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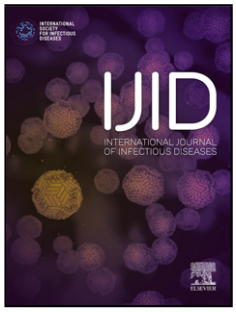

Coronavirus 2019 and health systems affected by protracted conflict: the case of Syria

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Title: Coronavirus 2019 and health systems affected by protracted conflict: the case of Syria

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Highlights:

- Conflict affected settings present particular challenges in the COVID-19 pandemic
- Political influences on public health negatively affect COVID-19 control in Syria
- Internationally recommended measures may be ineffective or impossible in Syria
- Detainees are particularly vulnerable should cases of COVID-19 increase uncontrollably
- Rapid capacity building of health systems and staff is needed across Syria to meet needs

Abstract:

Introduction: Two thirds of countries globally are unprepared to respond to a health emergency as per the International Health Regulations (2005) with conflict-affected countries like Syria particularly vulnerable. Political influences on outbreak preparedness, response and reporting may also adversely affect control of SARS-CoV-2 in Syria. Syria reported its first case on 22 March 2020 however concerns were raised that this was delayed and that underreporting continues.

Main: Syria's conflict has displaced more than half its pre-war population leaving 6.7 million people internally displaced; consequent overcrowding with insufficient water, sanitation and healthcare (including laboratory capacity) could lead to conditions which are ideal for spread of SARS-CoV-2 in Syria. Political changes have led to the formation of at least three health systems within Syria's borders, each with their own governance, capacity and planning. This fragmentation with little interaction between them could lead to poor resource allocation and adversely affect control. As such, COVID-19 could overwhelm the health systems (particularly intensive care capacity) leading to high deaths across the population, particularly for the most vulnerable such as detainees.

Conclusions: Locally implementable interventions which rapidly build WASH and health system capacity are required across Syria to ensure early detection and management of COVID-19 cases.

Key words: Syria. COVID-19. Communicable diseases. Preparedness. Conflict.

Introduction

Cases of coronavirus disease 2019 (COVID-19) are increasing exponentially, overwhelming otherwise well-functioning health systems in Europe and North America. These contexts have among the most robust preparedness plans however most have been unable to meet the demands placed on their health systems by this pandemic. Globally, only one third of countries have capacities to respond to a health emergency in line with International Health Regulations; conflict affected countries are disproportionately affected[1] due to the consequences of conflict on their health systems, infrastructure, institutions, economy and public health leaving them ill-prepared to manage pandemics such as COVID-19.[1]

In the Middle East and North Africa region, political instability, a lack of transparency and fragmentation along political divisions may affected preparedness. Syria, a country which has now entered the tenth year of a conflict which has displaced more than half of its population (6.7 million internally and 5.5 million as refugees) is particularly vulnerable with a fragmented and increasingly politically influenced health system.[2] This is alongside concern that the presence of high numbers of COVID-19 cases in neighbouring countries, particularly Iran and Turkey, could have introduced cases before Syria declared the closure of its borders on 23 March 2020[3] as even after the formal border closures, some movement continued across less formal borders. Turkey is home to around 3.6 million Syrian refugees and is also in the top ten countries with the highest number of COVID-19 cases with 120,204 confirmed cases (as of 28 April 2020.)[4]

In this commentary, we address issues relating to COVID-19 in Syria including political influences on public health and what measures are being taken to mitigate potential consequences of COVID-19 spread in a country whose health system has been decimated by years of conflict.

Syria, politics and the SARS-CoV-2 pandemic

Syria's current president inherited his position from his father in 2000. Despite early promise of political reform, when peaceful uprisings began in Syria in March 2011, civilians were violently repressed leading to one of the most violent and protracted conflicts since the Second World War. More than half a million civilians have been killed directly by the conflict.[5,6] This conflict has rendered less than 50% of health facilities functional and led to the exodus of nearly 70% of the qualified healthcare workforce with limited opportunities to train new healthcare workers sufficiently.[7,8] In Syria, even before the onset of conflict, the health system lacked sufficient public health infrastructure with inadequate surveillance or strategic preparedness.[7] Both before and since the onset of conflict, politics has influenced the response to communicable diseases outbreaks, something which contributed to delayed reporting of the resurgence of polio in Syria in 2013.[9] Since then, accusations of interference with humanitarian aid and consequently the diagnosis and management of outbreaks have occurred.[10]

