A Scoping Analysis of Theories, Models, and Standard Operating Procedures for the COVID-19 Pandemic in Uganda

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The Corona Virus Disease - 19 (COVID-19) pandemic is one of the most devastating events in the history of human health for the last several decades. Our analysis aimed at a cross-section of events, models and theories surrounding the pandemic. These included mathematical modeling, lockdown diaries, Standard Operating Procedures (SOPs), religious approaches, and the 5G network theory among others. The Global economies have been checked negatively by the pandemic. The COVID - 19 – pandemic challenge, primed many innovations and adaptations for survival. Use of phones and ICT as well as proper handling of asymptomatic victims was necessary as it resolves the anxiety issue of the infection spread. Leadership from the President to the lowers levels was critical for the management of COVID -19 challenge in Uganda.

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1. INTRODUCTION

The Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) which is responsible for the Coronavirus Disease 2019 (COVID-19) was first discovered in Wuhan, China and declared a pandemic by the World Health Organization on March 11th 2020 [1,2]. The pandemic spread very fast across Asia, Europe, America, Oceania and finally to Africa. As of 5th October,2021, COVID-19 had infected over 235 million people and caused an estimated 4.8 million related deaths in over 210 countries worldwide [3]. Uganda had her first case declared on 21st March, 2020 and by the end of May 2020, she had 450 cases, zero deaths and 72 recoveries. The country was totally locked down in March 2020 to curb the spread within the community. The National COVID-19 Task Force under the Prime Minister's office was launched to assist in the general follow-up of the pandemic events, with the Ministry of Health and report to the Office of the President. This was followed by a series of sectional task force units in various administrative segments to assist in the same way. By October, 2020, when institutions had to be operational, she had approximately had 11,443 cases, 100 deaths and 7676 recoveries. Finally, by the beginning of July, 2021, Uganda had approximately 83,636 causalities, 1939 deaths and with 55,551 recovered cases [2].

Several countries have undergone opening up and closing the lock downs in a bid to normalize living and working with the virus like other viruses such as Human Immunodeficiency Virus (HIV), Influenza virus (for common cold) among others. Following this, the paper aimed at discussing a cross-section survey from the breakout of the disease to the current status as perceived by the lay person. It therefore followed a cross-section of events for a period of twenty months since the pandemic started. This period includes the vaccination exercise which started in March, 2021 with the main vaccine of Astra Zeneca. Several types of vaccines were approved by WHO. These included AstraZeneca, Janssen, Pfizer-BioTech, Sputnik V, Sinopharm, Sinovac, Moderna and Convidecia among others [4]. In Uganda, a small population has so far been vaccinated and still calls for an effort. Despite the many theories for and against the vaccination, we still believe in research that the vaccines can do some good work in generating resistance to the spread of COVID and therefore recommend the public to go for the jabs as soon as they are availed by the government.

By the time of writing this paper, there were still many theories on the spread, prevention, diagnosis, treatment and vaccination of the COVID-19. In addition, there is a lot of misinformation on especially on the cure of the COVID-19 [5]. In this analysis, the word syndrome was used to mean a characteristic combination of opinions, emotions, or behavior as may be observed by the majority of the global nationals with a special consideration of events for the case of Uganda. The simple mathematical model generated therefore focused on the pandemic events regarding positive cases, deaths and recoveries for the period.

2. MATERIALS AND METHODS

The COVID-19 details were identified from a series of observations and literature in reference to the wake of the pandemic. The analysis was mainly based on the events and experiences in Uganda. These included daily observation and archiving of events about new infections, admissions, alertness and awareness campaigns, vaccination and the lockdowns series.

3. FINDINGS AND DISCUSSIONS

There are several theories and interventions that came up in a wake to fight the virus. These included mathematical or statistical models, lockdowns, clinical trials, treatment options and vaccination among others [6,7,8,2].

