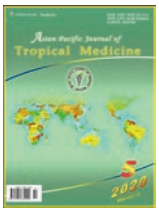

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The coronavirus disease 2019 (COVID-19) pandemic: A review and an update on cases in Africa

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ABSTRACT

The world has experienced several epidemics posing serious threat to global public health, including the 2002 severe acute respiratory syndrome (SARS) epidemic that caused 800 deaths out of about 8 000 cases, the 2009 H1N1 pandemic with 18 500 deaths, the 2012 Middle East respiratory syndrome (MERS) epidemic that caused 800 deaths out of 2 500 cases, the 2014 Ebola outbreak with 28 616 cases and 11 310 deaths, and the current coronavirus disease (COVID-19) pandemic with more than 35 000 deaths out of over 730 000 confirmed cases till now. Emerging infectious diseases continue to infect and reduce human populations. The COVID-19 pandemic has spread to more than 114 countries before it was officially declared as a pandemic by the WHO on the 11th March 2020. Here, the first set of index cases in Africa, and the differences between SARS-CoV-2 and other coronaviruses in addition to the preventive strategies on the emergence of COVID-19 were reviewed.

KEYWORDS: Coronavirus; COVID-19; SARS-CoV-2; Infectious disease; Africa

1. Introduction

Although virology began in 1892, the first coronavirus, avian infectious bronchitis virus, was isolated by Fred Beaudette in 1937[1], followed by severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002 and Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012. There are currently about 21 000 deaths out of over 470 000 cases with about 82 000 reported by China and a total of over 380 000 confirmed from 194 countries till the 25th March 2020[2,3]. This article summarized records of index cases in Africa, the difference between SARS-CoV-2 and other coronaviruses in addition to the preventive strategies.

2. Aetiology and origin of SARS-CoV-2

Coronaviruses (CoVs) are positively sensed single-stranded RNA viruses that belong to the order Nidovirales, family Coronaviridae, subfamily Orthocoronavirinae with 4 genera: alpha, beta, delta, and gamma coronaviruses[4]. Alpha CoVs and beta CoVs originated from bats and rodents while delta CoVs and gamma CoVs have their origins from avian species[5]. The beta CoVs including SARS-CoV-1 was isolated from bats in 1992 with civet cats being the intermediary host; MERS-CoV was isolated from dometry camels in 2003; and of course, the currently circulating SARS-CoV-2 formally referred to as 2019 novel coronavirus (2019-nCoV) causing COVID-19. SARS-CoV-2 has a pleomorphic and circular structure with a diameter of about 60-140 nm. It can be transmitted from human-to-human by respiratory droplets from sneezing, coughing, and aerosols, with symptomatic people being the major source of transmission. It has a dynamic incubation period of about 7 to 14 days[6].

The novel virus whole-genome sequence showed 96.2% similarity to a bat SARS-related coronavirus isolated in China against <80% to the genomes of SARS-CoV and <50% to MERS-CoV according to Lu *et al*.[7]; Zhou *et al*.[8] which further confirmed the similarity between the novel virus and bat betacoronavirus in the sub-genus Sarbecovirus earlier reported by Benvenuto *et al*.[9] and Xu *et al*.[10].

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According to Zhang *et al*.[11], phylogenomic analysis of the recently released genomic data of 2019-nCoV showed that the 2019-nCoV is most closely related to two severe acute respiratory syndrome (SARS)-like CoV sequences that were isolated in bats from 2015 to 2017, suggesting that the bats' coronaviruses and the human 2019-nCoV share a common ancestor. Therefore, the 2019-nCoV can be considered as a SARS-like virus hence, the name SARS-CoV-2 as designated by the Coronavirus Study Group of the International Committee on Taxonomy of Viruses. The two bat viruses were collected in Zhoushan, Zhejiang Province, China, from 2015 to 2017.

A study by Tang *et al*.[12] on population genetic analyses of 103 SARS-CoV-2 genomes proved that based on 2 different single nucleotide polymorphisms that showed early complete linkage across the viral strains submitted to the Genbank, these viruses evolved into 2 major genotypes designated as L and S with the L type (~70%) found to be more prevalent than the ancestral S type (~30%).

3. How is SARS-CoV-2 different from other coronaviruses?

SARS-COV-2, like the MERS and SARS coronaviruses, was likely evolved from a virus previously found in animals. It infects people of all ages with evidence that older people and those with underlying medical conditions are at a higher risk of getting severe COVID-19 disease, unlike other coronaviruses that cause a significant percentage of colds in adults and children that are not a serious threat for healthy adults[13,14]. A good reason could be due to high viral loads of SARS-CoV-2 that have been reported in the upper and lower respiratory tracts of patients comparing with SARS-CoV-1 hence the rate of transmission of SARS-CoV-2 is higher than that of SARS-CoV-1[15]. Also, due to the fact that no one has immunity to COVID-19, it means thousands to millions of people are likely to be more susceptible to viral infection and severe disease. According to the WHO, about 3.4% of reported COVID-19 cases have died till the 3rd March 2020[16].