On 22 March 2020, the Syrian Ministry of Health (MoH) confirmed the first case of COVID-19 in government-controlled areas and has since confirmed 43 cases, including 3 associated deaths (as of 28 April 2020).[11] The lack of transparency in Syria has shed doubt on when the Syrian MoH first became aware of cases and whether this was delayed.[12] On 5 March 2020, WHO released a statement refuting claims that were released on social media (attributed to WHO) which reported cases of COVID-19 in Syria.[12] Since then, universities and public institutions have been closed in government-controlled areas, and a curfew imposed from 6:00pm to 6:00am each day, something which has not occurred since the onset of conflict in March 2011.[13] (See Table 1) In areas outside of government control, one case (and subsequent fatality) has been reported in the north east of the country[14], while no cases have been reported in the northwest.[11,15] However, suggestion of under-reporting (perhaps related to under-testing) continue.

Despite countries neighbouring Syria declaring cases as early as February 2020, and governments of Jordan and Lebanon rapidly implementing stay-at-home orders and public health measures, the Syrian

MoH continued to deny the presence of any cases.[16] Iran (a country which shares geopolitical and strategic alliances with Syria) declared its first case on 19th February 2020 however, it has also been accused of delaying and under-reporting. An estimated 22,000 Iranians visit Syria each year on pilgrimage and there remain thousands of Iranian militia in Syria.[12] Despite the official declaration of border closures with all neighbouring countries, there are concerns that some crossing points (which are vital for humanitarian aid)[5] remain unmonitored and porous which could facilitate the spread of SARS-CoV-2.

The political changes which have resulted from the Syrian war and changes to military control have led to the presence of at least three parallel health systems, each with different capacities, preparedness strategies and governance: government-controlled areas make up the largest proportion of the country and are supported by the Syrian MoH and WHO, northeast Syria (NES) which is under de facto Kurdish control, and northwest Syria (NWS) which is under opposition control (under the Syrian National Coalition). These multiple health systems have resulted in an incoherent, fragmented response with different processes for the detection, control and management of cases in place.[12,13]

A focus on north west Syria where recent escalation has displaced 1 million civilians

Since 1 December 2019, a further escalation of violence has displaced almost one million Syrian civilians in NWS (where the estimated population is 4.17 million) towards the Syria-Turkish border; 81% of these are women and children.[5,6] This has left hundreds of thousands with inadequate food, shelter or health and humanitarian care. All sectors are overwhelmed with the most acute needs being shelter, WASH (water, sanitation and hygiene), nutrition and protection.[11] Overcrowding is rife; around 327,000 live in tents or camps (which could contain 6-12 individuals), 165,00 are in unfinished buildings, 93,000 are in collective shelters and 366,00 are living with host families or in rented properties.[11] WASH is insufficient, particularly in camps or collective shelters making physical distancing measures, frequent hand washing and self-isolation virtually impossible public health

133 measures in these circumstances.[16] These factors could contribute to a higher R0 (basic reproductive
134 rate) than the 2.2 to 2.7 estimated in non-conflict affected settings.[17]
135
136 In NWS, Idlib Health Directorate estimates that there are 98 ventilators for adults (all of which are in
137 use) for the 4.17 million civilians in the area.[11] Even with conservative estimates of numbers of cases,
138 these would be insufficient for the potential needs and the inadequate health system capacity could
139 result in excess mortality should infection spread. [18] This could be amplified by the insufficient
140 numbers of healthcare workers in general and those with relevant skills (e.g. intensive care,
141 pulmonology, infectious diseases) who can meet the demand with potential for care for non-COVID-
142 19 conditions suffering. There are estimated to be a total of 4046 healthcare workers in NWS which
143 includes 358 midwives, 1,693 nurses, 709 community healthcare workers, 1,023 technicians, 263
144 pharmacists and 1003 doctors in NWS which falls below WHO recommended ratios.[19]
145
146
147 *Surveillance*
148
149 There are two parallel mechanisms for syndromic surveillance of communicable diseases in Syria.
150 EWARN (Early Warning and Response Network) was set up by the Assistance Coordination Unit
151 which forms part of the Syrian National Coalition; it predominantly works in non-government
152 controlled areas. EWARS (Early Warning and Response System) was established by the Syrian MoH
153 with support and funding from WHO and work predominantly in government-controlled areas.[20,21]
154 These systems report a number of syndromes including SARS (severe acute respiratory syndrome)
155 and ILI (influenza like illness) which could act as early indicators for COVID-19. EWARN has been
156 revised to ensure rapid alert verification, triaging and testing of suspected cases.[11]
157
158 Capitalising on existing surveillance networks is potentially an effective strategy to identify cases
159 early and ensure early testing. However, limitations to the sensitivity of available PCR tests, number
160 of tests which can be processed each day, the few numbers of laboratories with the equipment and

