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Review Article

Challenges in the setting of coronavirus 2019: A review of disease and experience from delta state university teaching hospital

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ABSTRACT

Coronavirus disease 2019 (COVID-19) was first identified in December 2019 and declared a pandemic in March 2020 by the World Health Organization. Countries with advanced technology and huge financial base are finding it difficult to curtail the COVID-19 spread and its attendant morbidity and mortality. Spread of the disease to the African Sub-Region became fearful because poor health-care facilities and manpower needs due to the majorly dilapidated health-care infrastructure, considering the mortality tables from other more advanced nations. To adequately prepare the manpower and avoid strain on the workforce before the incidence of disease peaks, there was a massive re-training of health-care personnel and the workforce routine schedule re-designed. This paper reviews the disease and highlights the challenges in our setting toward combating the coronavirus 2019 disease.

Keywords: Coronavirus disease, Coronavirus disease-2019, Severe acute respiratory syndrome coronavirus 2, Challenges with coronavirus, Residency in coronavirus disease 2019

INTRODUCTION

Coronavirus disease 2019 (COVID-19) emerged from Wuhan, People's Republic of China in December 2019 following the report of a cluster of 27 unexplained pneumonia cases.[1,2] On January 30, 2020, the World Health Organization (WHO) declared the outbreak of coronavirus as a disease of public health emergency because of its rapid spread. Subsequently, the WHO declared it as a pandemic on March 11, 2020, with over 118,000 cases reported in 114 countries, and 4291 people having lost their lives.[3,4] COVID is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[5] The features include difficulty in breathing, fever, and pneumonia, normal or low white blood cell count or low lymphocyte count, and no reduction in symptoms after standard antibiotic administration for 3 days.[6,7]

As at April 8, 2020, coronavirus had spread to 211 countries and 1,426,102 persons globally affected with a recorded mortality of 81,865.[8] By April 24, 2020, a total of 2,626,321 persons had been confirmed with a mortality of 181,938 globally.[9] On March 13, 2020, the United States declared a national emergency following the spread of covid-19 to 47 of the country's 50 states.[10]

In Africa, with poor health-care facilities and inadequate health-care manpower, importation of the disease has resulted in a real fear of the unknown among the rich and the poor.[11] In Nigeria,

as at 9.00 pm (GMT+1:00), April 8, 2020, out of a population of 200 million, 5000 persons have been tested with 276 persons infected and six deaths.[12] The male:female ratio is 2.3:1 and majority (21%) of affected persons are between 31 and 40 years old.[13] There are worries that the tables may rise to an overwhelming level beyond health-care manpower capacity. Lagos State, the epicenter of COVID-19 in Nigeria, has a projection of 39,000 COVID-19 infected persons.[14] As at April 25, 2020, over 40 doctors and other health-care providers have tested positive for coronavirus.[15]

To curtail the spread, the Federal Government of Nigeria imposed a complete lockdown complemented by the state governors. Despite the lockdown, individuals are defiant of the order because the lockdown is not supported by palliative measures.

Delta state with over 4 million population got her first case of coronavirus on April 8, 2020, and the state government has equally imposed a complete lockdown and intensified contact to avert community transmission.

Several health-care personnel have had additional training on the care of COVID-19 infected patients in our institution. However, judging from the experience of two sisters tertiary health-care institutions in Nigeria, over 45 health-care personnel have been placed on quarantine because of exposure to an unsuspected COVID-19 patient further straining the workforce. In view of the limited resources, personal protective equipment (PPE) and the expected projected number of infected patients to be referred to our institution, we implemented a re-designed residency training program to prevent undue exposure of resident doctors and consultants to the disease and to make available more personnel to manage upcoming infected patients without undue strain on the workforce.

MATERIAL AND METHODS

A PubMed and Google scholar database search for current literature on Covid-19 was made and a review of the disease highlighting the trend and evolving recommendations made. We highlight the gaps and challenges in our environment in tackling the disease and changes made to reduce physician burnouts.