3.1 Mathematical Modeling

Several mathematical models were drafted in a bid to help fight or give highlights and precautions on the pandemic. The design of models about epidemiology normally follows a constant population, transmission, spread and control. They are sometimes built on differential equations that reflect population growth in a given time period. There are many ways in which a model can be derived depending on the assumptions raised against the motive. However, the analysis can tell the effectiveness of the model.

This study led to a simple mathematical model which can to some extent guide the global population about the pandemic based on specific results from Uganda. It was developed on the following rate-parameters: Infection (C_s) , Recovery (R_c) and Death (D_c), and based on several assumptions:

All people are likely to get infected by the virus because it is airborne hence increasing the infection probability. Therefore, the rate of getting infected is directly proportional to the existing population. More so, asymptotic cases are considered under the infected and that the recovery rates are far much higher than the death rates, i.e $R_c \gg D_c$. Therefore, we derive equation 1 of the model:

$$\frac{dC_s}{dt} = k(R_c - D_c)$$

$$C_s = ktS + k_1 \qquad S = R_c - D_c \qquad (1)$$

Where k and k_1 are the proportionality and integration constants respectively.

COVID-19 data for Uganda in Table 1 was used to evaluate the model for this study. Further analyses on this model shall come in a different study. Therefore,

So from Table 1, we evaluate for the integration and proportionality constants to $k_1 = 2.079$ and $k = 1$ respectively and

$$C_s = 2.079tS + 1 \qquad (2)$$

For any data, we can ably evaluate the infection rate, for any other time given the available population and the infection tendencies according to this simple model. It is also true that S is always positive and therefore the infection rate over a time is never zero, even when the death rate is zero, but can be hampered by recoveries and vaccination according to Equation (2). It also means that with time, whoever gets infected is likely to recover or get vaccinated to reduce on the infection effects.

Several COVID-19 studies came up immediately. These included a study on how an epidemic misinformation could lead to a high number of the novel Corona virus disease cases in Uganda [5]. The study basically looked at misinformation about COVID-19 in relation to its infection or spread rate.

The other study was about the characteristics and outcomes of initial patients diagnosed and treated with COVID-19 in Uganda [9]. A study on the fact that Africa, as a continent had remarkable resistance, made a precaution on the old and the chronically sick people and a recommendation on Kenyan schools re-opening by September, 2020 and a lift on some unnecessary lockdowns [10].

A model [8] focused on the rate of infection with time and it could ably predict and project the pandemic for some period ahead. Several other studies especially on the long-term symptoms of COVID-19 were identified [11]. He focused on symptoms that may persist for longer periods with the victims or even those that may take long to appear even when the victim can be identified by testing.

3.2 Lockdown Theories

Globally, lockdowns started in Wuhan, China and spread to Italy, America, German, France and other countries in order to manage the pandemic. In Uganda, the lockdown started on Wednesday 18th March 2020 when the President started announcing measures to help the country manage and respond to the pandemic that the World Health Organization had declared.

Several lockdown patterns prevailed in different parts of the world. In Uganda, like other countries, we had total lockdown of the airport, schools, country boarders, movement of some vehicles within the country and curfews in relation to the strict implementation of the Standard Operating Procedures (SOPs). It was observed that the pandemic seems to be taking a real statistical tune of increasing numbers as lock downs are eased. We went in to the first lockdown with one case and it was eased it in stages as cases increased. The second lockdown took the same pattern. Usually, the bigger portion of the public tends to think that

Table 1. COVID-19 Data on Infections, Death and Recovery Figures for Uganda (February, 2020 – June, 2021)(World Health Organization, 2021)

Period (End of..)	February, 2020	March, 2020	May, 2020	June, 2021
Status				
Infected	0	450	11,443	83,636
Dead	0	0	100	1,939
Recovered	0	72	7676	55,551

SOPs work while in lockdowns, and therefore become reluctant after easing them. The handling of masks from manufacturing/selling to their use needs more reviews, the security personnel and handling suspects especially by Uganda police and Uganda People's Defense Forces (UPDF) still has issues that need revision. The arrest, transport and storage models of suspects before forwarding them to courts of law needs thorough revision and focused forensic research. Noted also was that most countries were expected to go to lockdowns as they prepare for the several stages of the pandemic. These included more provisions on medical facilities like handling patients, possible vaccination, and treatment & immunity measures.