skilled laboratory technicians required to run the tests could limit the ability to effectively identify cases. In NWS, one laboratory technician (who has been trained in Ankara central reference laboratory in Turkey) [11] has established a laboratory in Idlib city with plans to establish two further laboratories in Idlib governorate. In GCAs, WHO has supported the Central Public Health Laboratory in Damascus and provided five PCR machines (with associated testing kits;) plans are to establish satellite laboratories in Aleppo, Homs and Lattakia governorates.[22] In NES, samples are to be sent to Damascus for testing where delays to reporting results could delay effective isolation and contact tracing. See table 1. Across the three areas, there is little ability for prompt testing, contact tracing and isolation of suspected or confirmed cases.

Populations at risk

Among other populations at risk are the elderly, those with comorbidities, those who are immunosuppressed and possibly those who are pregnant. Nearly 41% of the Syrian population requires treatment for non-communicable diseases and smoking prevalence among Syrian men is 51.3%.[23] There are over 90,000 detainees in Syria[24] and most are held without charge or have been charged with protesting against the Syrian government or providing healthcare to those opposed to the Syrian government while others are held by armed forces or militias in NES and NWS[24]. Syrians in prison are faced with over-crowded, poorly ventilated and unhygienic conditions where torture is prevalent[24], healthcare is sparse and malnutrition is rife which could lead to the rapid spread of SARS-CoV-2 in this population and a high proportion of severe or critical cases[25]. The detention centres themselves could act as a reservoir of infection where staff or visitors entering the centres could import or export SARS-CoV-2.

Meeting the challenge

Internationally recommended measures which could slow transmission including isolation of cases, self-quarantine, social distancing and the closures of public institutions (e.g. schools, universities)

have been introduced in different countries.[26] Some of these measures have been introduced in Syria to various degrees and with different levels of success. However, implementing such measures in conflict-affected settings or those with fragile health systems is fraught and could strengthen authoritarian measures which restrict human rights[27]. As such, tailored approaches relevant to the local context are important as some of the internationally introduced measures may be impracticable in low income or conflict-affected countries such as Syria where various social, economic and political factors have affected society and the health system.[28] Local humanitarian organisations have led community hygiene education and disinfection campaigns to support the local communities which have been effective to an extent.

In Syria, around 80% of the population live in poverty where food or supplies may be scarce[29]; as such, strict home quarantine measures which may leave breadwinners unable to work even for relatively short periods could have severe consequences for the population. In areas outside of government control, such as in NWS, 150,000 hectares of arable land have been unavailable for farming after the arrival of displaced people; this could lead to further food insecurity and starvation[11]. In addition, for those already living in desperation, the threat of COVID-19 could feel distant when daily survival is challenging and they face many threats to their life.

Researchers estimate that there is capacity to manage a maximum of 6,500 patients across the whole of Syria though capacity varies greatly across the country; this is based on the estimated number of ventilators across Syria.[12] Measures to upscale and upskill have been slow but are being planned across the three health systems. For example, in NWS, both community and health facility-based isolation approaches are to be introduced. Plans are underway to increase the number of intensive care unit beds[30] and training has started for 540 healthcare workers across 180 health facilities to ensure they are up to date with infection prevention and control and patient safety and to commence training to work in intensive care units.[11] However, these measures may still not meet potential demand. Other initiatives which support upskilling and skill shifting are urgently required to ensure the healthcare workforce can meet the challenges of the pandemic..[31]

Although some measures have been taken to identify and meet gaps in the COVID-19 response, shortages in human resources for health, personal protective equipment (PPE), and a lack of effective infection prevention and control measures could adversely affect the remaining healthcare workers. Further losses of healthcare workers as a result of SARS-CoV-2 infection (adding to the more than 923 who have been killed during the conflict) could cause further attrition to the workforce.[32] Healthcare workers at the frontline of healthcare provision in Syria are particularly vulnerable not only to the risk of transmission but also the ethical challenges posed by the volatile context, including difficult triage and resource allocation decisions due to limited resources, weak governance structures and the hostile environment where healthcare workers may be threatened.[33,34,35] Mechanisms to support healthcare workers in these contexts are required.

Conclusion

Countries affected by protracted conflict face numerous challenges with health systems that have already been decimated; as such, SARS-CoV-2 could spread rapidly through affected populations, particularly among those in the most vulnerable groups. In Syria, the multiple fragmented and increasingly politicised health systems within its borders present further challenges and the response requires locally appropriate interventions. Internationally recommended measures are unlikely to be enforceable or effective in areas where a lack of sanitation and overcrowding are rife; as such, rapid expansion of WASH and addressing shelter, particularly for IDPs is needed. Ceasefires (as have occurred in Yemen,) protection of health workers and health facilities, the expansion of humanitarian access through the remaining border crossings and evacuation of critical cases for life saving treatment are practicable measures which can support the response to COVID-19 in Syria.

