

## **Strengthening the Ability of Sudan Ministry of Health and their Partners to Respond to Epidemics**

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Over the last few decades, many outbreaks and epidemics have been reported in the Region with the potential for global spread, including avian influenza A (H5N1), Middle East respiratory syndrome coronavirus (MERS-CoV), yellow fever, Rift Valley fever, monkey pox, Crimean - Congo hemorrhagic fever, dengue, chikungunya and cholera. Most of these outbreaks were not detected early due to weak surveillance, lack of a functional laboratory network, inadequate human and other resources, and the lack of technical and managerial capacities.

Sudan is one of the countries that are constantly exposed to epidemics and hardly a year passes without an epidemic in one of the 18 states of Sudan, and often the epidemic spreads to a large number of states, due to poor infrastructure and weak capabilities of the national and states governments to deal with these epidemics, which increases the likelihood of these epidemics and reduces the chances of containing them in their first moments. Vulnerable groups such as women, children, people with disabilities, displaced populations, refugees, migrants, nomadic groups and inhabitants of rural and urban slum areas are particularly exposed to the effects of emergencies, these group represent around 30% of population.

The negative effects of epidemics on the economies and social systems of countries in general are taking place, and many countries especially Sudan are beginning to reconsider their systems to deal with epidemics, especially after the Acute Watery Diarrhea and Chikungunya epidemics take place in Sudan (2016 - 2018), which has significantly changed the perception of the issue by Sudan Government and organizations working on health.

The acute water diarrhea epidemic in Sudan in (2016 - 2018) has clearly demonstrated the weakness of the national and states capacity to deal with epidemics, especially since it needs the efforts of many sectors, as well as the health sector. The poor ability of states to deal with the epidemic has also been a direct cause of reducing the overall capacity to deal with and control the epidemic.

This reality calls for a review of the state's handling of the issue of epidemic response, especially since the current situation could lead to a national disaster in the event of an epidemic of one of the most severe diseases such as Ebola if appropriate measures are not taken to bring about a change in the epidemic treatment system in Sudan.

By analyzing the current status of epidemic-related sectors and examining the current experience of the acute water diarrhea and Chikungunya epidemics, this personal opinion after long experience working in Sudan and dealing with different epidemics from 1995 to 2018, trying to analyze the situation and proposed solutions to strengthen the ability of health emergency and epidemic control department at national and states level to content the outbreak as soon as possible.

### **Facts about dealing with the issue of epidemics**

In order to be able to develop an objective vision to improve national capacity to deal with epidemics, there are many facts on this issue that need to be clarified. These facts can be summarized as follows:

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- There are many social, cultural and economic determinants that directly affect epidemic prevalence levels and their finances. These determinants are among the root causes of epidemics and factors influencing efforts to address them, so they need to be identified and addressed.
- Epidemic causes and response efforts are directly affected by many relevant factors outside the traditional framework of health and some other ministries, for example, the ministry of water resources and electricity, irrigation, agriculture, the Ministry of Industry and environment as examples. The roles of these ministries are the cornerstone of the success of epidemic response efforts.
- There are many strategies need to be followed as its proven clear successful practically and economically that can be implemented to prevent epidemics or to stop their spread. The optimal use of resources requires following these strategies and not wasting resources in some strategies that are not scientifically based.
- Epidemics, if they fail to contain them in a short time, can lead to some political repercussions at the local level and can have political and economic repercussions on countries by the international community, and can affect the movement of individuals, animals and goods between countries and within a single country.

### Analysis of the current situation with regard to epidemics in Sudan

The current situation in Sudan on the issue of epidemics can be summarized in the following points:

- Extreme vulnerability in many issues that are key determinants of epidemics, particularly those related to environmental, water safety, food safety and waste transport and treatment in most states of Sudan, posing a direct threat to public health.
- Lack of a clear vision to improve the determinants affecting the issue of epidemics and poor interest in the issue of epidemic prevention.
- The lack of effective mechanisms for coordination between different sectors of the country and at various levels with regard to the issue of epidemics, and the lack of mechanisms to deal with emergency issues in many sectors.
- Poor funding available to address the issue of emergencies and epidemics, lack of timely access to it, and poor funding for emergency and epidemic preparedness requirements.
- Lack of clear vision regarding the roles between different levels of government (federal, state, locality) and on the technical interventions required to address epidemics and on the issue of funding such interventions. This situation has led to state governments relying on federal government support, which is unable to meet all states requirements in the event of large epidemics involving a number of Sudanese states, especially since there are no clear arrangements to provide and ensure the flow of such funding.
- Severe weakness in technical and logistical capacities to address epidemics at the state and local level of the Ministries of Health and related sectors.
- The inability of the National Public Health Laboratory for advanced diagnosis of certain viral epidemics and the weakness or absence of state laboratories, with poor field verification of the causes of epidemics.
- Lack of wards dedicated to isolating patients with highly contagious diseases.

