

Original Research Article

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

Abstract: The Corona Virus Disease (COVID-19) pandemic is one of the most devastating events in the history of human health for the last several decades. Various studies regarding COVID-19 have been made including but not limited to the current ones. This study started in 2019 following the onset of the pandemic and was carried out for a period of 20 months in Uganda. It aimed at a cross-section of events, measures and theories surrounding the pandemic. Basically, quantitative methods with several experiment lay-outs were used in this study. Findings showed that a number of theories and facts exist and could ably be used to prevent, control or even fight the disease. These included among others the mathematical modeling, lockdown diaries, the Standard Operating Procedures (SOPs) theory, the religious approaches, and the 5G network theory among others. A conceptual mathematical model was developed in the study, analyzed and could ably predict the infection, death and recovery rates. In fact, the virus exists and it is real in reducing the world population and therefore serious precautions should be adhered to as much as possible and as recommended by this study. The Global economies have been checked negatively by the pandemic. Therefore, this cross-sectional study is expected to improve the lives of the global population in simplifying the awareness, treatment and preventive model in fighting the COVID-19.

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 (Guo et al., 2020; World Health Organization, 2021). The pandemic spread very fast across Europe, America 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 (Johns Hopkins University, 2021). 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 casualties, 1939 deaths and with 55,551 recovered cases (World Health Organization, 2021).

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 Convindecia among others (Subbarao, 2021). 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 (Nannyonga et al., 2020). In this study, 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 observational experiments and literature in relation to the current situation in the wake of the pandemic. The study was basically quantitative, with more experiments in Uganda than across Africa or the globe. The involved daily observation and archiving of events about new infections, admissions, alertness and awareness campaigns, vaccination and the lockdowns series. The research blocks for physical observational experiments were in the Central, North Western and Eastern districts of Uganda where accessibility was managed during the study.

3. Findings and Discussions

There are several theories that have come up in a wake to fight the virus. This included a cross-sectional study on mathematical or statistical models, the lockdowns diaries and clinical trials on treatment and vaccination among others.

The 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, asymptomatic 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:

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

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

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,

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

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

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

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

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.

There are several studies done about COVID-19 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 by (Nannyonga et al., 2020). Her 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 (B Kirenga et al., 2020). A study by Kimatu focused 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 (Kimatu, 2020).

A model by Fulgensia (Mbabazi et al., 2020) 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 (Parshley, 2020). 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.

The 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 borders, 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 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 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 a 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.

The 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(Hancock, 2020). A number of the studies are focused on hydroxychloroquine, Regeneron,

Oxygen, Dexamethasone, Zinc, Vitamin C, Azithromycin 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 (Bruce Kirenga et al., 2021), the UBV01 trial (Natural Chemotherapeutics Research Institute Uganda, 2021), and the CONAT Trial (COVID-19 Natural Products Trial) that is yet to be conducted.

The 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 (Uma, 2020). 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.

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 figure 1. This physical technology is just by stepping on the pedals for soap, sanitizer and water.



Figure 1: Different Hand Washers

The 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) caution 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)), (Bukhaari & Muslim, 1914). 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.

The Digital Identity Theory (DIT).

There is a theory about some new group labelled ID2020 (Digital Identity Theory, 2020). 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(Digital Identity Theory, 2020).. 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.

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) (Italian Ministry of Health, 2019). 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, apranax and paracetamol (Italian Ministry of Health, 2019).

General Information and Other Theories

In a similar story to managing the virus or bacteria (COVID-19), there are cases of information shared therein. Ariho (2020) focused on having status updates on the state of Referral hospitals and other health centers, their staffing levels, ICU centers. She 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 (Ariho, 2020)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

COVID-19 is believed to have come to stay and therefore a need for a comprehensive model or system to live with it. This study looked at a cross-section of events, models, plans and systems