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References:

1. *Annual Report on Global Preparedness for Health Emergencies Global Preparedness Monitoring Board A WORLD AT RISK*.; 2019. http://apps.who.int/iris. Accessed April 21, 2020.
2. Doyle C. Syrian people to suffer again amid regime's virus denial.https://www.arabnews.com/node/1650531. Published 2020.
3. Aji, Alber; Mroue B. War-torn Syria braces for lockdown after first virus case. *ABC News*. https://abcnews.go.com/Health/wireStory/travel-hub-uae-halt-flights-virus-reaches-gaza-69742317. Published 2020.
4. Johns Hopkins University. COVID-19 Map - Johns Hopkins Coronavirus Resource Center. UN News. https://coronavirus.jhu.edu/map.html. Published 2020. Accessed April 26, 2020.
5. Aula Abbara, Diana Rayes, researcher, Munzer Khalil, Mazen Kewara AT. Humanitarian catastrophe for civilians in northwest Syria. *Br Med J*. 2020;368.
6. Syria Public Health Network. *Policy Brief North West Syria: Humanitarian Catastrophe*.; 2020.
7. Kherallah M, Alahfez T, Sahloul Z, Eddin KD, Jamil G. Health care in Syria before and during the crisis. *Avicenna J Med*. 2012;2(3):51-53. doi:10.4103/2231-0770.102275
8. Coutts Adam FMF. Response to Syria's health crisis—poor and uncoordinated. *Lancet*. 2013;381(9885):2242-2243.
9. Tajaldin B, Almilaji K, Langton P, Sparrow A. Defining polio: Closing the gap in global surveillance. *Ann Glob Heal*. 2015;81(3):386-395. doi:10.1016/j.aogh.2015.06.007

10. Haid H. *Principled Aid in Syria A Framework for International Agencies*.; 2019.
11. UN OCHA. *Recent Developments in Northwest Syria - Situation Report No. 11 - As of 27 March 2020*.; 2020.
12. Gharibah, Mazen; Mehchy Z. *COVID-19 Pandemic: Syria's Response and Healthcare Capacity*.; 2020.
13. Spotlight: Coronavirus update.
14. Syrian Arab Republic: COVID-19 Update No. 07 - 25 April 2020 - Syrian Arab Republic | ReliefWeb. https://reliefweb.int/report/syrian-arab-republic/syrian-arab-republic-covid-19-update-no-07-25-april-2020. Accessed April 30, 2020.
15. UN OCHA. *Syrian Arab Republic: COVID-19 Update No. 03 - 25 March 2020*.; 2020.
16. Al-Hlou EH and Y. 'Wash Our Hands? Some People Can't Wash Their Kids for a Week.' *New York Times*. 2020.
17. Sanche S, Lin YT, Xu C, Romero-Severson E, Hengartner N, Ke R. High Contagiousness and Rapid Spread of Severe Acute Respiratory Syndrome Coronavirus 2. *Emerg Infect Dis*. 2020;26(7). doi:10.3201/eid2607.200282
18. Chulov M. Fears over hidden Covid-19 outbreak in Lebanon, Iraq and Syria. *The Guardian*. https://www.theguardian.com/world/2020/mar/31/fears-over-hidden-covid-19-outbreak-in-lebanon-iraq-and-syria. Published 2020.
19. WHO. *WHO Gaziantep Field Presence, Turkey (Medical Portable Ventilator Machine)- Availability of Health Equipment Monitored through HeRAMS Tool*.; 2020. https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/herams_1st_quarter_2020_v2.pdf. Accessed April 30, 2020.
20. Ismail SA, Abbara A, Collin SM, et al. Communicable disease surveillance and control in the context of conflict and mass displacement in Syria. *Int J Infect Dis*. 2016;47. doi:10.1016/j.ijid.2016.05.011
21. Sparrow A, Almilaji K, Tajaldin B, Teodoro N, Langton P. Cholera in the time of war: implications of weak surveillance in Syria for the WHO's preparedness—a comparison of two monitoring systems. *BMJ Glob Heal*. 2016;1(3):e000029. doi:10.1136/bmjgh-2016-000029

22. Syria coronavirus threat sparks broad UN containment effort | UN News. https://news.un.org/en/story/2020/04/1061722. Accessed April 26, 2020.

