

Africa's COVID-19 Third Wave: A Coupled Behavior-Disease System in a Mutual Feedback Loop

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ABSTRACT

A year after COVID-19 was declared a pandemic much of the Africa continent is now experiencing spikes in the number of COVID-19 cases and related deaths in what is now referred to as the third that barely went unnoticed in Africa. As of July 2021, Morocco, South Africa, Tunisia, Egypt, Nigeria, Libya, Kenya, Algeria, Zambia and Ethiopia that accounted for approximately 86% of the recently reported increase in COVID-19 could be aptly described as being at the forefront of the continent's third wave of the COVID-19 pandemic. Unlike those countries in Asia and Latin America that experienced what may generally be described as autochthonous COVID-19 third wave, Africa's third wave COVID-19 cases are widely believed to have been triggered by imported cases. Africa like the rest of the world relaxed its COVID-19 restrictions almost at the same time; hence the continent's current spikes of COVID-19 cases and related deaths during the third wave of the pandemic have raised some questions. These spikes came right behind the heels of a second wave of the pandemic.

Keywords: COVID-19; Epidemiological database; Asymptomatic

INTRODUCTION

In late April 2021 some countries in Africa started experiencing spikes in the number of COVID-19 cases and related deaths in what is now referred to as the continent's third wave of the pandemic. These spikes came right behind the heels of a second wave [1] of the pandemic that was barely invisible in Africa. There were contentions whether Africa actually experienced a second wave of the COVID-19 pandemic [2]. The COVID-19 third wave came after many jurisdictions around the world relaxed their COVID-19 pandemic restrictions. In mid-June 2021, the World Health Organisation regional director for Matshidiso Moeti reported that Africa's COVID-19 new cases

and deaths rose by over 30% and 15% respectively with Seychelles (25.1%, n=160244/638232), Mayotte (10.9% n=69460/638232), Cape Verde (9.1% n=58122/638232), Tunisia (5.7% n=36238/638232), Namibia (5.6% n=35901/638232), Reunion (5.3% n=33917/638232), South Africa (5.3% n=33633/638232), Botswana (4.7% n=29781/638232), Libya (4.4% n=27901/638232) and Eswatini (2.6% n=16281/638232) accounted for approximately 78.6% (n=501477/638232) of the total number of confirmed COVID-19 cases per million of the population in early July 2021 (Figure 1) [3,4].

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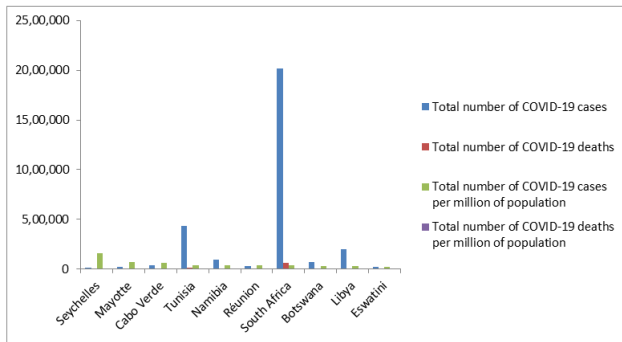


Figure 1: Total number of COVID-19 cases and deaths per million of population for the twelve most affected countries in Africa as of the first week of July 2021.

Literature Review

South Africa has the highest COVID-19 cases and deaths but Seychelles recorded the highest COVID-19 cases per million of the population as of the first week in July 2021.

This third wave of the COVID-19 pandemic in Africa is worrying because it came right behind the heels of the reopening of international borders and crossing points by many countries which allows the movement of people into and within nations. Few studies [5,6] have earlier connected the second wave of the pandemic to the lifting of the restriction on traveling, physical distancing and other social activities by many jurisdictions around the world. Mathematical models backed by empirical analysis have also shown that physical distancing can mitigate COVID-19 transmission and control [7-9] and that such mitigating measures can actually reduce the reproduction number of COVID-19 to below [10-12]. We discovered that those African countries that can be actively described to be experiencing the third wave of COVID-19 are those with high volume of international flight traffic [13]. However, we believe that the lifting of the restriction on international traveling, physical distancing and other social activities are part of the response to the accumulating socio-economic impact of COVID-19 pandemic on the populace. Thus, it appears that the COVID-19 pandemic is operating as a coupled behavior-disease system in which the disease and social dynamics are intertwined with each other in a mutual feedback loop. We are however of the opinion that blaming Africa’s current third wave of COVID-19 only on the relaxation of pandemic precaution including the easing of international flight will require a second opinion. For instance it takes at least two weeks for a person exposed to COVID-19 to become sick enough to be tested and have their case epidemiologically linked or counted in an epidemiological database; and that it takes even more time for more people to become ill after being exposed to the primary case. Also, Africa’s high youthful population which was initially thought of be a protective factor against increasing COVID-19 infection and mortality rates since young people are generally believed to have asymptomatic COVID-19 infection may even now prove not to be so. Young people may serve as super-spreaders of the infection to their older generation since large proportion of COVID-19 transmission occurs during the asymptomatic period while 40% [14] of COVID-19 infected

people are asymptomatic. Africa’s youthful population may spell doom for its aging population since the many asymptomatic youthful patients that will remain either largely unnoticed or undetected will continue to spread the virus to its aged population. We are of the opinion that Africa’s third wave COVID-19 infection and mortality rates may worsen off considering the fact that the region has limited resources including either non-existing or partially functioning lab as well as the overreliance on syndromic COVID-19 diagnosis surveillance which invariably implies that large number of COVID-19 transmission will occur prior to the laboratory detection of cases.