Presentations of COVID-19

Coronaviruses are a group of viruses belonging to the family Coronaviridae. They have a large single strand RNA as a nucleic material, measuring 26–32 kbs in length and polyadenylated.[16,17] Coronaviruses are sub-grouped as alpha (α), beta (β), gamma (γ), and delta (δ).[17] SARS-COV-2, a beta-coronavirus, appears to be the most pathogenic human coronavirus so far identified as causing a deadly pneumonia aside SARS-COV which was earlier thought to be the worst among the Coronaviridae family.[16,18] In 2019, the Chinese government informed the WHO of a pneumonia of unknown origin thought to have originated from animals in Hunan seafood market where live animals such as bats, frogs, snakes, birds, and rabbits are sold.[6,19] It was later discovered that persons who never visited the market also contracted the disease showing a human-to-human spread observed to be by droplets or directed contact.[20,21]

Presentations of COVID-19 vary from asymptomatic, mildly, or severely symptomatic to death. The mean incubation period is 6.4 days.[20] Symptoms develop between 2 and 14 days after exposure to the virus.[6,22] In children, the most common symptoms are cough, upper airway congestion, myalgia, and headache.[23] In adults, cough, fever, and shortness of breath, nasal congestion, runny nose, sore throat, diarrhea, or fatigue make up the most common symptoms.[22,24,25] One in six patients present with severe symptoms. The average time from first symptom to dyspnea and acute respiratory distress is 5 days and 8 days, respectively.[26] Those with concomitant diseases such as asthma, diabetes, hypertension, and heart diseases present with more severe symptoms.[24] Severely symptomatic patients are usually 65 years and above.[19] Mortality rate is approximately 2–4.3%.[26,27]

Diagnostic testing

Molecular-based approaches are used to confirm the diagnosis of COVID-19. The main technique used is nucleic acid testing. Other methods include virus antigen or serological antibody testing, which give a shorter turnaround time.[28-30] For the confirmation of a suspected case of COVID-19, the WHO recommends that SARS-COV-2 be isolated from specimens taken from the respiratory tract through sputum, nasal, and pharyngeal swabs, or bronchoalveolar lavage fluid and sent to an authoritative biosafety level 3 laboratories for nucleic acid amplification test using genome-sequenced real-time polymerase chain reaction (RT-PCRs) designed with specific primers and probes to detect the SARS-COV-2.[30-33] On April 4, 2020, the Centers for Disease Control and Prevention (CDC) recommended that, for initial diagnostic testing, the preferred choice for swab-based SARS-CoV-2 testing is a nasopharyngeal specimen.[33] When not possible, acceptable alternatives include oropharyngeal (OP) specimen, nasal mid-turbinate (NMT) swab, anterior nares (nasal swab; NS) specimen or nasopharyngeal wash/aspirate, or nasal aspirate (NA) specimen.[33]

For NS, samples from both nares should be collected using a single polyester swab with a plastic shaft. For NS or NMT swabs, the transport tube should contain either viral transport medium, Amies transport medium, or sterile saline.[33] To maximize test sensitivity and limit use of testing resources, if both NP and OP swabs are collected,

they should be combined in a single tube.[33] During sample collection, CDC recommends the use of PPE, including an N95 or higher-level respirator (or facemask if a respirator is not available), eye protection, gloves, and a gown.[33,34]

Who gets tested, according to the CDC should depend on local epidemiology of Covid-19 and the clinical course of the illness.[34] A negative result does not rule out the infection, especially in persons exposed to the virus.[35]

Treatment

Suspected cases are treated isolated in a single room or self-isolated. Confirmed cases may be treated in the same ward. Critical cases should be managed in the intensive care unit.

The general treatment focuses on ensuring a clear airway, adequate bed rest, fluid, and electrolyte balance and oxygen saturation. Patients with temperature of 38.5°C and above will need tepid sponge and analgesics.

