Sudan: a primary health care case study in the context of the COVID-19 pandemic

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Executive summary

This case study examines primary health care (PHC) in Sudan in the context of the COVID-19 pandemic between January 2020 and July 2022. Data were collected from a review of published documents supplemented by stakeholder consultations.

Sudan experienced significant economic and social challenges at the onset of the COVID-19 pandemic in early 2020. Key events and challenges included the December 2019 revolution, political instability, prolonged internal conflicts such as the war in Darfur and the associated population displacement as well as the impact of international economic sanctions. These challenges heavily affected the health system, which has long been underfunded.

Sudan's first case of COVID-19 was confirmed on 13 March 2020. This was followed by the enactment of a country-wide travel ban and a dawn-to-sunset curfew, starting first in the capital Khartoum, which was the epicenter of the pandemic. Soon many health workers failed to report to work, contributing to the suspension of services, including the closure of primary care centres in Khartoum. Other contributing factors included limited preparatory training for health personnel, non-availability of personal protective equipment (PPE), and inadequate logistical provision for health workers such as transport and livelihood support.

Case study findings revealed that the COVID-19 response in Sudan was a highly centralized and top-down, an approach routinely seen in efforts to combat frequent seasonal infectious disease outbreaks. Rapid Response Teams (RRTs) were formed and trained in Khartoum and other states. The role of the RRTs was to respond to calls or information about suspected COVID-19 cases or patients with serious respiratory symptoms. This approach was mainly patient focused and lacked broader public health preventive elements. A public awareness campaign was initiated in parallel, involving provision of pandemic information and response messages through mass media and digital platforms (TV, radio and online). Despite the intensity of the broadcasted messages, misinformation, fear and apprehension were apparent in the community.

The response emphasized the continuity of essential service delivery with little attention to multi-sectoral collaboration and community engagement at field level. However, community engagement was mainly realized through resource mobilization from private sector groups and diaspora communities raising funds utilized to refurbish and reequip hospitals and health centres. RRTs were formed from mainly health personnel to undertake pandemic field response activities including case finding and transport to isolation centers and contact tracing. Many specialist physicians volunteered to provide around-the-clock advice and support to both pandemic field and inpatient activities. Some community groups were organized to support the elderly and families to obtain supplies during periods of movement restrictions. The Ministry of Finance provided generous financial support to the campaign while local governments provided personnel facilities and vehicles to support field activities.
Findings suggest that primary care services could play a greater role in infection control efforts in addition to maintaining essential health services. Population-wide health interventions are delivered through a network of around 5000 primary care facilities. To better integrate pandemic containment functions at grassroots and community level, the Directorate of Emergency Containment could retain technical leadership and logistical support for the delivery of these functions, similar to the role of other specialized departments responsible for maternal and child health, immunization and nutrition.
Methodology

This case study examines PHC in the context of the COVID-19 pandemic in Sudan between January 2020 and July 2022. A review of events and activities drew from published literature, reports produced by stakeholder organizations during the pandemic and stakeholder consultations. Documents included policies, plans, programmes and activities relevant to pandemic containment. The academic literature was searched through PubMed and Google Scholar searches using the following keywords: (COVID-19 OR PANDEMIC) AND (PHC OR primary health care OR health centers OR basic units) AND (Sudan). Policy documents and other grey literature were downloaded from national and international websites. Stakeholder consultations were conducted with 11 participants, including staff from three Federal Ministry of Health (FMOH) directorates (Surveillance and Emergency Containment Directorate together with the Planning and PHC Directorates) and the WHO Country Office for Sudan.

Introduction

COVID-19 was first characterized as a global pandemic on 11 March 2020 (1). On 13 March 2020 the first case of COVID-19 was reported in Sudan (2).

Key response imperatives were to: expand critical care capacity; secure and maintain supplies of commodities such as oxygen, PPE and laboratory reagents; initiate surveillance processes; mobilize human resources; launch public awareness and communication campaigns; and maintain the delivery of non-COVID-19 essential health services (3).

