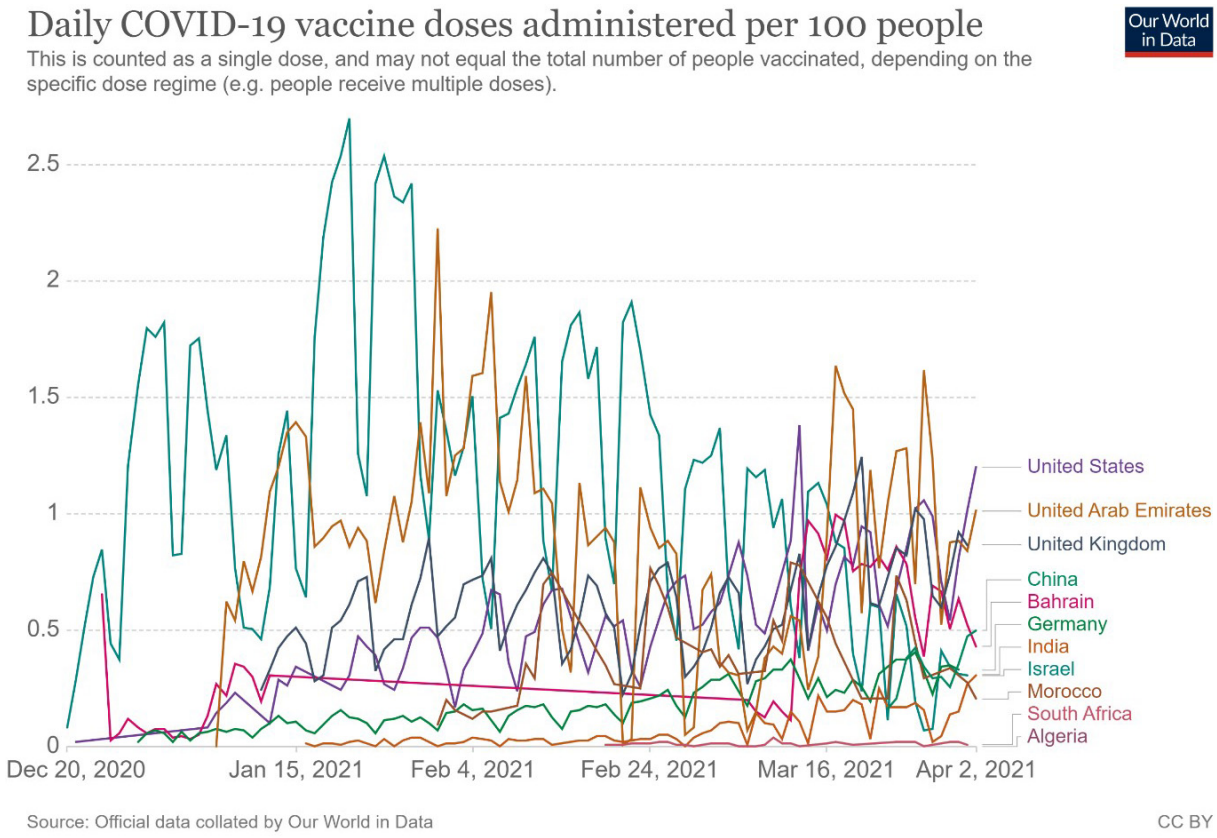

FIGURE 1. Daily new COVID-19 vaccination doses administered per 100 people in 31 March 2021 [23].

in all, Morocco has received 1 million doses from the Chinese laboratory Sinopharm and 6 million doses of the AstraZeneca vaccine allowing Morocco to vaccinate several audiences and the general public over the age of 60, and the most vulnerable [9, 21].

Also, an agreement has also been made with Russia for the delivery of eight million doses of Sputnik vaccine [22].

On Tuesday 16 February 2021 it was noted that the reproduction rate (R0) of COVID-19 showed an improvement for the 13th consecutive week to stabilize at 0.85, specifying that the death curve also registered a 30% drop over the past week. Indicators already show the success of this campaign.

