COVID-19 Pandemic in Nigeria: misconception among individuals, impact on animals and the role of mathematical epidemiologists

Oluwasegun M. Ibrahim[1] and Damilola D. Ekundayo[2]

[1] Department of Mathematical Sciences, African Institute for Mathematical Sciences, Kigali, Rwanda

Email: oluwasegun.micheal@aims.ac.rw

[1]Applied Mathematics Section, Department of Mathematics, University of Benin, Benin City, Nigeria

Email: oluwasegun.ibrahim@physci.uniben.edu

[2]Biology Section, Department of Science Education, Abubakar Tafawa Balewa University, Bauchi, Nigeria

Email: ekundayodamilola311@gmail.com

Abstract

In March 2020, the World Health Organization declared coronavirus disease 2019 (COVID-19), caused by the novel severe acute respiratory syndrome coronavirus 2, to be a pandemic. Since the declaration, Nigeria economy has been greatly impacted thus resulting in a recession. This paper considers a couple of misconceptions among Nigerian people in the COVID-19 pandemic era thereby causing the spread of the novel virus and hence making the situation difficult for the government to handle. In particular, we discuss the first and second waves of the pandemic as it affects the Nigerian people. The impact of the pandemic on animals and the role of mathematical epidemiologists in combatting the spread is discussed herein. We give some recommendations that could be adopted by the government and the good people of Nigeria to reduce the further spread of the virus.

Keywords: COVID-19, pandemic, misconception, mathematical modeling, infectious disease, Nigeria.

1 Introduction

The emergence of the Novel Coronavirus otherwise known as COVID-19, which broke out in the Hubei Province of China in December 2019, has no doubt hurt the socio-economic growth of the World. According to the World Health Organization (WHO), most people infected with the Novel Coronaviruswill experience mild to moderate respiratory illness and recover without requiring special treatment. It is also evident that older people and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness [1]. The reward of the successful effort in containing the COVID-19 infection in Asia came about in WHO pronouncing Europe as the focal point of the illness on the 13th of March, 2020. Although the mortality rate of the Novel Coronavirus is put at 3.4% by the WHO as of the 3rd of March, 2020, the virus is still dangerous to human race and spreading as fast as possible [2]. COVID-19 is said to have affected all the continents of the world with Europe being one of the hardest-hit continents. According to Our World in Data (OWD) report on the 4th of April, 2020, Italy sits comfortably at the top of the chart of the death rate with more than 15,000 deaths recorded and many others infected while the United States of

America (USA) is currently the highest hit with more than 50,000 deaths recorded as at the 26th of April, 2020 [3].
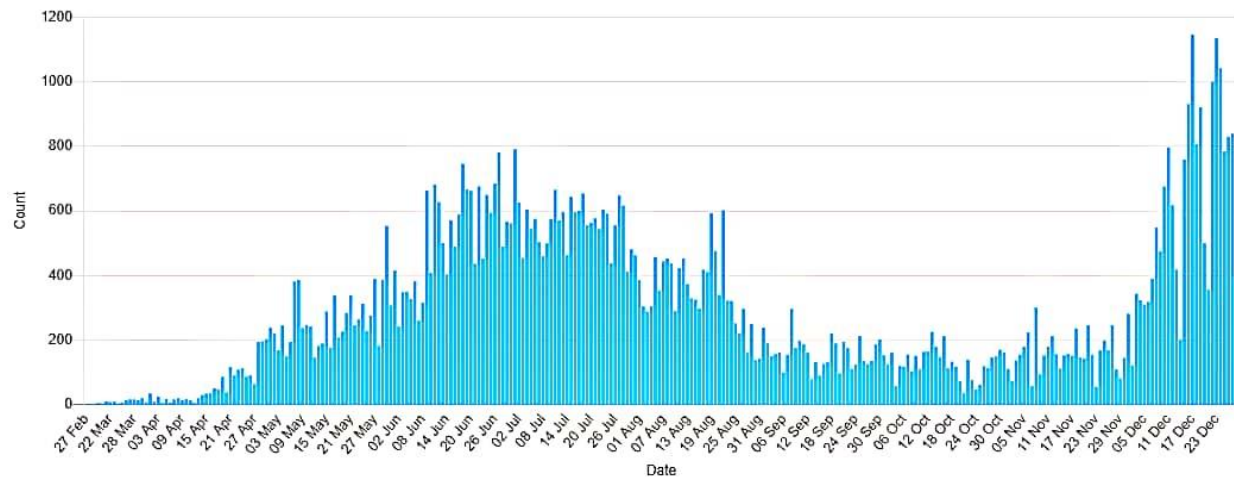
Figure 1: Confirmed COVID19 Cases - Nigeria 2020. Source: [4]

Africa attains the 400,000 mark on July 1st, 2020 when John Hopkins tallies put the caseload at 405,171. This implies that over 100,000 cases were recorded within the space of one week to reach half a million milestone. Further report shows that a total confirmed cases of 508,114; active cases of 251,103; recoveries of 245,033 and 11,978 numbers of deaths were recorded. The five most impacted countries are as follows: South Africa, Egypt, Nigeria, Ghana, and Algeria [5].

