

The current situation of COVID-19 in Sudan

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Abstract

The outbreak of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a global public health concern with rapid growth in the number of patients with significant mortality rates. The first case in Sudan was reported on 13 March 2020, and up to 3 July 2020 there are 9894 confirmed cases and 616 deaths. The case fatality rate was 6.23%. There is variation in case fatality rate (CFR), which in some cities (like Khartoum) was low (3.8%), but in others (like North Darfur) it was very high (31.7%). The government of Sudan has implemented preventive measures during the current coronavirus disease pandemic, such as partial lockdown, contact monitoring, risk communication, social distance, quarantine and isolation to prevent the spread of SARS-CoV-2. However, there are new community cases every day; this could be as a result of the weak application of these measures by the government, and the lack of commitment of people to these measures. The number of COVID-19 cases is currently decreasing in Sudan, but we are expected to see an increase in numbers of cases as a result of the massive demonstrations that occurred in Sudan recently, and as a result of the expected reopening and restoration of normal life. The government must increase testing facilities, and maintain social distancing and necessary precautions to limit the spread of infection after life returns to normal.

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Introduction

The novel coronavirus disease (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) originated in Wuhan City, Hubei Province, China, in December 2019 [1]. SARS-CoV-2 dramatically expanded worldwide and on 11 March 2020 the WHO declared the outbreak of SARS-CoV-2 a pandemic [2]. The COVID-19 pandemic has become a significant global public health concern. In particular, SARS-CoV-2 has

spread faster than either SARS-CoV or Middle East respiratory syndrome coronavirus because of its high binding affinity to human receptors [3]. The rapid spread of SARS-CoV-2 significantly increases the burden on a country's health-care system by raising the number of individuals seriously ill with COVID-19 and who need medical treatment [4].

The clinical manifestation of COVID-19 ranges from asymptomatic to severe breathing difficulties and multi-organ failure [5]. As reported by the CDC, a broad range of symptoms have been observed in individuals with COVID-19, ranging from minor symptoms to serious illness. Symptoms may occur 2–14 days after exposure to the virus, including fever or chills, cough, difficulty breathing, fatigue, muscle or body aches, headache, loss of taste or smell, sore throat, nausea or vomiting, and diarrhoea [6]. SARS-CoV-2 can be transmitted via respiratory droplets following coughing or sneezing by an infected individual, between people within <1 m of each other,

and potentially through touching surfaces contaminated with the virus, such as telephones or doorknobs [7]. No effective antiviral therapy or vaccine has yet been developed. For patients diagnosed with COVID-19, it is recommended that appropriate symptomatic treatment and respiratory support be given [8,9]. Therefore, prevention is the only way to control the outbreak of COVID-19; the best prevention strategies for the community are to minimize the incidence of exposure to the virus, including the following: use of face masks, regular handwashing with soap or hand sanitizer containing at least 60% alcohol, avoiding contact with infected people and maintaining the appropriate distance as far as possible [10]. Protection from or reduction of the transmission of SARS-CoV-2 may be achieved through the identification, isolation and follow up of infected patients. In addition, environmental disinfection and personal protective equipment for medical staff are used [11].

COVID-19 continues to expand globally, according to a WHO report, as of 3 July 2020 there were 10 710 005 cases and 517 877 deaths in 188 countries and territories. In Africa, the virus was first reported in mid-February 2020, and to 3 July 2020, more than 329 796 cases have been confirmed, with 6486 deaths [12]. The pandemic is speeding up – it took 98 days to reach 100 000 cases and only 19 days to progress to 200 000 cases. Ten African countries have recently shown a massive increase in the number of infected patients, making up for almost 80% of all cases in Africa. Over 70% of deaths have occurred in just five countries: Algeria, Egypt, Nigeria, South Africa and Sudan [12].

Sudan is the second largest country in Africa, with a total population of 43 849 260 [13], located in the northeastern part of Africa, neighbored by countries with a high number of COVID-19 cases, such as Egypt and the Gulf Arab countries. Before the announcement of the first case of COVID-19, the Sudan Federal Ministry of Health had strengthened the measures at entry points and, on 13 April, the government announced a partial lockdown. However, because of the weak application of these preventive measures, and the open borders of Sudan with neighbouring countries, these measures were not effective; a large number of people refused and escaped quarantine [14]. To 3 July 2020, Sudan has witnessed community transmission of COVID-19, with new cases reported daily. In this review, we highlight the current situation of COVID-19, hospital facilities and quarantine centres, and the expected scenario in Sudan.