Based on the genomic structure, SARS-CoV-2 has an open reading frame (ORF3b) different from that of SARS-CoVs and a secreted protein that is ORF8 encoded[5]. Tang *et al*.[12] reported that spike structure of SARS-CoV-2 has functional site variations in the receptor-binding domain compared to viruses from pangolin SARSr-CoVs, which could be the resultant effects of mutations and natural selection, enhancing viral transmission and observable host debility. In fact, Angeletti *et al*.[17] reported that it is the mutational changes at positions 723 and 1 010 involving the replacement of glycine amino acid with serine and isoleucine by proline respectively in the ORF1ab encoded 2 (nsp2) and nsp3.

4. Diagnosis of COVID-19

Coronaviruses have been reported to cause 5% to 10% of acute respiratory infections with more than 2% of the population as healthy carriers of HCoV[18]. The clinical diagnoses are similar to those of other human coronaviruses. The WHO gave a case definition as a patient with fever and at least a symptom of cough or shortness of breath, and with no other cause that explains the symptom and history of journey to or residence of any location reporting local transmission of COVID-19 during the 14 days prior to symptom onset, or a patient with acute respiratory illness and having been in contact with a confirmed or probable COVID-19 case in the last 14 days prior to the onset of symptoms, or a patient with severe acute respiratory infection [fever and at least one sign/symptom of respiratory disease (*e.g.*, cough, shortness of breath)] and requiring hospitalization and with no other aetiology that fully explains the clinical presentation. A probable case is a suspect case with an inconclusive testing for COVID-19 while a confirmed case is a person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms[14].

Laboratory diagnoses require the collection of respiratory specimens including oropharyngeal or nasopharyngeal aspirates or washes, oropharyngeal or nasopharyngeal swabs, sputum, bronchoalveolar lavage and tracheal aspirates[19] usually examined and tested with the cultural method of viral isolation in tissue culture or cell lines, the serological technique of antibody titre measurement, electron microscopy for examination of viral particles, conventional and real-time reverse transcriptase polymerase chain reaction.

5. Index cases of COVID-19 in Africa

In Africa, there has been a low number of cases of COVID-19 across the continent where 46 out of 47 WHO member countries have reported a total of about 2 475 confirmed cases of COVID-19 and 64 deaths till the 25th March 2020, with the countries better prepared, though, almost all cases were imported majorly from Europe[3,20]. Egypt recorded the first confirmed case on the 14th February 2020, followed by Algeria on the 25th February 2020. Nigeria recorded her index case on the 27th February 2020. Senegal recorded its first case on the 1st March 2020[21], followed by Morocco and Tunisia on the 2nd March 2020. In the southern African region, South Africa was the first to report COVID-19 on the 5th March 2020 while Cameroon reported two cases along with Togo on the 6th March 2020; and Burkina Faso on the 9th March 2020. The Democratic Republic of Congo was the 11th African country to report on the 10th March 2020 followed by Ivory Coast and Ghana on the 11th and 12th of March respectively while Ethiopia, Ethiopia, Gabon, Guinea, Kenya, Mauritania, Namibia and Rwanda all confirmed index cases along with Sudan on the 13th March 2020. Some other countries with confirmed reported cases include Angola, Benin, Cape Verde,

Central Africa Republic, Chad, Congo, Cote d'Ivoire, Djibouti, Eritrea, Eswatini, Gambia, Equatorial Guinea, Kosovo, Liberia, Seychelles and Somalia. Only Libya has escaped infection in North Africa till the 14th March 2020[2,3,20].

Some of the likely factors that favoured Africa was the screening at the various airports on the continent and containment strategy of fast detection of cases, isolation for treatment and contact tracing while part of the unanswered questions is: could it be the inability of SARS-CoV-2 to thrive in a hot environment or the pretty high number of youths population on the continents or an issue of genetic resistance as a result of the selective allele to diseases earlier reported by Andersen, Shylakhter[22]?

In Nigeria, after the confirmation of the first case on the 27th February 2020, and for the first time, researchers from the Centre for Human and Zoonotic Virology in Lagos University Teaching Hospital/College of Medicine of the University of Lagos, African Centre for Genomics of Infectious Diseases in Reedemers University and the Nigeria Institute of Medical Research Lagos successfully performed the genome sequencing of COVID-19. According to the Nigeria Centre for Disease Control, a second confirmed case was detected in the country on the 9th March 2020. This case was a contact of the index case. Out of a total of number of people screened for COVID-19 so far in Nigeria, there are 51 confirmed cases from 9 States of Bauchi, Edo, Ekiti, Lagos, Ogun, Osun, Oyo, Rivers and the Federal Capital Territory. Lagos State with a current population of over 20 million is leading with over 30 confirmed cases. One death has been recorded in the country while two cases including the index and first contact have been discharged to go home on the 13th March 2020 after testing negative to the virus twice consecutively[23]. Normally, COVID-19 patient is expected to have cleared the virus and can be discharged after two to four negative qRT-PCR tests on nasopharyngeal and throat swabs sampled at 24 h interval[24].