Nigeria is no doubt battling with the dreaded virus; thus, it is imperative to look inward to avert another round of total lockdown as many nations of the world are currently experiencing another round of lockdown. Figure 1 poses serious concern as Nigeria is gradually entering the second phase of the disease spread. In the course of this paper, we discuss briefly a few misconceptions circulating around and as well report the manifestation of the transmission of the disease from humans to animals. We also highlight the roles mathematical epidemiologists could play in reducing the spread of the pandemic and make recommendations for policymakers.

2. Misconception and Impact on Human in Nigeria

2.1 COVID-19: First wave

As the medical experts and scientists in the world work tirelessly towards finding the most efficient COVID-19 vaccines, it is worthy of note that the pandemic virus is still surrounded by a lot of misconceptions in Africa, in particular, Nigeria. The WHO states that the disease has sparked an "infodemic". This implies that a staggering amount of information on social media, some simply false. In particular, some people in Nigeria believe that the COVID-19 is not real; others indeed believe that it is real but cannot affect the poor or those who do not travel beyond the country. Another school of thought believed that some sorts of alcoholic substances and concoction could cure the virus or prevent them from getting infected.

During the first wave of COVID-19 pandemic in Nigeria, a good number of people believe that it is a "rich-man's virus" and so it can not affect the poor masses. Others believe that COVID-19 cannot survive in a region around the equator as the temperature would kill it. However, with more than 1,273 people infected and 40 deaths recorded already in Nigeria as indicated on Nigeria Centre for Disease Control (NCDC) website [6] and 31,933 people infected and 1,423 deaths recorded across Africa as indicated on Africa Centre for Disease Control (ACDC) website [7], it is crystal clear that the virus is not selective as it keeps infecting the rich and the poor alike and could potentially spread on African soil if not combated since the figures are becoming more frightening daily.

Another false claim in the first wave phaseis that the virus could be cured or prevented by consuming alcoholic substance, garlic, lemon, and good food to strengthen body immune system and the likes. Again, this claim has been debunked by the WHO and many medical experts around the world. The only way out of it at the moment is premised on personal hygiene - which includes regular hand washing, social distancing, avoidance of large gatherings, and regular decontamination of the environment, etc. A lot of media files (most often video, audios) have been circulating on social media with the claim that some drugs combination can potentially reduce symptoms, unfortunately, there are no data or known research conducted by the authors of this information to back up their recommendations. An illiterate or literate that cannot source for a fact will hook-line-and-sink such an idea and drug abuse becomes the order of the day. A strict measure was introduced by a popular social media platform "Whatsapp" with more than 2 billion people in over 180 countries across the world to limit viral message forwards to one chat at a time in order to stem the rapid spread of COVID-19 misinformation [8]. However, a user could theoretically still forward the same message to individuals or groups one by one as it is believed this limitation will be effective in preventing a spread of untrue information about the pandemic.

On the global scene, a study conducted in Italy suggests that it is hard to find a product right now that has a superior safety profile than Chloroquine as at in March 2020 [9]. Besides, its expense is minimal and could be affordable by all. Thus, its possible use both in prophylaxis in people exposed to the novel coronavirus and as a curative treatment will probably be promptly evaluated by our Chinese colleagues. If clinical data confirm the biological results, the COVID-19-associated disease will have become one of the simplest and cheapest to treat and prevent infectious respiratory diseases [9]. Unfortunately, some countries, among others experimented with the use of Chloroquine for some patients, however, the medication failed to pass the clinical trials and its use for the treatment of COVID-19 patients was heavily criticized by some scientists across the world.

2.2 COVID-19: Second wave

On the 17th of December, 2020, the Nigeria Presidential Task Force on COVID-19 declared that there are strong indications that Nigeria has entered the second wave of COVID-19 infections [10]. The strong indication is as a result of an increase in the number of infected cases in Nigeria cities. This is evident in Figure 1. One may begin to wonder why such a sudden rise in the infection cases in Nigeria, in particular, Lagos and Federal Capital Territory, Abuja cities despite the nation-wide lockdown. On the 23rd of December 2020, 1133 new confirmed cases and 5 deaths were recorded in Nigeria.Thus, 84811 cases have been confirmed, 71357 cases have been

discharged and 1264 deaths have been recorded in 36 states and the Federal Capital Territory, Abuja [4]. As the world continues to grapple with the dreaded coronavirus, we take a look at some factors that may have contributed to the sudden spike in the confirmed cases of the virus among Nigerians after the battle against it appeared to have been won.