The current situation in Sudan

The COVID-19 has been reported in Sudan since 13 March 2020, and up to 3 July 2020 there had been 9894 confirmed cases and 616 deaths, with a 6.6% case fatality rate. The highest number of confirmed cases appeared in the Khartoum State

(7214), followed by Gazira (955), Gadarif (250), Sinnar (195), North Kordufan (183), Red Sea (182) and River Nile (202), more details are given in Table 1 and Fig. 1. About 35% of confirmed cases were over 45 years old, and this age group showed the highest mortality rate (6%) (Fig. 2) and the majority were in men (58%). The highest number of mortalities occurred in Khartoum (273), followed by Gazira (146), North Darfur (45), Gadarif (22) and Red Sea (38), more details are in Table 1 [15]. The case fatality rate was 6.23% in Sudan; in some states (like Khartoum) it was low (3.8%), whereas in other states, like Central Darfur and North Darfur, it was very high (66% and 30%, respectively), this variation may be a result of differences in hospital and diagnosis facilities between the capital (Khartoum) and the remote Darfur states or could be because the actual number of community cases in Darfur states is higher than detected [16]. A much higher number of unrecognized cases is extremely probable because of the restricted number of tests, a public reluctance to report infections and, perhaps worse, attitudes of denial.

New community-based cases of COVID-19 are reported daily, creating a massive impact on public health and socio-economic disasters affecting the daily lives of many people [17]. In recent weeks, as shown in Fig. 3, the case numbers from week 22 to week 27 have dropped; this might be due to a problem in testing facilities (as shown in Fig. 4, the number of samples tested was very low during the last 3 weeks) or due to the partial success of the current lockdown strategy. The reopening date is set as the second week of July 2020, but with reports of a rapid increase in new cases, it is probable that lockdown will be lengthened, or new preventive strategies will be brought in.

TABLE 1. Distribution of suspected cases, confirmed cases and deaths for COVID-19 by states up to 3 July [15]

State	Cumulative of cases up to 3 July 2020			
	Suspected	Confirmed	Death	CFR
Khartoum	13 997	7214	273	3.8%
Gazera	1363	955	146	15.3%
Ghadaref	427	250	22	8.8%
Sennar	374	195	16	8.2%
North Kordufan	326	183	19	10.4%
Red Sea	274	182	38	20.9
River Nile	261	202	13	6.4%
North Darfur	302	142	45	31.7%
White Nile	287	158	6	3.8%
Kassala	209	123	13	10.6%
Northern State	171	96	10	10.4%
West Darfur	114	32	2	6.3%
West Kordufan	97	56	1	1.8%
South Darfur	91	38	1	2.6%
East Darfur	53	21	4	19%
Blue Nile	36	27	1	3.7%
South Kordufan	28	15	3	20
Central Darfur	11	5	3	60%
Total	18 421	9894	616	6.23%

Abbreviation: CFR, case fatality rate.