The onset of the pandemic came at a period of instability that contributed to the downfall of the military regime that had ruled the country for more than thirty years (4). The health system was also contending with the aftermath of several decades of underinvestment. Furthermore, the country had experienced protracted conflicts that led to the displacement of many people, particularly those in the Darfur region. The combination of political instability and economic fragility thus provided a backdrop to pandemic response efforts (5-8). Severe seasonal floods in 2020, affecting almost 300 000 of the population (9) presented a further challenge. The country also continued to face seasonal episodes of vector-borne disease outbreaks (e.g., malaria, dengue fever and chikungunya).

Country context

Sudan is located at the crossroads of sub-Saharan Africa and the Middle East. It shares borders with seven countries; Libya and Egypt to the north, Chad to the west, the Central African Republic to the south-west, South Sudan to the south, and Ethiopia to the south-east and Eritrea to the east (10, 11).
The Sudanese population stood at 41 985 000 people in 2020, with an estimated annual population growth rate of 2.5%. Approximately 31% of the population live in urban areas at and 69% live within rural and nomadic settings. The median age of the population is 18.2 years, while life expectancy is estimated at 70.8 and 67.6 years for females and males, respectively (12).

In addition to a high burden of communicable diseases such as malaria, tuberculosis and schistosomiasis, Sudan is experiencing an increasing burden of noncommunicable diseases (NCDs), particularly within urban settings (13). Natural disasters such as droughts and floods, as well as internal conflicts and outbreaks of violence, are commonplace. In 2012, the burden of disease attributable to communicable diseases was 52.8%, to NCDs 33.9% and to injuries 13.4% (13, 14). WHO data show a maternal mortality ratio of 295 per 100 000 live births in 2020, while the under-five mortality rate stood at 58 deaths per 1000 live births (14).

Following 2004 international sanctions, Sudan's economy deteriorated, resulting in a doubling of poverty rates and a shift in status from a lower middle-income to a low-income country from 2018. A 2020 debt sustainability analysis conducted by the International Monetary Fund (IMF) and World Bank found that Sudan was in debt distress (15).

The health care system

The health system is overseen by the FMOH and 18 state ministries (SMOHs). The FMOH is responsible for the provision of nationwide health policies/plans, strategies, financing and overall monitoring and evaluation, while SMOHs develop state-level implementation plans according to federal guidelines. Local government councils are concerned mainly with overseeing service delivery implementation activities.

Health care delivery facilities are organized across three levels: primary, secondary and tertiary. Density and distribution of health facilities varies between states and rural/urban settings. Accordingly, primary care facilities include the Basic Health Units (BHU) which serve 5000 people or less and are usually staffed by a community health worker (CHW). Dispensaries provide care to 5000–10 000 people who are mostly located in larger rural settings. The dispensary is usually headed by a medical assistant with one nurse and provides a wider range of services compared to a BHU.

Family health centers serve 10 000–20 000 people and are staffed by health teams headed by a doctor; they usually deliver a wide range of primary care services. Health centers are the most common primary care facility within urban settings while dispensaries and BHUs are found in rural areas. There are also rural or local smaller hospitals that provide secondary-level health services for rural populations.
Private sector services are concentrated mainly in cities and largely provide fee-for-service curative care. Overall, 71% of the population lives within 5 km of the nearest health facility and accessibility varies from one state to another, with North Kordofan having the lowest accessibility rate at 53% (16). Urban and richer households use outpatient services more than the poor and rural population, while utilization rates increase as household per capita income rises (16).

Inequity in health care coverage is a major challenge. Urban/rural disparities in access to health care are well documented and an estimated 14% of the population lives in areas with no access to health services (17). The distribution of health resources shows disparities too, with the number of physicians per 100,000 population varying between 1.8 and 28.5 physicians across Sudan’s 18 administrative states and nurse density rates ranging from 6.6 to 90.2 nurses per 100,000 population (17).