Moreover, is not the first national vaccination campaign of the kingdom of Morocco. In 2013, a campaign was launched against measles and rubella. It affected 11 million people aged 9 months to 18 years, or one third of the population. The said campaign was spread over 4 weeks. These diseases were present in virtually all homes, and the situation quickly turned to barely 4 or 5 cases of measles per year [9].

Furthermore, the daily COVID-19 Vaccine doses administered by 100 people in 31 March 2021 were 0.92 in the United Kingdom, 0.89 in the United Arab Emirates, 0.81 in the United States, 0.63 in Bahrain, 0.36 in China, 0.33 in Germany, 0.31 in Israel, 0.30 in Morocco, 0.15 in India, and <0.01 in both South Africa and Algeria (Fig. 1) [23].

Also, the COVID-19 vaccine doses administered per 100 people in 31 March 2021 were 115.89 in Israel, 84.01 in the United Arab Emirates, 52.53 in the United Kingdom, 44.93 in the United States, 45.04 in Bahrain, 21.66 in Morocco, 16.44 in Germany, 8.32 in China, 4.72 in India, and 0.44 in South Africa (Fig. 2) [23].

Besides, the population fully vaccinated against COVID-19 in 01 April 2021 were 55.51% in Israel, 22.12% in the United Arab Emirates, 20.08% in Chile, 16.77% in USA, 15.25% in Serbia, 15.14% in Bahrain, 10.21% in Morocco, 8.94% in Hungary, 8.23% in Turkey, 7.29% in UK, 3.07% in Russia, 2.39% in Brazil, 1.70% in Uruguay, 0.70% in India, and 0.45% in South Africa (Fig. 3) [22]. This allows Morocco to figure in the top 10 countries fully vaccinated against COVID-19 despite the lack of resources and belonging to developing countries.

In 25 February 2021, and when Germany and other European countries slide through the second wave in lockdown, Morocco was well on the way to vaccinating itself out of the crisis. In Germany, the 7-day average is currently 126,806 first and second vaccinations per day. Morocco vaccinated an average of 173,920 doses a day last week [24].

Another excellent examples in COVID-19 vaccination are Israel and the United Arab Emirates. In fact, the percentage of the population fully vaccinated in 01 April 2021 is 55.51% in Israel and 22.12% in the United Arab Emirates which is making them ones of the leading counties in the field [25]. This leading position is due to the small and young population, its high population density avoiding the need for complex logistical arrangements to reach far areas, and well-developed infrastructure for implementing prompt responses to large-scale national emergencies [26, 27].

To our knowledge, our study in strategy of vaccination against COVID-19 is the first one in Morocco and Africa. In fact, the vaccination strategy employed in Morocco and led