Being a novel disease, there is no treatment specific for the disease. However, the following have been tried with some promise: Nucleoside analogs (favipiravir, and remdesivir), chloroquine/hydroxychloroquine, lopinavir and ritonavir, and pegylated interferon with ribavirin.[30]

In RNA viruses, nucleoside analogs inhibit viral RNA synthesis by targeting the RNA-dependent RNA polymerase responsible for the replication of viral RNA causing termination of viral genome replication by blocking the entry of incoming natural nucleotides.[30,36-38] Favipiravir is a guanine analog which shows antiviral effect on SARS-COV-2. It is used in combination with other antiviral agents such as interferon-α. Ribavirin, a guanine analog, has been used in combination with other anti-viral agents such as pegylated interferon to stimulate innate response. Its efficacy and safety are uncertain.[39,40] Remdesivir was thought to be the most promising drug in treating COVID-19.[41] However, a recent clinical trial in china using Remdesivir was stopped abruptly because of higher mortalities in Remdesivir (13.9%) than placebo group (12.8%) Remdesivir is associated with any clinical or virological benefits.[42,43] A combination of remdesivir and chloroquine is effective against COVID-19.[44] The effectiveness of ribavirin in the treatment of COVID-19 is uncertain.[39,45] Interferon-α 2–4 μg/kg in 2 ml sterile water, nebulization 2 times/day for 5–7 days in early disease reduces the viral load, alleviating symptoms and shortening the course of disease.[46] The use of interferon-α 2b spray, 1–2 sprays/nostril, and 8–10 sprays on the oropharynx 2 hourly, 8–10 sprays/day, is also useful in high-risk persons with close contact with suspected Covid-19 infected patients and in patients with the upper respiratory tract symptoms.[46]

Protease inhibitors which act by preventing viral gene replication by binding to enzymes responsible for proteolytic cleavage are being investigated and drugs targeting viral protease, polymerase, and host proteins are being looked into.[30,47,48]

Chloroquine, an antimalarial drug, acts by driving protons into lysosomes to increase the intracellular (lysosomal) pH and inhibits endosomal acidification required for virus/cell fusion by inhibiting both the fusion of autophagosomes with lysosomes, lysosomal protein degradation, and in COVID-19 it also interferes with glycosylation of cellular receptors.[49-52]

Hydroxychloroquine is found to be more potent than chloroquine.[53] Zinc inhibits Coronavirus replication.[54] Hydroxychloroquine and chloroquine potentiate uptake of zinc into lysosomes.[55] The role of monoclonal and polyclonal antibodies and teicoplanin (which inhibits the viral genome exposure in cytoplasm) is not clear.[56]

Discharge criteria[25,46]

Patients are certified fit for discharge after meeting the following criteria:

1. Temperature should be normal for more than 3 days
2. Obvious improvement in the respiratory symptoms
3. Test for the detection of pathogenic nuclei, carried out on two consecutive occasions with a sampling interval of at least 1 day, is negative.

Prevention of human-to-human transmission

Within hospitals, the outpatient department is the first key gate and should be targeted.[57] In both hospital and non-hospital environment, the use of mask, hand washing, and social distancing has been advocated.[58]

Challenges

Contact tracing and logistics

Contact tracing is focused at reducing community transmission. Japan carries out over 6000 tests/day and contact tracing is intensively carried out using CCTV and credit card transactions.[59] In Ghana, drones are used to deliver patient samples collected to testing centers to facilitate testing.[60] In Nigeria, there were only 4 RT-PCR centers now upgraded to 12 that cover a population of 200 million.[61] One of these centers has suspended testing because of lack of RT-PCR testing kits.[62] The target testing capacity in Nigeria is 1500/day. However, as at April 22, 2020, 3 months into COVID-19 presence in Nigeria, only 9522 suspected persons have been tested with a positive rate of 12.20% and a case fatality rate of 3%.[13,63] In Nigeria, the absence of population data and formal contact address system, resistance to lockdown and poor logistics make contact tracing difficult.