Total health spending in Sudan during 2019 was estimated at 4.6% of GDP (18). The main contributor to health spending is private spending by individuals, which accounts for 83% of total health expenditure (including 79.4% coming directly out-of-pocket (OOP)). Overall government contributions stand at 61% and 5.9% for the federal and state governments respectively (18, 19). Thus, Sudan has one of the highest OOP health spending rates among countries of the WHO Eastern Mediterranean region. The impact of this high OOP expenditure on access to health services is particularly significant when considering that almost 46% of the population live below the poverty line (19).

Table 1 shows the distribution of primary care facilities by state. The unequal distribution of facilities contributes to variation in accessibility to primary care services.

Table 1. Distribution of PHC facilities by state

<table>
<thead>
<tr>
<th>State</th>
<th>No. of health centres</th>
<th>No. of BHUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>96</td>
<td>160</td>
</tr>
<tr>
<td>River Nile</td>
<td>63</td>
<td>230</td>
</tr>
<tr>
<td>Red Sea</td>
<td>69</td>
<td>113</td>
</tr>
<tr>
<td>Gadarif</td>
<td>58</td>
<td>0</td>
</tr>
<tr>
<td>Kassala</td>
<td>114</td>
<td>0</td>
</tr>
<tr>
<td>Khartoum</td>
<td>468</td>
<td>0</td>
</tr>
<tr>
<td>Gezeira</td>
<td>349</td>
<td>0</td>
</tr>
<tr>
<td>Sennar</td>
<td>74</td>
<td>121</td>
</tr>
<tr>
<td>White Nile</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>Blue Nile</td>
<td>33</td>
<td>104</td>
</tr>
<tr>
<td>North Kordofan</td>
<td>160</td>
<td>387</td>
</tr>
<tr>
<td>South Kordofan</td>
<td>71</td>
<td>223</td>
</tr>
<tr>
<td>North Darfur</td>
<td>082</td>
<td>166</td>
</tr>
<tr>
<td>West Darfur</td>
<td>38</td>
<td>44</td>
</tr>
<tr>
<td>South Darfur</td>
<td>79</td>
<td>141</td>
</tr>
<tr>
<td>Central Darfur</td>
<td>22</td>
<td>40</td>
</tr>
<tr>
<td>East Darfur</td>
<td>15</td>
<td>34</td>
</tr>
<tr>
<td>Total Sudan</td>
<td>1791</td>
<td>1963</td>
</tr>
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Source: Sudan NextGen, 2019 (20).
Country response to the COVID-19 pandemic

At the time of the first confirmed case of COVID-19, the Emergency Department at the FMOH was dealing with six seasonal outbreaks, namely: watery diarrhoea, Rift Valley fever, dengue fever, diphtheria and chikungunya, in addition to a seasonal rise in malaria cases.

Following the first confirmed case of COVID-19 on 13 March 2020 (2), a surge in reported cases was reported and movement restrictions were introduced on 24 April (3). All airports, seaports and land crossings into the country were closed, with only scheduled flights carrying humanitarian supplies permitted to land at Khartoum airport. Interstate transportation was halted and a countrywide curfew was imposed. During the curfew period in Khartoum, people were allowed time to purchase essential supplies. According to federal regulations, all public services in the country were suspended except for banking and emergency medical services (4).

The gradual lifting of movement restrictions started on 8 July 2020 when Government offices were partially reopened with 30%-50% of the workforce allowed to return to their work premises with mandatory mask wearing. The Sudan Civil Aviation Authority (SCAA) resumed domestic flights on 12 July 2020, followed shortly by the resumption of international flights (5).

The country’s poor economic situation, social instability and the population’s need to go out for work to make ends meet likely contributed to low adherence to movement restriction policies. Fears were expressed that the curfews and closures would further aggravate the economic hardship (6, 21). Some experts questioned the population-wide imposition of the stay-at-home measures, arguing for a balance between disease prevention and economic well-being (22).

During the first wave of the pandemic, the highest cumulative burden of COVID-19 cases occurred within Khartoum state, Sudan’s largest city. By September 2020, 13 660 confirmed were reported with 836 related deaths. By 25 July 2022, 63 074 confirmed cases had been recorded, with 4958 deaths (5). Pandemic figures accessed in 2022 show case and mortality rates similar to neighbouring African and Middle Eastern countries (23).