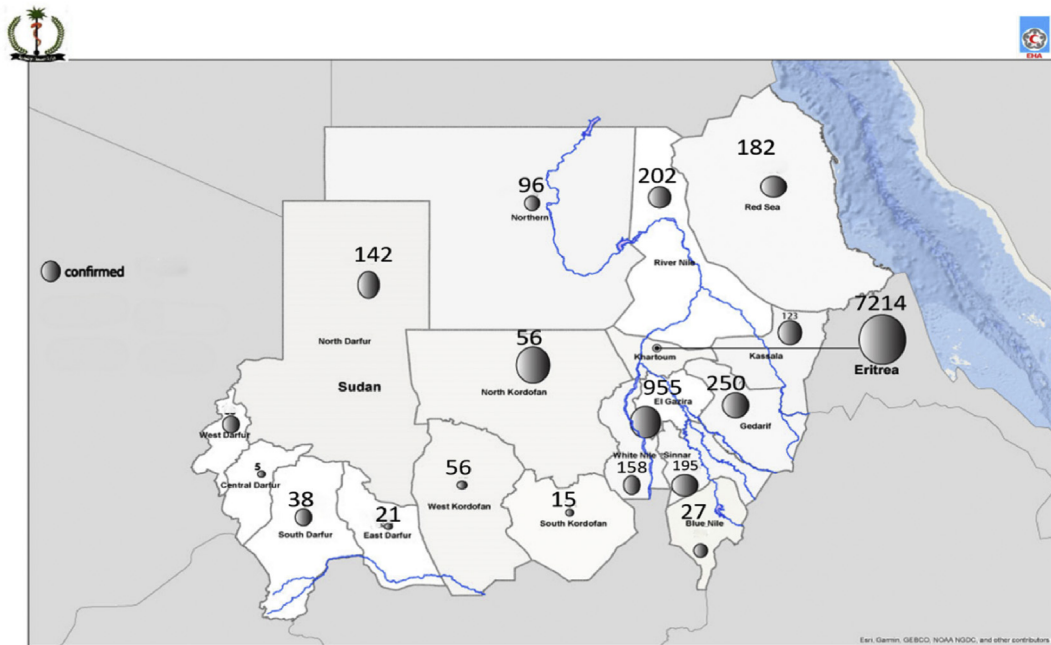


FIG. 1. The general condition of COVID-19 cases in the Sudan states up to 3 July 2020 [15].

Action by the government of Sudan against COVID-19

The Government of Sudan is taking a lot of measures against COVID-19 to guarantee and fulfil its responsibilities to its people. From the day on which the first case was reported in Khartoum State, on 13 March 2020, all services and measures have been used with the maximum capacity to guarantee the safety of people’s lives in the country. In that time, all cases have had a history of travel, suggesting that transmissions are imported from elsewhere in the country. The Government of Sudan is implementing COVID-19 prevention methods with

their interventions, such as early diagnosis and contact tracing, risk communication, social distancing, quarantine and isolation, to prevent the spread of COVID-19, closing the bridges linking the cities of Khartoum, suspension of prayers in mosques and churches, and partial lockdown. Some of the Darfur region states have closed their borders and imposed travel restrictions to reduce the movement of individuals. However, the implementation of these precautions is complicated by the weakness of Sudan’s transition government and its fragmented health system [14].

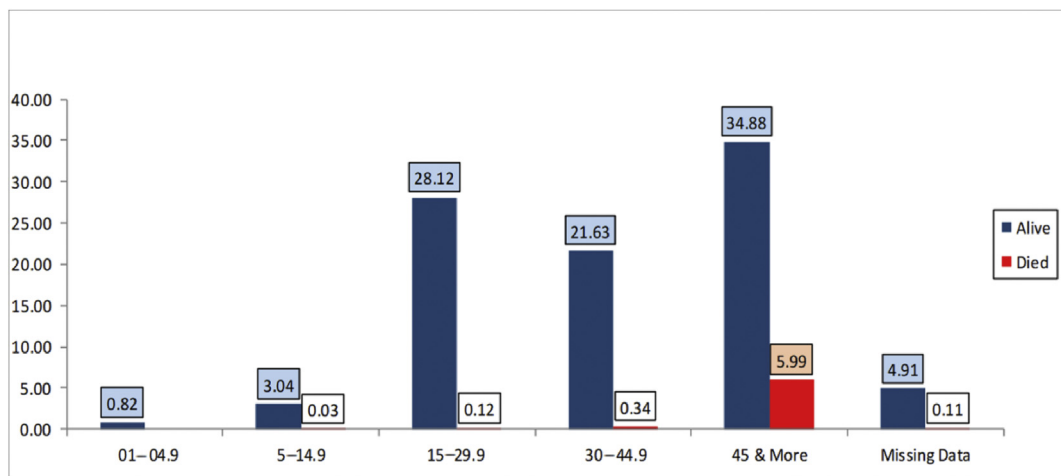


FIG. 2. Distribution of confirmed cases of COVID-19 by age groups, and general situation up to 3 July 2020.