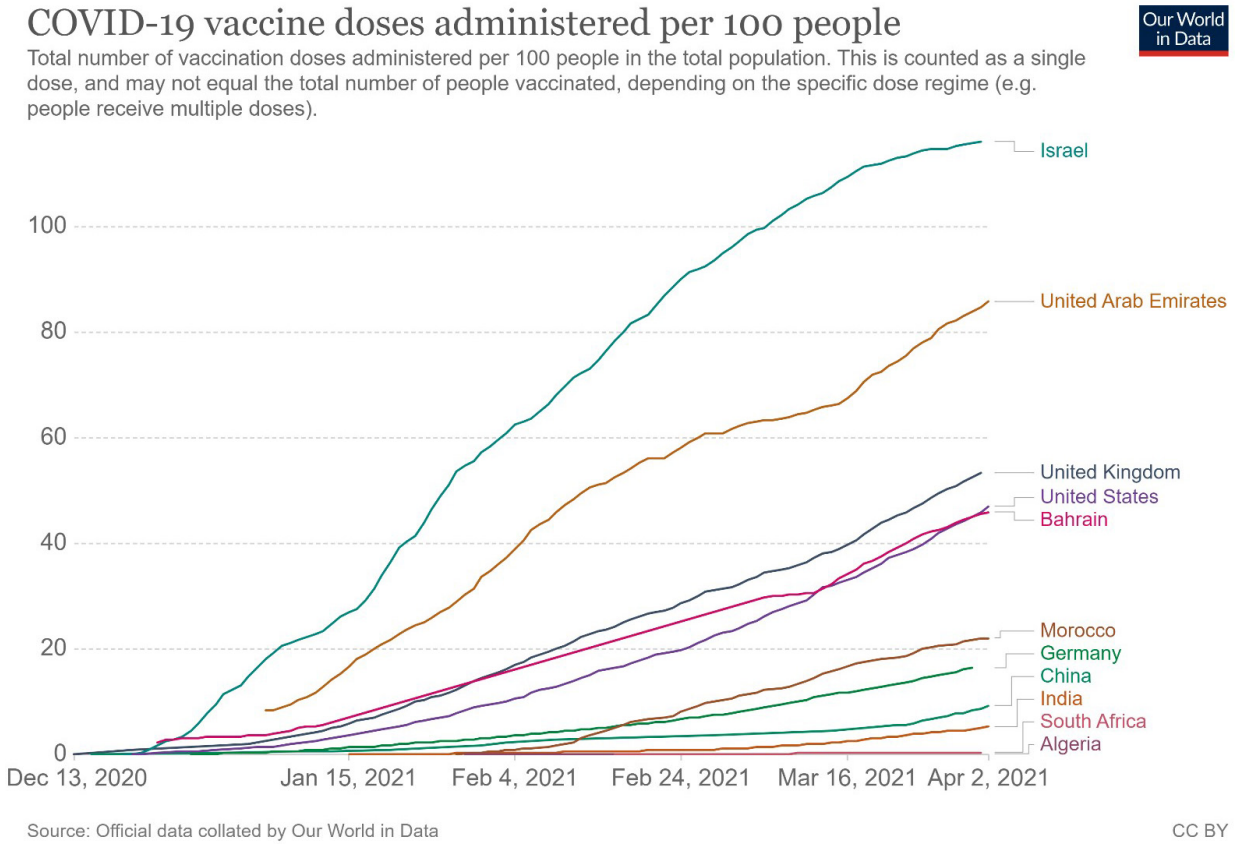

FIGURE 2. COVID-19 vaccine doses administered per 100 people in 31 March 2021 [23].