Primary care and essential public health functions

At the FMOH level, an Emergency Operations Committee was formed in which relevant departments including the PHC Department were represented. The Committee assumed the de facto leadership for day-to-day pandemic response decisions. Subcommittees were formed to deal with specific technical issues while WHO and United Nations (UN) agencies provided technical and material support.
One of the subcommittees was established to revise and update the COVID-19 case management protocol which was conducted almost weekly during the early pandemic phase. A group of volunteer specialists monitored incoming information and updated management guidelines accordingly. Training of selected health personnel was initiated using WHO guidelines, with trained physicians and nurses assuming the role of trainers for their colleagues.

Rapid Response Teams (RRTs) were formed to conduct case identification, isolation and contact-tracing. Seven RRTs were formed in Khartoum while each of the other states had one to two RRTs. Usually, RRTs were composed of at least five members including at least one doctor, a public health officer and a technical expert in surveillance. The first RRTs were trained centrally in Khartoum and subsequently other regions followed suit. The RRTs were required to respond to calls from sick individuals or their relatives. Each call was followed by a site visit to provide assistance to the patient and elaborate on the case history, collect samples for testing, and transport likely positive cases and those seriously ill to isolation centers. The RRTs were located and operated from local government premises while they received limited supervision and support from the FMOH.

COVID-19 patients were admitted to an isolation center that was established at Khartoum hospital. A severe shortage in the availability of PPE, including in health facilities, presented a challenge. The escalation in the numbers of new COVID-19 patients was rapid and exceeded the limited bed capacity made available. Thus, many patients visited multiple health facilities but were often turned away due to lack of beds. Private sector hospitals initially refused to admit COVID-19 patients; however, these hospitals eventually followed public facilities and designated isolation wards after training their staff on COVID-19 triage and case management.

At the early phase of the pandemic in 2020, efforts were focused on securing beds and providing critical care support for the rising number of patients with severe symptoms. Stakeholders reported that disproportionate attention was directed to hospitals with little attention if any paid to primary care centers or to the role these could play in responding to the pandemic. Laboratory services were severely limited and COVID-19 diagnostic material was scarce. There were delays in receiving test results for up to one week in some instances. In the absence of laboratory tests, some doctors resorted to lung scans to make presumptive COVID-19 diagnoses.

In many instances, it was reported that once a case of COVID-19 was diagnosed in a health facility, some staff refused to leave the workplace for fear of taking the virus back to their families. Under the curfew rules, work was suspended across government offices and services, except for security and emergency medical services. However, as public transport was suspended, many health workers failed to show up to their workplaces, affecting service delivery. Many people were thus unable to access basic health care or medications.
Southern Sudan experienced similar service suspensions during the Ebola virus outbreaks. At that time, fear of Ebola virus among health care workers led to a breakdown in service delivery, leading to substantial reductions in health care utilization (24). These included over 80% reductions in maternal delivery care in Ebola virus-affected areas, 40% national reductions in malaria admissions among children fewer than 5 years of age and substantial reductions in vaccination coverage (24). The COVID-19 experience suggests that these learnings may not have been effectively incorporated.

The PHC Directorate was assigned two representatives on the Emergency Covid-19 Containment Committee at the FMOH. On 25 March 2020, the Committee drafted a plan to ensure continuity of care during the pandemic and on 31 March the PHC Directorate produced its own guidelines for maintaining continuity of service delivery and training of its staff on the triage of COVID-19 patients. One-day training modules were initially offered to trainers from Khartoum governorate and later to trainers from other states. The preliminary guidelines for service continuity were later followed by more specific guidelines tailored to each of the basic components of PHC services (e.g., maternal and child health and nutrition and growth monitoring). These plans were not immediately implemented as services were suspended abruptly a few days after the development of plans.

A Continuity Plan was also developed for Khartoum (the epicenter of the outbreak). It included reopening 104 health centres, most of these which were facilities that opened for two shifts per day. Selected centres were refurbished and reequipped, and transport and some financial incentives were provided to health workers.