Lockdown issues

Lockdown adherence has been a major challenge since over 70% of citizens in the region live below the poverty line and need to fend for themselves and families on a daily basis.[64] No food supply chain to the populace has been made by the government. Although, the government has designated some open school fields as market outlets for food items, human traffic, and congestion in these centers do not allow for social distancing. Compromised Nigerian Force has helped inter-state movement especially between night and morning worsening community disease transmission. There are no quarantine centers for asymptomatic persons exposed to the virus.

Management issues

There have been more deaths of patients suspected to have COVID-19 whose test results turn out negative, than those tested positive for the disease. Lack of PPEs has significantly contributed to the mortalities.

Surgical face mask prices have skyrocketed because of border closure. Healthcare workers were once told to use one surgical face mask for 1 week. Absence of face masks has generated anxiety among health-care practitioners.

Patient disclosure issues

Patients, particularly the very important personnel (VIP), present to hospitals and hide their travel history putting healthcare providers at risk of contracting the disease. This has halted provision of health-care services to the general public in some centers. This trend is worrisome and has prompted prosecution of such patients.[65,66]

Power supply issues

Power supply is erratic. The average room temperature is 34–38°C. It is difficult for residents to remain indoors. The isolation/treatment centers lack 24-h power supply making the use of ventilators difficult.

Poor infrastructural issues

The institutions clinical building is undergoing renovation and patients are cramped up in satellite decant sites. Ventilation is poor in these sites. Unfortunately, work has stopped in the clinical building because of COVID-19. Several health-care providers have been quarantined because of contact with suspected cases.

Transportation issues

Following the lockdown, transportation is difficult. No arrangements for mobility of healthcare workers by government. The police men collect bribe and allow intra- and inter-city movement for commercial vehicles, without social distancing, despite a lockdown order thus facilitating community spread.

Issues of concomitant disease in the COVID-19 patient

Team management remains a core practice in medicine. A COVID-19 patient presenting with a concomitant illness poses a major challenge to the care team because of limited PPEs, lack of dedicated theaters, instruments, dialysis machines equipment, etc. Infrared thermometers are inadequate and market prices are astronomically high since the onset of COVID-19. There are no infusion pumps and no multiparameter patient monitors.

Radiological service issues

The radiology department has had issues over time: Battling to sustain imaging machines such as X-ray, computed tomography (CT), and magnetic resonance imaging. They have all broken down. Imaging has a great role to play in the management of COVID-19 because of imaging findings that are diagnostic. Carrying out a chest X-ray or CT on these patients to rule out pneumonic changes is currently, unattainable. Until government makes the necessary provision for the most basic of these investigations, radiological diagnostic procedures remain elusive.

Laboratory service issues

The institution runs the laboratory services on a public-private partnership basis. It is not a recognized testing center for COVID-19. The only nearby designated center for the diagnosis of COVID-19 located 3-h drive away and serves over 45 million people in the region.[64] At present, it takes 72 h to obtain results of COVID-19 due to inadequate testing kits. Sample collection may take up to 2–3 days because of lack of sample transport medium. Occasionally, samples are collected using the normal wound swab stick and sent for the RT-PCR test within 3 h by road.

Pathology issues

Little is known about the pathology of COVID-19 in our region. Storage and handling of corpses are issues in our region. Postmortem transmission has not been elucidated. Unfortunately, disposure of the body after death has been rigidly regulated by government. The masses have refused to believe that COVID-19 exits. Postmortem findings on COVID-19 are still scanty, and in our environment, autopsies are not performed because of limited PPEs, fear of disease transmission, and lack of hospital policy on performing autopsy on in-hospital dead patients. It is possible that the microscopic

changes from the disease in the black population may be different from that in the white population. Burial ceremonies are crowded particularly when such involve VIPs in the society.