to manage the pandemic. The findings suggested several conclusive ideas that can help on the effects of the pandemic. Avoiding crowded places and maintaining a social distance of at least a meter is advisable. Face masking and high level of hygiene especially through cleaning hands and clothes. However, avoid putting on masks for longer periods as they interfere with your breathing and oxygen levels, use them only where it is inevitable. Boosting immunity is advantageous than treating the infection. Several other immunity boosters like keeping away fear, careful outing, and cutting down or completely avoid alcohol/smoking and doing some physical exercises during the pandemic are recommended by this study. Proper handling of asymptomatic victims is necessary as it resolves the anxiety issue of the infection spread. Use of phones and other IT systems to monitor their progress is sufficient than wasting the medical facility's resources. Politicking the pandemic has caused some harm and has made people to think that the COVID-19 'thing' is political or a business. More so, a forensic study has been recommended for the arrest, transporting and keeping of suspects by police and other security agencies. As already observed on the continent, failed education of the majority of the nationals may cause serious future effects for some African countries. For example, the 2021 PLE results by UNEB indicated a dropout percentage of 61% from 2013 to 2020. Pandemics fatigue affect productivity and performance of human beings. Therefore, pulmonary physiotherapies and general counseling is recommended especially after recovery and continued for the rest of the nation. Continued vaccination against the virus is one of the conclusive solutions to working with the pandemic.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

5.0 REFERENCES

- Ariho, A. (2020). *Public Informative Document to the Hon. Minister of Health, and His Excellency, the President about the COVID-19 Status*.
- Bukhaari, & Muslim. (1914). Traditions of Prophet Muhammad (PBUH) for the Hadith Number indicated from the Prophet-hood time.
- Digital Identity Theory. (2020). Kiva and Gravity granted first ID2020 certifications for empowering users of digital ID technology | Biometric Update. Retrieved March 18, 2022, from <https://www.biometricupdate.com/202003/kiva-and-gravity-earth-granted-first-id2020-certifications-for-empowering-users-of-digital-id-technology>

- Guo, Y.-R., Cao, Q.-D., Hong, Z.-S., Tan, Y.-Y., Chen, S.-D., Jin, H.-J., ... Yan, Y. (2020). The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak—an update on the status. *Military Medical Research*, 7(1), 1–10.
- Hancock, M. (2020). *Report on COVID-19*. London.
- Italian Ministry of Health. (2019). autopsies on COVID-19 cases.
- Johns Hopkins University. (2020). Coronavirus Resource Center.
- Kimatu, J. (2020). The negative effects of the who covid-19 prevention guidelines on the human immune system. *Biomedical & Pharmacology Journal*, 13(3), 1477–1481. <https://doi.org/10.13005/bpj/2020>
- Kirenga, B, Muttamba, W., ... A. K.-B. open, & 2020, U. (2020). Characteristics and outcomes of admitted patients infected with SARS-CoV-2 in Uganda. *Bmjopenrespres.Bmj.Com*.
- Kirenga, Bruce, Byakika-Kibwika, P., Muttamba, W., Kayongo, A., Loryndah, N. O., Mugenyi, L., ... Bazeyo, W. (2021). Efficacy of convalescent plasma for treatment of COVID-19 in Uganda. *BMJ Open Respiratory Research*, 8(1), e001017. <https://doi.org/10.1136/BMJRESP-2021-001017>
- Mbabazi, F. K., Yahaya, G., Awichi, R., Olupot, P. O., Rwahwire, S., Biira, S., & Luboobi, L. S. (2020). A Mathematical Model Approach for Prevention and Intervention Measures of the COVID-19 Pandemic in Uganda. *MedRxiv*, 2020.05.08.20095067. <https://doi.org/10.1101/2020.05.08.20095067>
- Nannyonga, B. K., Wanyenze, R. K., Kaleebu, P., Ssenkusu, J. M., Sengooba, F., Lutalo, T., ... Woldermariam, Y. T. (2020). Infodemic: How an Epidemic of Misinformation Could Lead to a High Number of the Novel Corona Virus Disease Cases in Uganda. *Preprints*. <https://doi.org/10.20944/PREPRINTS202006.0009.V1>
- Natural Chemotherapeutics Research Institute Uganda. (2021). Uganda Launches first clinical trial - NCRI | Natural Chemotherapeutics Research Institute. Retrieved October 21, 2021, from <https://ncri.go.ug/2021/01/27/uganda-launches-first-clinical-trial-of-chemotherapeutic-products-to-treat-covid-19/>
- Parshley, L. (2020). The many strange long-term symptoms of Covid-19, explained. Retrieved from twitter.com/@loisparshley
- Subbarao, K. (2021). The success of SARS-CoV-2 vaccines and challenges ahead. *Cell Host and Microbe*, 29(7), 1111–1123. <https://doi.org/10.1016/J.CHOM.2021.06.016>
- World Health Organization. (2021). WHO Coronavirus (COVID-19) Dashboard. Retrieved from covid19.who.int