Under service continuity plans, the frequency of primary care activities provided outside of health centres was reduced, as were home visits. Around 7000 midwives were trained on infection prevention and control to reinforce adherence to strict disinfection during midwifery practice.

While country-wide movement restrictions were in place, face-to-face communication became neither feasible nor desirable during primary care service delivery. Out of necessity, health providers explored the utilization of virtual models of communication. Mass media channels such as radio, TV and recorded telephone messages were used extensively to deliver Risk Communication and Community Engagement (RCCE) key messages including personal safety measures to reduce virus transmission and where to seek help. Similarly, digital platforms including WhatsApp were also utilized and media celebrities were enlisted on air to reinforce COVID-19 messages.

Telemedicine and online care approaches were also implemented. Telephone hotlines were set up for the public to seek guidance on suspected cases of COVID-19 or to seek assistance. There were also attempts to introduce telemedicine consultations for maternal and child health and chronic disease patients. Numerous specialist clinicians volunteered to support these online services. Electronic prescriptions were issued during these sessions and health
insurance schemes cooperated in the home delivery of medications to a limited number of NCD patients. As the pandemic progressed, online communication platforms were utilized for administrative purposes such as holding meetings and conducting training activities such as COVID-19 basic training courses. Thus, the pandemic revealed the potential of telemedicine and telecommunications for the delivery of primary care services as was the case in many places around the world (25).

**Multisectoral collaboration**

Almost all ministries were represented in the national (ministerial) pandemic response committee, which held several meetings to mobilize and harmonize inputs from different ministries. The Ministry of Finance supported purchasing of new vehicles, power generators, laboratory equipment, and oxygen supplies before the arrival of international assistance.

The private sector also mobilized support for the physical rehabilitation of health facilities including both hospitals and health centres. Other ministries initiated and led initiatives and activities relevant to the pandemic containment programme within their respective domain. For example, the Ministry of Education took an early decision to suspend educational activities and many teachers joined in supporting the activities of RRTs at the community level. The municipalities and local government institutions provided hubs from which RRTs could conduct their work and contributed vehicles and staff to support these activities. The police force provided escorts and support to the emergency services and RRT activities while the national broadcasting services supported information dissemination.

Meanwhile, international assistance from organizations such as WHO, UNICEF and Médecins Sans Frontières complemented community efforts to strengthen hospitals while also rebuilding cold chain capacity and supporting online services and mass media communication activities during service suspensions. While the COVID-19 pandemic revealed the fragility of the health system, it also catalysed efforts to mobilize community and international partners to repair facilities, purchase essential equipment and supplies, and support health workers.

**Community response and engagement**

Sudan has long-established traditions of community organization and participation in the delivery of primary care services and in health promotion and prevention (26). Adopting these approaches in the COVID-19 response was challenging. Widespread apprehension and fear likely affected the individuals’ willingness to participate in community mobilization activities. The concentration of the pandemic decision-making process at the national level may have also restricted action at the local level. Further, the abrupt suspension of health
Conclusion and lessons learned

Following the reporting of the first confirmed case of COVID-19 in March 2020, there was wide apprehension and concern about the country’s ability to cope with the impact and consequences of the pandemic (5-8).

The abrupt suspension of health services including primary care services and the imposition of countrywide movement restrictions created many challenges for health care providers and community members. Partial disruptions of services were common (27) and the refusal or reluctance of health workers to work during the pandemic was not limited to Sudan. Yet Sudan was unique in that these factors led to the almost complete suspension of services particularly in PHC facilities. It is likely that fragility and disorganization of the health system contributed to the abrupt service suspension. Other contributing factors may include limited preparatory training for health personnel, non-availability of PPE supplies and limited logistical arrangements for health personnel such as
transport and livelihood support in the workplace. While plans were developed at the federal and state level for the pandemic response, there may have been less attention to the multiple challenges faced by health workers at a local level.

The top-down response to COVID-19 reflected historical approaches adapted to the containment of infectious disease outbreaks and health emergencies. The Department of Infectious Disease Surveillance and Emergency usually organizes response campaigns by mobilizing and training special teams for each health crisis. While this approach has proved cost-effective and convenient in the past, it proved challenging in the COVID-19 response. The high transmissibility of the virus, lack of an identifiable vector, the unpredictable patterns of spread and the initial absence of a vaccine also impacted response effectiveness.