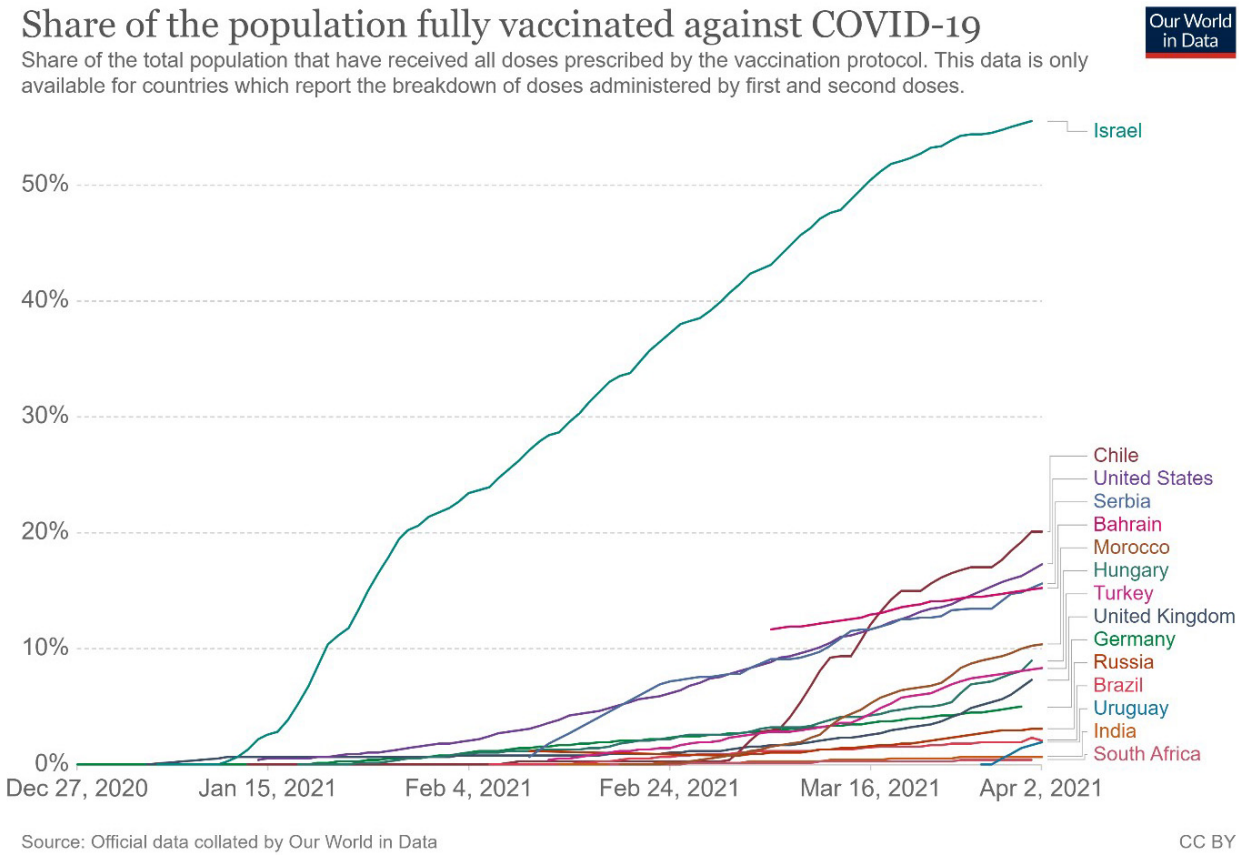

FIGURE 3. The population fully vaccinated against COVID-19 in 01 April 2021 [23].

good results in combating COVID-19 because of:

(1) Anticipation of purchasing vaccines: Morocco was among the 1st countries in the world to acquire anti-COVID-19 vaccine.

(2) Strong population awareness programs were conducted in social medias, radio and Tv channels, and also in mosques.

(3) The establishment of specialized anti-COVID-19 vaccination centers in both urban and rural territories.

(4) Free transport of citizens to vaccination centers, especially in rural areas.

(5) The Moroccan specificity: >The king of Morocco: as the political and spiritual leader (or the prince of believers) of the nation was the 1st Moroccan to be vaccinated constituting the example of citizenship and patriotism and have given an essential boost to the vaccination campaign.

>Moroccan local authorities: the Mekadem and sheikh are officials of the Ministry of the Interior in respectively urban and rural areas, whose are characterized by their relationships of proximity, familiarity and trust with Moroccan population, and thereafter have contributed massively to convince the population in vaccination and participate to their transport to the vaccination centers.

This study demonstrated that Morocco is on the right way to vaccine its population to irradicate COVID-19 from its territory, thanks to anticipation, high management, the dedication of health workers, and the competence of executives of the ministries of health and interior. It gives also an example to other countries to benefit from its experience. Nevertheless, vaccination is only one element of a comprehensive COVID-19 strategy, it must be accompanied by measures to reduce circulating infection and keep them low.

AUTHOR CONTRIBUTIONS

Conceptualization, RAA; methodology, RAA; validation, RAA, formal analysis, RAA; investigation, RAA; writing, RAA; original draft preparation, RAA; writing—review and editing, RAA; visualization, RAA, AB; supervision, MC; All authors have read and agreed to the published version of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

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CONFLICT OF INTEREST

The images are taken from Our World in Data. The authors have no financial conflict of interest to disclose.

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