- There is insufficient equipment to prevent the entry of infectious diseases from other countries at border crossing points, airports and ports.
- The lack of a sufficient manpower in the Federal Ministry of Health, especially with regard to the specialized workforce in dealing with epidemics, forcing them to contract with workers from hospitals in Khartoum state which may make another.
- problem for Khartoum state ministry of health. This situation leads to delays in response, inability to implement training programmes and increased capacity.

Year	State Affected
1966	Gadaref
1970	Gadaref
1972	Equatoria (Juba) and All Northern States (n = 15)
1978	No data available
1980	South
1981	Gadaref
1988	Khartoum, Northern State and Red Sea
1999	Khartoum, Gadaref, North Kordofan, Red Sea and Kassala
2002	North Kordofan
2000-2004	All Darfur States
2006	All States
2007	Kassala, Gadaref and Sennar
2008	Gadaref
2010	All States
2014	All States

**Table 1:** History of Acute Watery Diarrhoea (AWD) outbreaks in Sudan.

State	Male					Female					Total				
	Pop.	N	D	AR	CFR	Pop.	N	D	AR	CFR	Pop.	N	D	AR	CFR
Kassala	934,169	472	18	5.1	3.81	919,341	486	5	5.3	1.03	1,853,509	958	23	5.2	2.4
Blue Nile	580,778	965	34	16.6	3.52	571,560	1393	44	24.4	3.16	1,152,338	2358	78	20.5	3.31
Rive Nile	705,942	967	13	13.7	1.34	694,736	986	17	14.2	1.72	1,400,678	1953	30	13.9	1.54
Gezira	2,513,403	1694	35	6.7	2.07	2,473,508	1740	31	7	1.78	4,986,911	3434	66	6.9	1.92
Sinner	999,844	1743	14	17.4	0.8	983,973	2001	20	20.3	1	1,983,817	3744	34	18.9	0.91
Khartoum	3,479,605	1344	23	3.9	1.71	3,424,373	911	10	2.7	1.1	6,903,978	2255	33	3.3	1.46
Gadaref	1,188,190	1066	13	9	1.22	1,169,330	1200	20	10.3	1.67	2,357,520	2266	33	9.6	1.46
Red Sea	549,604	851	11	15.5	1.29	540,880	733	10	13.6	1.36	1,090,484	1584	21	14.5	1.33
Northern	226,543	683	10	30.1	1.46	222,947	216	7	9.7	3.24	449,490	899	17	20	1.89
White Nile	1,328,005	3517	51	26.5	1.45	1,306,926	5307	61	40.6	1.15	2,634,931	8824	112	33.5	1.27
North Kordfn	999,844	539	7	5.4	1.3	983,973	575	6	5.8	1.04	1,983,817	1114	13	5.6	1.17
South Kordfn	831,271	512	36	6.2	7.03	818,076	709	49	8.7	6.91	1,649,347	1221	85	7.4	6.96
West Kordfan	730,546	150	22	2.1	14.7	718,950	193	11	2.7	5.7	1,449,496	343	33	2.4	9.62
North Darfur	841,459	238	10	2.8	4.2	828,102	436	19	5.3	4.36	1,669,561	674	29	4	4.3
East Darfur	383,675	368	21	9.6	5.71	377,585	407	22	10.8	5.41	761,260	775	43	10.2	5.55
South Darfur	2,847,968	1089	42	3.8	3.86	2,802,762	1479	81	5.3	5.48	5,650,730	2568	123	4.5	4.79
West Darfur	613,461	252	13	4.1	5.16	603,723	432	6	7.2	1.39	1,217,184	684	19	5.6	2.78
Central Darfur	524,076	549	14	10.5	2.55	515,756	759	16	14.7	2.11	1,039,832	1308	30	12.6	2.29
Total	20,278,381	16999	387	8.4	2.28	19,956,501	19963	435	10	2.18	40,234,882	36962	822	9.2	2.22

**Table 2:** Distribution of cases of Acute Watery Diarrhea (AWD), Attack rates (AR) per and case Fatality Rates (CFR) percent in different states of Sudan during an outbreak of AWD, 2016 - 2018.