One of the factors that may have led to the sudden spike in the new cases of coronavirus in Nigeria is the government's inability to win the trust of the citizenry. Since the first case of the virus was confirmed in Nigeria, many people have expressed doubt on the information coming from the government agencies at various levels regarding the existence of the deadly virus in Nigeria. Others who appeared to believe that the virus is indeed in Nigeria do so in part as they tag it the "rich-man's virus". Some even believe that the government is out to make money through the unreal virus. For the latter group of people, they tag the virus "corona-business". This level of doubt expressed by many citizens may have made the people throw caution to the wind by living their normal life even while the virus has not offered the opportunity for such. One may believe such negligence is one of the factors responsible for the sudden spike in the new cases.

Another factor that we may do well not to divest from the sudden spike in the cases of coronavirus is the EndSars protest that engulfed the nation for about a month in October 2020. According to the report of CNN on the 9th December 2020, Nigerian cities were engulfed by series of protests in October to demand the disbandment of the SARS (Special Anti-Robbery Squad) – a unit in the Nigerian Police Force, alleged to have been terrorizing the same citizenry they were meant to protect [11]. Youths across the nation gathered together to protest against police brutality and bad governance about a couple of months ago, and many of them defiled the government laid-down rules of COVID-19. There was no observance of physical distancing, a reasonable number of them refused to use face masks, and those who used it at best, hung the mask below their cheeks. It is logical to therefore think that many of the youths might have contracted the virus then and now we begin to see the manifestation of the exercise.

Moreover, poverty might be one of the contributing factors to the sudden spike of coronavirus in Nigeria. According to the last survey of the National Bureau of Statistics in 2019 as reported by Punch Nigeria [12], the number of people living below a dollar ($1) per day is put at 82.9 million, and that is about 40.1% of the population of Nigeria. For several months in Nigeria, people were not allowed to go out during the first wave of COVID-19, and comfortable people, most of the middle class and political office holders, complied with the laws. But people who depended on daily toils for survival flagrantly disobeyed what they tagged "inhumane law" to look for what to live on. This set of people neither believe there is coronavirus nor have the financial power to purchase nose masks should they even choose to believe it exists. Of course, it is easier to dismiss what one is ignorant of or choose not to believe.

3. Impact on Animal

According to the World Organization for Animal Health (formerly known as International des Epizooties (OEI)) [13], there is no evidence that dogs or cats are playing a vital role in the spread of COVID-19. However, the infected humans or pet owners should be aware that they can potentially transmit this disease to their pets, hence, it is quite instructive to keep animals separated from any person who has COVID-19 symptoms. On the 5th of April, 2020, the United

States Department of Agriculture (USDA) has confirmed severe acute respiratory syndrome coronavirus (SARS-CoV-2) in one Tiger at a Zoo in New York [14]. As stated in the USDA report, this is the first instance of a Tiger being infected with COVID-19as several Lions and Tigers at the Zoo showed symptoms of respiratory illness. It is believed that the Tiger became sick after possible exposure to a Zoo employee who was actively shedding the virus [14].

It is important to note that there is no strong evidence to suggest that many animals, including pets or livestock, can spread COVID-19 infection to people, however, individuals sick with COVID-19 or showing symptoms of COVID-19 should restrict contact with pets and other animals, just like you would with other humans. As indicated in the CDC report [15], there have not been reports of pets becoming sick with COVID-19 in the United States, it is still recommended that people sick with COVID-19 limit contact with animals until more information is known about the virus. When possible, have another member of your household care for your animals while you are sick. It was further stressed that there is no evidence to suggest that imported animals or animal products pose a risk for spreading COVID-19 in the USA. This is a rapidly evolving situation and information will be updated as it becomes available [15].

Africa, Nigeria in particular, can take a clue from this recommendation. The news that a Tiger tested positive to COVID-19 in a Zoo somewhere in the USA portends great danger to the people and economy of Nigeria. This is because a great number of a section of Nigerians in the Northern part of the country are nomadic livestock farmers, who travel around the nation always. If any of their animals contract COVID-19, the negative impact of such is only best imagined as it is capable of wreaking further havoc on the already battered economy of the nation and the wellbeing of the citizens.