3.3 Clinical Trials

Any pandemics certainly calls for clinical trials on immunity, prevention and cure of the disease in question. By Mid-May, 2020, there were over 249 clinical trials in search of treatment for COVID-19. At one time, the steroid drug Dexamethasone coming on board had proved great results to the extent that it was believed that 0.33 of patients on ventilators could be saved [6]. A number of the studies focused on hydroxychloroquine, Regeneron, Oxygen, Dexamethasone, Zinc, Vitamin C, Azithromicin and Vitamin D. These drugs later, became part of the preventive and first aid package for several homes because they could easily be accessible and were affordable. Locally, clinical trials involved use of convalescent plasma [9], the UBV01 trial [12], and the CONAT Trial (COVID-19 Natural Products Trial) that is yet to be conducted.

3.4 Early Warning Signs

Several alerts on early warning signs have been approved in the event in fighting COVID-19. These vary according to the wave episodes and the cross-section includes some of these major signs:

The high temperatures possibly ranging from 38 to 45 degrees Celsius. At times, feeling shivery may accompany the body temperature. There could be coughs that are continuous and lasting for more than an hour or several episodes of coughing like 3 episodes in a day. At times, some patients experience change or loss of your smelling sense sometimes arising from flu or a runny nose or frequent sneezing.

According to some studies, victims develop small itchy blisters and some rash on some parts of the body. These appear before any other symptoms lasting for some days. Noted however is the fact that there are diseases with some of the symptoms other than COVID-19. There are precautions that we take if at least one of these signs appears for a COVID victim:

An expected victim is advised to practice self-isolation from other people including home and family members for a period between 7 to 14 days is crucial; Keeping social distance of at least 2 to 4 meters from others; Washing of your hands with soap (for at least 20 seconds) or sanitizing them more often including all members coming to your home is important and reduces on the spread of the disease. This may also take on the fact that cleaning surfaces or objects we touch most often like phones, door surfaces, and bathroom/toilet surfaces is vital; Use of face masks when you have to appear near other people.

Limiting the time, you are keeping this space is equally important, therefore it is recommended that we spend less time as much as possible because there is a possibility of having the *vp* moving by a simple wind blow from one person to the other.

There are several other risk avenues that are worthy minding: It is crucial to limit talking to someone face to face even with a mask for long, bypassing an unmasked victim, not properly ventilated spaces, high surface transfer risk areas like public places and functions like bathrooms, schools, workplaces, malls and markets and meetings.

3.5 Information and Mechanical Technology

Sensor technologies have existed for so long only that they are tuned to fit certain situations at hand. For Sensor-made sanitizer and hand washing technologies have been revived and retrieved to avoid touching surfaces throughout the globe. More so the physical technologies as seen in Fig. 1. This physical technology is just by stepping on the pedals for soap, sanitizer and water.

3.6 Religious Perspectives

Global lives are governed by beliefs and scientific research. Some of the beliefs manifest

in religions which eventually takes over politics and science. According to religions, pandemics are not new, they are simply sequential. They have happened some time and are likely to happen again. So what religion says about them is actually crucial in managing them.

From the Islamic point of view, there are several traditions towards some practices that Prophet Muhammad (PBUH) cautions us about: "Those with contagious diseases should be kept away from those who are healthy." Bukhaari (6771) and Muslim (2221); _"Do not enter a land where the plague (contagious ailment) has broken out; don't leave from where it has broken out" (Bukhaari (5739) and Muslim (2219)); "Do not cause harm or return harm." (Sunan Ibn Mājah (2340)); "Those who stay at home to protect themselves and others are under the protection of Allah."; "Every disease has a cure. If a cure is applied to the disease, it is relieved by the permission of Allah." Muslim (2204); "while sneezing, would cover his face with his hand or with his garment,"and "The plague (contagion) patient who remains in his home with patience and expectation of reward, knowing that nothing will befall him other than Allah's decree will attain the reward or a martyr"(Bukhaari (2829) and Muslim (1914), [13]. These traditions signify quarantine and other limits to spreading the virus and hope for its cure.