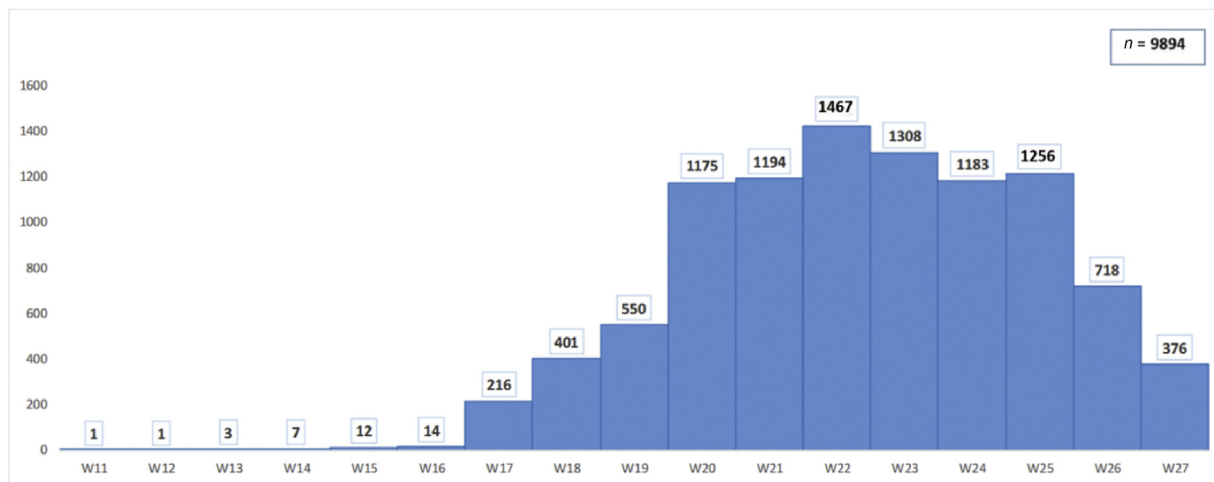


FIG. 3. Distribution of positive cases of COVID-19 by epidemic week (W11–W26) 2020.

Isolation centre and quarantine for COVID-19 in Sudan

According to the World Bank, Sudan's hospital-bed capacity was 0.8 per 1000 people in 2013 [14,19]. Up to 3 June 2020, Sudan had established 36 isolation centres (IC) in all its states with bed capacity around 985 beds and 198 intensive care unit beds [15]; for the total population of Sudan this capacity is very low by international standards [20]. The government of Sudan equipped quarantine centres in all Sudanese states; these received 2374 individuals and had discharged 2189 of them up to 3 July 2020 [15].

Testing facilities

Testing is one of the most important parts of the fight against SARS-CoV-2, through which we can identify infected people, so as to treat and isolate them at the appropriate time. Testing is the key to controlling the virus, with more testing giving easier control of the spread of the virus [21]. The government of Sudan established seven centres with PCR facilities for the diagnosis of SARS-CoV-2 in five of the 18 Sudanese states. Two

centres were in Khartoum State (NPHL and Military Hospital laboratory), and there was one centre in each of the Red Sea (Port Sudan), Elgazera (Wadmadani), North Kordofan (Elobiet) and South Darfur (Nyala). The current testing capacity of these diagnostic centres is 800 samples per day. However, overall capacity remains low. In addition to this low testing capacity, there are several other problems that limit its work, including sample collection and transportation [22]. According to the WHO recommendation, a positive rate of around 3%–12% is the general benchmark of adequate testing [23,24]. Up to 3 July 2020, Sudan conducted only 17 945 tests for 18 262 suspected cases, 55% of them were positive (Table 2) [15]. Comparing the percentage of positivity in Sudan with other countries such as Korea (1%), Australia (1%), Mexico (20%) and Bolivia (50%), we find that Sudan is among the countries with the highest positive rates [24]. This high positivity rate (55%) indicates that Sudan is not testing widely enough to find all cases, and the actual number of circulating cases in the community is far higher than