23. Sawsan Abdulrahim MJ. Socioeconomic differences in smoking in Jordan, Lebanon, Syria, and Palestine: A cross-sectional analysis of national surveys. *PLoS One*. 2018. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0189829.

24. Syria Network for Human Rights. *Serious Concern About Health Conditions in Detention Centers Fears of a COVID-19 Pandemic in Syrian Detention Centers*.; 2020.

25. Abbara A, AlKabbani H, Al-Masri I, Sahloul Z, Sparrow A. Populations under siege and in prison require investment from Syria's national tuberculosis programme. *Lancet Respir Med*. 2018;6(7):e34. doi:10.1016/S2213-2600(18)30182-6

26. Ferguson N. *Report 9: Impact of Non-Pharmaceutical Interventions (NPIs) to Reduce COVID-19 Mortality and Healthcare Demand*.; 2020. https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/covid-19/.

27. Daragahi B. Coronavirus could be used by authoritarian leaders as excuse to undermine democracy, experts warn. *Independent*. 2020.

28. Maysoon Dahab, Kevin van Zandvoort, Stefan Flasche, Abdihamid Warsame, Paul B. Spiegel, Ronald J Waldman FC. *Home News and Events News COVID-19 Control in Low-Income Settings and Displaced Populations: What Can Realistically Be Done? COVID-19 Control in Low-Income Settings and Displaced Populations: What Can Realistically Be Done?*; 2020. https://www.lshtm.ac.uk/newsevents/news/2020/covid-19-control-low-income-settings-and-displaced-populations-what-can.

29. UNDP. UNDP: Goal 1: no poverty. https://www.sy.undp.org/content/syria/en/home/sustainable-development-goals/goal-1-no-poverty.html. Accessed April 1, 2020.

30. UN OCHA. *Recent Developments in Northwest Syria. 24 April 2020*.; 2020. https://reliefweb.int/sites/reliefweb.int/files/resources/nws_flash_update_20200424.pdf. Accessed April 30, 2020.

31. WHO EMRO. *COVID-19 Preparedness and Response for NW-Syria; Situation Report as of*

1st April 2020.; 2020. https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/health_task_force_nws_covid-19_sitrep_-_1_april_2020.pdf. Accessed April 30, 2020.

32. Physicians for Human Rights. Medical Personnel are Targeted in Syria. https://phr.org/our-work/resources/medical-personnel-are-targeted-in-syria/. Published 2019.

33. Greenberg N. Managing mental health challenges faced by healthcare workers during covid-19 pandemic. *Br Med J*. 2020.

34. *Reality Makes Our Decisions: Ethical Challenges in Humanitarian Health in Situations of Extreme Violence*.; 2019. https://www.jhsph.edu/research/centers-and-institutes/center-for-public-health-and-human-rights/_pdf/Len Violence Report.pdf.

35. Douedari Y, Howard N. Perspectives on rebuilding health system governance in opposition-controlled Syria: A qualitative study. *Int J Heal Policy Manag*. 2019;8(4):233-244. doi:10.15171/ijhpm.2018.132

Table 1: This table shows the testing and lockdown measures in place in	**Government Controlled Areas**	**North West Syria**	**North East Syria**

government-controlled areas (GCAs), north west Syria (NWS) and north east Syria (NES).			
Testing	WHO has supported the Central Public Health Laboratory in Damascus with training of technicians, other staff and have provided five PCR machines for testing. WHO have also provided support to establish three new satellite laboratories.	Testing is available in one laboratory in Idlib since 24th March 2020. Three laboratory technician have been trained in Ankara National Reference Laboratory in Turkey with support from 'WHO COVID-19 Health Taskforce in North West Syria.' Two further laboratories are planned.	Samples to be sent to the central laboratory in Damascus though discussions for other testing sites (e.g. government-controlled area of Qamishli) are underway.
Lockdown Measures	14 March 2020: Public institutions and educational establishments closed. Public events cancelled. 29 March 2020: Movement between and within	15 March 2020: Internal crossings (with GCAs, NES) closed; roads between northern Aleppo (under Turkish control) and Idlib governorate have been	21 March 2020: Curfew imposed other than for healthcare workers, international staff, delivery drivers and those working in grocery stores.

	governorates (rural to central areas) was banned. Curfew: 6pm to 6am daily	closed with exceptions for essential medical evacuation, health workers and humanitarian aid. Main border crossings with Turkey e.g. Bab Al-Hawa and Bab Al Salama have been reduced to only essential humanitarian activities. Educational establishments, and 'crowded' markets have been closed. Mosques were closed but were forced to reopen after demands from extremist groups.	

No authors have a conflict of interest

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