Africa unlike other continents recorded fewer COVID-19 cases and deaths during the first and second phases of the pandemic which led many school of thoughts to postulate that the continent was being spared by the pandemic. From the epidemiological data available it is clear that the spikes in the incidence and mortality rates during the third wave of COVID-19 pandemic in Africa is not due to increase in diagnostic COVID-19 testing (Figure 2).

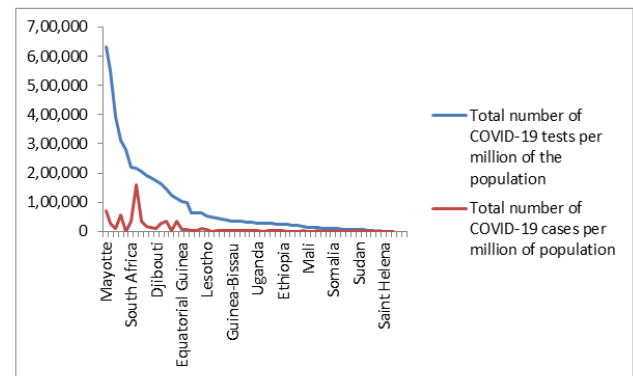


Figure 2: A graph showing the trend of COVID-19 test and number of COVID-19 cases per million of the population for the twelve most affected countries in Africa during the first week of July 2021.

DISCUSSION

In the past few months Africa has upped its number of COVID-19 testing with Mayotte recording the highest number of COVID-19 tests per million of its population as of July 2021. We observed a strong association between an increase in the total number of confirmed COVID-19 cases per million of a country’s population and the number of COVID-19 tests conducted per million of a country’s population (OR= 1.5, p-value=<0.0005). In early period of the pandemic, Africa was known for its lack of or limited COVID-19 testing; but this pattern changed with the donation (especially from China) of COVID-19 diagnostic kits to the continent mid last year. Africa however, has also shifted its population that’s being tested. Previously, much of Africa’s COVID-19 tests were done on only sick persons suspected of having COVID-19 as opposed to now when testing is done more within the community were they are likely going to capture more infected people, including asymptomatic COVID-19 cases.

Unlike Europe and USA where the upsurge of COVID-19 cases that constituted the third wave of pandemic are autochthonous or community transmitted and were triggered by the emergence of COVID-19 Delta and Delta Plus strains, most of Africa's COVID-19 cases that are viewed to constitute the third wave of the pandemic are either imported cases or triggered by imported COVID-19 cases. In Sierra Leone for instance, inbound international passengers constitute majority of the country's daily COVID-19 cases.

This importation of COVID-19 cases through international traveling also adds fuel to the argument for the need to understand the behavior-disease system of the pandemic. For the COVID-19 pandemic to be halted with or without mass vaccination, its behavior-disease system should be fully understood in the first place. Unlike the first and second waves of the pandemic in which few cases were reported in Africa, the effect of the third wave in Africa is so pronounced thereby indicating variations in the distribution of COVID-19 incidences and mortality rates. From our knowledge of the 1918 flu, several factors are responsible for spikes in disease incidence following the first wave of an outbreak. Like 1918 flu pandemic and other disease outbreaks, human behavior remains the most important factor responsible for the third phase of such outbreaks [15-17]. There are differences in the ways in which people respond to pandemics. Like Asia with some of the most disorganized human settlement systems, human behavior and residency may play an important role of the impact of the COVID-19 third wave in Africa. One in three Africans is living below the global poverty level [18]. Thus, for Africans to follow COVID-19 precautions such as physical distancing, hand hygiene and the wearing of face mask may appear as a difficult chore. The closure of cities, towns, communities, and other public places in order to limit the number of people interacting with each other is difficult within the Africa context also. Africa is a continent with high population mixing since most of its people practice communal living as a means of sustaining their livelihood. Because of such living system, Africans tend to display high state of communal behavior which is expected to invariably lead to the greater spread and increase in the incidences and mortality of COVID-19 within the continent compared to other continents.

The effect of the third wave of COVID-19 pandemic will be more pronounced on people of with low-incomes, the homeless and people with limited access to healthcare since they cannot take time off of work when sick, and thereby causing others to become infected and making the cycle continue. Africa thus looks a perfect candidate for the full effect of the third wave of the COVID-19 pandemic. A third wave COVID-19 pandemic will thus worsen off the economic and healthcare inequities among Africans in spite of the rolling out of COVID-19 vaccines which works toward establishing herd immunity among the general population to prevent future waves from occurring or being as severe. All the various COVID-19 waves are exacerbated by different human behaviors, inertia governmental actions and rules, travel, daily activities, as well as the emergence of viral variants.

CONCLUSION

The relationship between COVID-19 mitigating actions and its incidence and hence mortality is clear; places where few people wear face masks, largely gather indoors to eat, drink, celebrate, socialize, or observe religious practices, are expected to observe more COVID-19 cases. Also, multigenerational households and places where people live or work closely together; which are typical of the Africa setting are also expected to see more spread of COVID-19 cases. Thus from an African perspective it appears that human behavior alone may triggered the worst case scenario for the continent's third wave of COVID-19.

CONSENT FOR PUBLICATION

Not Applicable

AVAILABILITY OF DATA AND MATERIALS

Not Applicable

COMPETING INTERESTS

All authors declared they have no competing interest.

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AUTHORS' CONTRIBUTION

JK, FS and MS conceived and designed this study as well as organized the conduct of this research. JK, FS and MS drafted the manuscript. JK critically reviewed and revised the manuscript.

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AUTHORS INFORMATION

Not applicable

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