Age Group	Male					Female					Total				
	Pop	N	D	AR	CFR	Population	N	D	AR	CFR	Population	N	D	AR	CFR
Less than 5	3,027,175	1,667	44	5.5	2.64	2,924,994	1,385	39	4.7	2.82	5,952,169	3,052	83	5.1	2.72
5 - 9.9	2,746,327	1,662	43	6.1	2.59	2,663,191	1,369	27	5.1	1.97	5,409,518	3,031	70	5.6	2.31
10 - 19.9	4,680,001	2,936	43	6.3	1.46	4,559,696	2,861	37	6.3	1.29	9,239,697	5,797	80	6.3	1.38
20 - 29.9	3,447,655	2,907	30	8.4	1.03	3,392,580	3,815	49	11.2	1.28	6,840,235	6,722	79	9.8	1.18
30 - 39.9	2,534,931	2,223	47	8.8	2.11	2,530,218	3,454	57	13.7	1.65	5,065,149	5,677	104	11.2	1.83
40 - 49.9	1,716,138	1,664	47	9.7	2.82	1,756,200	2,533	58	14.4	2.29	3,472,338	4,197	105	12.1	2.5
50 - 59.9	1,059,251	1,335	33	12.6	2.47	1,115,766	1,607	27	14.4	1.68	2,175,017	2,942	60	13.5	2.04
60 - 69	621,574	2,605	100	41.9	3.84	670,894	2,939	141	43.8	4.8	1,292,468	5,544	241	42.9	4.35
70+	365,155	16,999	387	465.5	2.28	423,136	19,963	435	471.8	2.18	788,291	36,962	822	468.9	2.22
Total	20,198,207	33,998	774	16.8	2.28	20,036,675	39,926	870	19.9	2.18	40,234,882	73,924	1644	18.4	2.22

**Table 3:** Distribution of cases of age-sex distribution of Attack Rates (AR) per 10,000 and Case Fatality Rates (CFR) percent during an outbreak of Acute Watery Diarrhea (AWD), Sudan 2016-2018.

State	Sex	N	Mean	Standard Deviation (SD)	Inter Quartile Range (IQR)
Kassala	Male	8,556	28.4	18.7	13 - 40
	Female	11,317	29.3	17.6	15 - 40
	Total	19,873	28.9	18.1	14 - 40
Red Sea	Male	14,086	31.3	19.3	18 - 45
	Female	14,775	32.3	18	15- 45
	Total	28,861	31.9	18.7	17 - 45

**Table 4:** Mean age of Chikungunya cases in Kassala and Red Sea State.

Age Group	Sex	Kassala			Port Sudan			Both States		
		Population	No. of cases (%)	AR	Population	No. of cases (%)	AR	Population	No. of cases (%)	AR
Less than 5	Male	1,40,007	584 (50.2)	42	82,371	449 (53.5)	55	2,22,378	1,033 (51.6)	46
	Female	1,34,207	579 (49.8)	43	78,959	390 (46.5)	49	2,13,166	969 (48.4)	45
	Total	2,74,214	1,163 (5.8)	42	1,61,330	839 (2.9)	52	4,35,544	2,002 (4.1)	46
5-9.9	Male	1,27,018	822 (48.6)	65	74,729	1,159 (54.9)	155	2,01,747	1,981 (52.1)	98
	Female	1,22,195	871 (51.4)	71	71,892	952 (45.1)	132	1,94,086	1,823 (47.9)	94
	Total	2,49,213	1,693 (8.5)	68	1,46,621	2,111 (7.3)	144	3,95,833	3,804 (7.8)	96
10 - 19.9	Male	2,16,450	2,035 (46.7)	94	1,27,345	3,227 (54.0)	253	3,43,796	5,262 (50.9)	153
	Female	2,09,212	2,324 (53.3)	111	1,23,087	2,744 (46.0)	223	3,32,299	5,068 (49.1)	153
	Total	4,25,663	4,359 (21.9)	102	2,50,432	5,971 (20.7)	238	6,76,095	10,330 (21.2)	153