On the other hand, the Christian point of view points out several areas of concern on pandemics especially for healing or hope, fear and justice. Amidst confusion, people remember their creator a lot as may be sanctioned in some verses. For example, the verses mostly quoted for the pandemic period are "In all things, God works for the good" (Romans 8:28), Do not fear, for I am with you, do not be dismayed, for I am your God. I will strengthen you and help you; I will uphold you with my righteous right hand" (Isaiah 41:10). These two verses help to strengthen someone who might be in fear of what is next to develop proper resistance and immunity in a fight against the pandemic.

3.7 Digital Identity Theory (DIT)

There is a theory about some new group labelled ID2020 [14]. It is believed that their main objective is to use that the COVID-19 vaccine towards the New World Order (NOW) motive. The vaccine could be used to digitally identify human beings. They believe work can be simplified through this because current research is based on the internet of things (IOT). Can the internet be directly connected to a human being! Can a human being by body and mind be operated as an internet-connected device or machine or tool by an implant? They believe that this can empower the powerless, exclude/include people or even persecute them [14]. They also believe that this may require the use of the 5G internet with high frequency at short distances. Much as it is dangerous to animal life and plants (ionizing radiation & believed to break chemical bonds), it is believed that it was rolled out in Wuhan, China where the COVID-19 is believed to have started, then other areas of the globe followed. In Uganda, we are still using 4G as pronounced by some networks like Airtel.

Fig. 1. Different hand washers

Generally, the theory was summed up to forming or inventing an alliance that is using artificial intelligence (AI) to manage population control and ease of ideas like fighting poverty and sickness of the one-world economy, religion and government according to the source. The AI requires an implant possibly through vaccination, and a 5G speed of IOT which is expected to balance the side effects and enable easier transactions. According to some studies in Italy, the autopsies carried out on COVIDoViD cases revealed "Amplified Global 5G Electromagnetic Radiation Poisoning" (AG5GRP) [15]. They also concluded that it is not a virus but a bacteria causing blood clots in the human body, a disseminated intravascular coagulation or Thrombosis that can easily be treated by Antibiotics, Anti-inflammatories and Anticoagulants like aspirin, apronax and paracetamol [16].

3.8 General Information and Other Theories

In a similar story to managing the virus or bacteria (COVID-19), there are cases of information shared therein. Some [17] focused on having status updates on the state of Referral hospitals and other health centers, their staffing levels, ICU centers. This one emphasized that the information would build our confidence and trust that you have used the lock down periods to improve the same. This still follows for now, by the time of compiling the paper, on focusing on the vaccination ratios in relation to the facilities versus the expected third wave of the hit [17]. There are other issues that rolled up to fight the pandemic. These included contributions from nationals, local downs versus food and other supplies, some undefined accountabilities of COVID funds including but not limited to vaccination funds, the proposed deduction of Ugandans' wages for the Uganda national response to COVID-19 in the office of the Prime Minister.

4. CONCLUSION

This analysis focused on a cross-section of events, models, plans and systems to manage the pandemic in Uganda. The COVID - 19 – pandemic challenge, primed many innovations and adaptations for survival. Use of phones and ICT as well as proper handling of asymptomatic victims was necessary as it resolves the anxiety issue of the infection spread. Leadership from the President to the lowers levels was critical for

the management of COVID -19 challenge in Uganda. Finally, well knowing that pandemics fatigue affect productivity and performance of human beings, pulmonary physiotherapies and general counseling is recommended especially after recovery and continued for the rest of the nation.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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