The response strategy may have also lacked comprehensive educational and communication messages to raise awareness about COVID-19 and modify the behaviour of the population. The work of the RRTs focused only on immediate concerns, namely, suspected new cases and those who were seriously ill. In short visits, the RRTs were not able to deliver awareness-raising messages that could influence community behaviour or attitudes.

Mass and social media channels were utilized extensively, which enabled governments and other authorities to reach the maximum number of people in the community in the shortest time. However, to improve community responsiveness, planning for future health emergencies might require more personalized, face-to-face communication modalities, particularly among populations with modest literacy rates. The sudden suspension of health services (particularly primary care services) following the onset of the pandemic further reduced opportunities for face-to-face communication and care. At the same time, mistrust in official or public messages communicated via mass media was deeply rooted, and misinformation about the pandemic spread widely among communities. While COVID-19 skepticism was observed worldwide, illiterate rural populations may be more susceptible to misinformation.

Another key finding was that the role of primary care services was restricted to delivery of basic services while field containment of the pandemic was designated to the newly created RRTs. This was typical of the vertical top-down approach and raises important questions about the effectiveness, efficiency and limitations of such approaches as a national strategy to epidemic containment. Integrating containment of emergency and epidemic functions at field level, with primary health care services playing a central role, may be an alternative approach, as adopted by other specialized health services.

The integration of epidemic containment with PHC may enhance the opportunities to mobilize multisectoral collaboration and community engagement as two key strategies that could have been better implemented in the pandemic response. The integration may also: 1) improve the coordination and delivery of clinical and public health care services at one site; 2) enable the utilization of population-based information gained from public health information to enhance clinical decision-making; 3) facilitate identification
of underlying community health problems so that clinical problems can be addressed; 4) consolidate health promotion and prevention through combined education and advocacy activities; and 5) streamline policy, training and research at field level (28).

With around 5000 primary health facilities across a sparsely populated country with poor infrastructure, the PHC system represents the most convenient route to reach the entire population with specific health interventions. The PHC system has an active network for managerial and administrative communication at the federal, state and local levels. It has the capacity for initiating rapid and coordinated action when needed. Furthermore, the PHC facility network is well placed to provide continuous follow up of containment interventions. Primary care staff would benefit from appropriate training to adequately fulfill these new functions, while facilities require resources and tools to meet expanded mandates.

From a governance perspective, the Directorate of Emergency Containment could retain its technical leadership for mobilization of resources, logistics support and monitoring progress at primary care facilities during epidemics and health crises. This is similar to the role assumed by other national technical programmes such as maternal and child health, immunization and dental health.

The public demand for the resumption of essential primary care services following their suspension highlighted public perceptions of their importance. This contrasts with a common perception that primary care services are inferior to hospital services. The new appreciation of primary care was translated into generous support received by health centres in the form of refurbishing and reequipping before being reopened.

Attempts to utilize online and telemedicine consultations during the pandemic, particularly to meet the needs of pregnant women and chronic disease patients were limited in scope during periods of movement restriction and many patients lacked access and familiarity with the technology. However, the experience has drawn attention to the potential of these technologies to be utilized in the future delivery of primary care services (25).
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23. WHO coronavirus dashboard; (https://covid19.who.int/).


This case study was developed by the Alliance for Health Policy and Systems Research, an international partnership hosted by the World Health Organization, in collaboration with the WHO Regional Office for the Eastern Mediterranean (EMRO) and WHO country offices. In 2015, the Alliance commissioned the Primary Health Care Systems (PRIMASYS) case studies in twenty low- and middle-income countries (LMICs) across WHO regions. This case study builds on and expands these previous studies in the context of the COVID-19 pandemic, applying the Astana PHC framework considering integrated health services, multisectoral policy and action and people and communities. This case study aims to advance the science and lay a groundwork for improved policy efforts to advance primary health care in LMICs.