6. Current cases of COVID-19 in Africa

As the global trend on the outbreak of COVID-19 continues, the pandemic had its first wave between December and January 2020 in Asia, and then swept through to Europe and America, recording its second wave from February till date. There is great fear in Africa as the low number of cases is increasing, which may culminate in the third wave of the pandemic going by the global spread.

Currently, 46 out of 47 WHO member States from the 56 African countries have over 2 400 confirmed cases of COVID-19 with South Africa leading with over 700 cases. This may be due to the condition of the weather, regional location and the population of foreign nationals in that part of Africa. Egypt has the second highest with more than 400 cases and over 20 deaths, followed by Algeria with over 260 confirmed cases and more than 19 deaths, while Sudan has the least record of one death out of the 2 cases reported till the 18th March 2020 (Table 1)[2,3,20,25].

Table 1. Confirmed cases of COVID-19 in some African countries till the 25th March 2020.

No.	Country*	Number of cases	Number of deaths
1	Algeria	264	19
2	Burkina Faso	114	4
3	Cameroon	70	1
4	Mauritius	48	2
5	DRC	48	3
6	Egypt	402	20
7	Gabon	6	1
8	Tunisia	114	3
9	Ghana	68	2
10	Zimbabwe	3	1
11	Gambia	3	1
12	Sudan	3	1
13	Morocco	170	5
14	Nigeria	51	1

*African countries with recorded number of deaths due to COVID-19 till the 25th of March, 2020. No. of cases and deaths may change with time.

An interesting case and a worthy example of a Nigerian who returned to the country from the United Kingdom on the 13th March 2020 was detected on the 17th March 2020. On return to the country, the case did self-isolation and later developed some symptoms. Officials from the Lagos State COVID-19 Emergency Operations were dispatched to the case's home to collect sample upon receiving a call through one of the Nigeria Centre for Disease Control toll free lines. The case was tested positive for COVID-19 and was transferred to the Lagos State Infectious Disease Hospital for treatment. Contact tracing has since been initiated to identify all her contacts in the country[26].

7. Infection control methods: The WHO strategic objectives

The number one strategy is aggressive preventive methods including following the WHO's strategic objectives: interrupt transmission from animals to humans and human-to-human including reduction of secondary infections among health care workers and other close contacts, preventing transmission by continuous surveillance, isolation and prompt care for patients; addressing vital unknowns regarding clinical severity, and development of diagnostics; communicating important risks to all communities and counter false information. Serious public health actions must be adopted including follow-up of contacts, infection prevention and control in health centers, implementation of health actions for travelers, and awareness-raising among the people[27].

According to the WHO, countries must detect, test, treat, isolate, trace every contact, and mobilise their citizens in the response. Those with a handful number of cases must prevent them from becoming

clusters, and those clusters from becoming community transmission. All countries need to activate and scale-up crisis response mechanisms: be in touch with the communities and how they can protect themselves, get the hospitals ready, and train the health workers[27]. In essence, there is a need to apply the principles of the 5Ps: prevention, preparedness, public health, political leadership, and the people.

Furthermore, there is a need for the deliberate design of strategies for protecting the infected environment including "social distancing methods" of suspending schools and recommending telework to prevent infected people from spreading the disease to their classmates.

Common preventive measures must be strictly followed, including good respiratory hygiene, hand washing, reduced or no movement into and out of infected areas except for necessity. Also, SARS-CoV-2 like other viruses can be inactivated with 70% concentration of isopropanol and ethanol apart from 0.1% sodium hypochlorite within 1 min exposure[28].

For vaccine, we now have phase I study on a potential vaccine, mRNA-1273 and a preclinical, protein-based vaccine candidate, COVID-19 S-Trimer, against COVID-19 according to the Infectious Disease Hub report 2020.

8. Conclusions

There are currently over 21 000 deaths out of more than 470 000 cases from 194 countries/locations globally with Africa having low number of confirmed cases of over 2 400 and more than 60 deaths in 46 out of the 47 WHO member countries till the 25th March 2020. Egypt recorded the first confirmed case on the 14th February 2020, followed by Algeria on the 25th February 2020, while Nigeria recorded on the 27th February 2020. The novel virus whole-genome sequence showed 96.2% similarity to a bat SARS-related coronavirus isolated in China against <80% to the genomes of SARS-CoV and <50% to MERS-CoV. Therefore, the 2019-nCoV can be considered as a SARS-like virus, hence the name SARS-CoV-2 designated by the Coronavirus Study Group of the International Committee on Taxonomy of Viruses. However, the first preventive strategy is to interrupt the chain of transmission from animal-to-human.

Conflict of interest statement

The author declares that there is no conflict of interest.

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