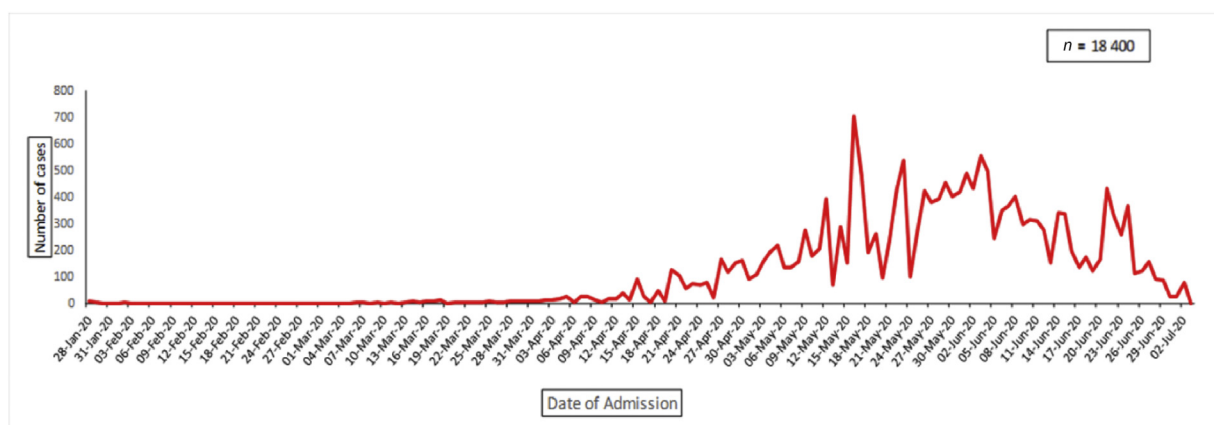


FIG. 4. Distribution of COVID-19 suspected cases by date of admission up to 3 July 2020.

TABLE 2. Distribution of suspected cases of COVID-19 by the result of tested samples up to 3 July 2020

State	No. of cases	No. of samples	Sample results			
			Positive	Negative	Pending	Rejected
Khartoum	13 997	13 884	7214	6405	205	60
Gazera	1363	1352	955	387	8	2
Sennar	374	370	195	170	5	0
White Nile	287	287	158	128	0	1
Blue Nile	36	36	27	9	0	0
Ghadaref	427	420	250	167	2	1
Kassala	209	209	123	85	1	0
Red Sea	274	274	182	84	8	0
River Nile	261	257	202	53	2	0
Northern State	171	170	96	74	0	0
Northern Kordufan	326	315	183	126	5	1
South Kordufan	28	27	15	12	0	0
West Kordufan	97	96	56	40	0	0
North Darfur	302	296	142	150	2	2
South Darfur	91	91	38	50	3	0
Central Darfur	11	11	5	6	0	0
East Darfur	53	53	21	32	0	0
West Darfur	114	114	32	73	9	0
Total	18 421	18 262	9894	8051	250	67

the confirmed numbers. This point is supported by the recent report of a high number of asymptomatic cases that were discovered in people returning from Sudan— of 450 Thai people who had returned recently from Sudan, 21 had COVID-19 while being asymptomatic [25].

Conclusion and expected scenario

So far, the spread of the virus and its impact on Sudan is less compared with other countries. This could be attributed to the partial success of the preventive measures implemented by the government or might be due to a lack of testing facilities.

There is a high case fatality rate in some states (such as North and Central Darfur states), this could be due to a lack of hospitals, or the actual number of cases may be more than that reported due to the lack of testing facilities.

Despite a coronavirus lockdown, on 30 June 2020 more than one million Sudanese protestors gathered in the capital of Sudan (Khartoum) and other Sudanese cities without distancing or protective measures (Fig. 5) [18]. Countries that have witnessed protests have reported more cases of SARS-CoV-2 infections. In the USA, the number of COVID-19 cases increases by 3.39 cases per day per 100 000 people, after the protests surrounding George Floyd's death [26]. As a result of the massive protests and the scheduled reopening of lockdown, we expect an increase in the number of COVID-19 cases in Sudan. COVID-19 cases are currently decreasing in Sudan, but if the number of cases is massively increased, then the situation could worsen and become out of control through lack and shortage of equipped medical facilities and of well-trained medical personnel. Therefore, the government must scale up testing capacity, maintain social distancing and ensure the necessary



FIG. 5. Sudanese protests in Zalingi city on 30 June 2020 during the COVID-19 pandemic [18].

precautions to limit the spread of infection after reopening and restoring normal life [27].

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data

Data are available on request.

Conflicts of interest

The authors declare no conflict of interest.

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Authors' contribution

HNA, NE, YH, NME and NMA, wrote the manuscript. HNA, NME and NE collected the literature, selected the literature and finalized the manuscript. All authors read and approved the final manuscript.

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