Hazard allowances

Health-care personnel in Nigeria do not earn anything significant as hazard allowance. At present, doctors are paid a hazard allowance of N5,000 ($13)/month. Faced with Covid-19 global pandemic and mortalities of over 2000 persons/day in countries such as the United States, the Nigerian Minister of Health claims he is not aware if hazard allowances are being paid healthcare workers.[63,67] The Minister claims that doctors only screen routinely for temperature in COVID-19 patients and hence need no further allowances.[63] This has further infuriated the health-care workforce preventing volunteerism and full participation in the care of COVID-19 victims in our center.

Judging from the increasing risk associated with rendering service to COVID-19 infected patients in our environment and the reduced number of health-care workforce because of self-isolation, various departments decided to re-design the residency training program. Our goal, therefore, is to preserve our workforce while preventing undue exposure to the disease.

The residency re-designed program

To reduce the undue COVID-19 exposure-risk of residents, we re-designed our training program. To achieve this, we looked at three aspects of functionality: Resident cohort, the workload, and mandatory staffing needs. The resident cohort entails the resident workforce at any point in time that can be effectively deployed strategically in the event of an emergency condition. The workload comprises the inpatient, outpatient, and surgical emergency demands over a week period. Mandatory staffing needs comprises the daily clinical activities requiring residents to safely care for patients.

To begin with, we held discussions with the institution's management on how best to prepare for the pandemic with the available resources and manpower. Table 1 shows the modifications for the department of surgery (the structure is similar for other departments).

Before now, each unit comprised 1–2 residents. If a resident is absent or quarantined, strain is put on those present. Therefore, we redesigned our program by collapsing 12 original teams into two larger teams (A and B) each comprising residents and consultants from each subspecialty encompassing the usual residency cadre.

Structure of the team

We tailored the teams to meet routine patients' needs but on a lower scale while anticipating the upcoming influx of COVID-19 patients. Emergency and critical care were handled accordingly. Residents' rotation is shown in Table 2.

Outpatient care team

This team works for 1 week. Coordinated by a consultant, this team does not take calls.

Emergencies, calls, and inpatient care team

This team, which functions for 1 week, takes care of all inpatients and accepts patients sent in from the outpatient clinics, the operating theaters and manages all critical care patients. The house officers and junior residents in this team take night calls. This team functions for 1 week. Having stopped all elective surgeries, the need for surgical case intervention has dropped. This team also sees all

Table 1: Modifications during COVID-19 residency program.

Changes at Hospital Administrative level
Stop all elective surgeries
Minimize outpatient bookings
Long time booking schedule
Reduce caregivers to one per patient
Open triage centers and fever clinic
Cancel all clinical review meetings
Suspend all medical or allied students' related training
Provide SOPs
Changes at team level
Form larger teams
Each team comprises personnel from each subspecialty and different resident levels
Each large team has functional sub-teams
Distancing (Intrateam and interteam)
Enhance digital communication within and between teams
Specify workstations
Changes at individual level
Improve individual's digital communication skills
Set up a review committee

COVID-19: Coronavirus disease 2019, SOPs: Standard operating protocols

Table 2: Schedule of rotation of functional units A and B among the two teams.

Weeks	Teams	Functional teams
1st Week	Outpatient clinics	A
	Emergencies, calls, and inpatient care team	B
2nd Week	Outpatient clinics	B
	Emergencies, calls, and inpatient care team	A

emergencies, prepares them for surgery and does all the emergency surgeries for 1 week.

CONCLUSION

Coronavirus 2019 cripples systems and economies. Adequate research funding to unravel the disease mechanism and treatment is urgently needed. Provision of adequate personal protective and patient support equipment alongside adequate testing kits by government is highly encouraged while improving advocacy on prevention.

Authors' contribution

All the authors were involved in either conceptualization, literature search, development, or review of the paper.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

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