4. Role of Mathematical Epidemiologist

The study in [16] considers a comparison between the number of confirmed cases in the worst affected European countries and the West African countries with confirmed COVID-19 cases. Based on the research, it was evident that the virus can as well spread in countries with warmer climates. On account of West Africa, a fast quickening in the number of cases could rapidly overpower the vulnerable health system such as public or private health Institutions. Swift action to control further spread of the infection, and to improve the response capacities of affected nations in West Africa is, therefore, urgent [16].

Mathematical modeling of infectious disease serves as an indisputable scientific tool that could be used to further understand the dynamics of the COVID-19 pandemic in Nigeria. One way to do this is by constructing deterministic models that could help gain both qualitative and quantitative insight into the dynamics of the novel virus [17]. The susceptible, exposed, infected and recovered (SEIR) framework could be employed. According to WHO, it takes a maximum of 14 days before the symptoms can manifest in infected individuals [18]. As a result, the exposed class gives detailed information about individuals in the latent stage (when the symptoms have not manifested in the infected individuals but they are capable of infecting susceptible individuals) within the 14 days incubation period.

From the infectious disease modeling perspective, one should be concerned about basic reproduction (R_0) of the disease in humans. The R_0 is the number of secondary infections

generated from one infected individual, this is understood to be between 2 and 2.5 for the COVID-19 [18]. Mathematically formulating the R_0, the progression of the disease could be monitored overtime. See the work in [19] for extensive analysis of an SEIR model with effective use of the R_0 to combat a respiratory-like disease from a population. The force of infection can be adopted in the mathematical modeling of COVID-19. This could take the form bilinear (mass action or density-dependent) incidence function; standard (frequency-dependent) incidence function; saturated incidence function. These functions can be measured with the relevant data depending on the situation of interest. Since it is not well established that animals can transmit this disease, it is however not certain whether a R_0 can be obtained for the animal population at the moment, but it could be possible if there is an increase in infection among animals of similar and non-similar species.

Another interesting aspect of mathematical epidemiology is the application of optimal control in resource-poor/limited settings. Most African countries (including Nigeria being the country with the largest economy in Africa) cannot fight this pandemic without intervention funds or health support from the Western World. This intervention may not be sufficient for the entire population, hence, there is a need for proper maximization of the available resources while minimizing cost. More importantly, this approach is needful when there is insufficient or no commitment from the funding body. Furthermore, employing tools from dynamical system theory could help us determine parameters that are sensitive to the situation at hand. We are hopeful that the ongoing research on the disease vaccine becomes successful and affordable; mathematical modeling could help policymakers to determine the proportion of the population to be vaccinated and also check for vaccine wane rate and its effect.

5. Suggestions and Recommendation

A joint effort is needed to tackle the spread of COVID-19 in Nigeria. Thus, we give the following suggestions and recommendations.

- There should be synergy between the government and the good people of Nigeria. This can be achieved by rebuilding public trust in government which will allow effective implementation of health policies.
- The government should as a matter of urgency increase the scope of her COVID-19 relief packages for her citizens, small- and large-scale businesses owners in order to lift people out of extreme poverty while improving the economy.
- If the government can invest in research, scientists at various levels, it could probably bring researchers in various fields together to team up and come up with a long-lasting solution that fits into Nigeria situation.
- Tackling the current pandemic in Nigeria, should not be seen as the work of those in Public Health or Biomedical Sciences, instead, experts in other areas such as Applied Mathematics, Statistics, and a lot more can be encouraged to join the response team to tackle the deadly disease.
- In a moment like this, individuals diagnosed with COVID-19 disease should avoid unnecessary contact with animals, in particular, pets. Thus, regular washing of hands before and after interacting with animals is essential.

- Ultimately, while Nigerians await the distribution of the latest vaccines for COVID-19, ensuring the use of face masks, observing social distancing, aggressive testing, avoidance of unnecessary outing and staying safe remain our best arsenal.

5. Conclusion

A few misconceptions people hold on coronavirus, some factors that may have triggered the sudden recent spike in the number of the reported cases of COVID-19 in Nigeria, the impacts of COVID-19 on animals, and the roles of epidemiologists in finding a lasting coronavirus solution were discussed, and the suggestions and recommendation to adopt were also briefly discussed in this paper. As the World, especially Nigeria, struggles to contain the spread of COVID-19, the need for personal hygiene, social distancing, regular hand washing, avoidance of large gatherings and other preventive/precautionary measures cannot be over-emphasized. By not letting down our guard now, we can save ourselves and others from contracting the virus and as well contain its spread among human beings. More than never before, the government at various levels and media houses must intensify public enlightenment to clarify the misconceptions that many still have about the Novel Coronavirus. Another lockdown may keep Nigeria in recession for a long time.

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