20 - 29.9	Male	1,59,454	1,406 (38.1)	88	93,813	2,314 (47.1)	247	2,53,267	3,720 (43.2)	147
	Female	1,55,661	2,282 (61.9)	147	91,581	2,604 (52.9)	284	2,47,242	4,886 (56.8)	198
	Total	3,15,116	3,688 (18.5)	117	1,85,394	4,918 (17.0)	265	5,00,509	8,606 (17.6)	172
30 - 39.9	Male	1,17,241	1,277 (39.0)	109	68,977	2,206 (43.3)	320	1,86,218	3,483 (41.6)	187
	Female	1,16,094	1,999 (61.0)	172	68,302	2,889 (56.7)	423	1,84,396	4,888 (58.4)	265
	Total	2,33,335	3,276 (16.5)	140	1,37,279	5,095 (17.7)	371	3,70,613	8,371 (17.2)	226
40 - 49.9	Male	79,372	1,030 (39.9)	130	46,697	1,801 (41.9)	386	1,26,069	2,831 (41.2)	225
	Female	80,580	1,550 (60.1)	192	47,408	2,496 (58.1)	526	1,27,987	4,046 (58.8)	316
	Total	1,59,951	2,580 (13.0)	161	94,105	4,297 (14.9)	457	2,54,056	6,877 (14.1)	271
50 - 59.9	Male	48,990	650 (42.0)	133	28,823	1,510 (48.6)	524	77,813	2,160 (46.4)	278
	Female	51,195	896 (58.0)	175	30,120	1,600 (51.4)	531	81,314	2,496 (53.6)	307
	Total	1,00,185	1,546 (48.0)	154	58,942	3,110 (10.8)	528	1,59,127	4,656 (9.5)	293
60 - 69	Male	28,748	767 (48.0)	267	16,913	1,420 (56.3)	840	45,661	2,187 (53.1)	479
	Female	30,783	830 (52.0)	270	18,110	1,100 (43.7)	607	48,893	1,930 (46.9)	395
	Total	59,530	1,597 (8.0)	268	35,024	2,520 (8.7)	720	94,554	4,117 (8.4)	435
TOTAL	Male	9,34,169	8,571 (43.1)	92	5,49,604	14,086 (48.8)	256	14,83,773	22,657 (46.5)	153
	Female	9,19,341	11,331 (56.9)	123	5,40,880	14,775 (51.2)	273	14,60,221	26,106 (53.5)	179
	Total	18,29,308	19,902 (100.0)	109	10,76,245	28,861 (100.0)	268	29,05,553	48,763 (100.0)	168

**Table 5:** Shows the Attack Rate (AR) per 10,000 population in both Kassala and Red Sea.

Considering the above and from the analysis of the current health situation with regard to epidemics, the proposal for strengthening capacities to address epidemics in Sudan can be summarized as follows:

- Establishment of national centers for Diseases Control -CDCs under the Federal Ministry of Health with regional branches can be initiated with a clear definition of their roles and those of the relevant authorities and those of state ministries of health.
- Strengthening infrastructure to address epidemics by:
  - Construction of isolation wards and isolation sections in hospitals to treat patients with highly contagious diseases of all kinds, with adequate equipment for mobile isolation wards that are easy to transport to different areas of Sudan if needed.
  - Construction of quarantine centres at all border crossing points, airports and international ports.
- Providing the funding required to respond to emergencies and epidemics, including fund for preparedness.
- Establish emergency units and find mechanisms to deal with emergencies in the relevant sectors by:
  - Develop and authorize sectoral national policies to deal with emergencies and epidemics so that health-related authorities are encouraged/obliged to establish mechanisms to deal with emergencies and epidemics and identify the roles of different actors in emergencies and epidemics.

- Construction of a water emergency unit at the Ministry of Water Resources, Irrigation and Electricity to address the issue of water safety to cope with epidemics related to water-related diseases.
- Policy authorization to develop arrangements for the design and financing of epidemic awareness programmes through various media, especially government and semi-governmental ones.
- Strengthening coordination between relevant authorities by:
  - Appoint representatives of the relevant authorities (Ministry of Agriculture, Ministry of Livestock, Ministry of Water Resources, Irrigation and Electricity, Ministry of Information) to the mandate system in the center's disease control centers and branches.
  - Strengthening and activating the technical committees of the National Council for the Coordination of Health Services to coordinate between the relevant authorities on the issue of emergencies and epidemiology.
- Review the organizations responsible for water in terms of structure and relationships so that they strengthen their governance.
- Addressing the problem of transporting and treating waste in all states of Sudan by:
  - Develop a national waste transport and treatment policy.
  - Creating financing to provide requirements for the establishment of integrated waste transport and treatment systems by establishing a bank finance portfolio for this purpose [1-13].

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