Research Article

Evaluation of the Lockdowns for SARS-CoV-2 Epidemic in South Eastern Nigeria - 🔓

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ABSTRACT

The novel SARS-CoV-2, the causative agent of COVID-19, a pandemic of great public health concern. COVID-19 was first reported in Wuhan, China in December, 2019 and declared a pandemic by the World Health Organization on March 11, 2020. The first case of COVID-19 in Nigeria was confirmed on the 27th of February, 2020 and has since spread to 36 states and the Federal Capital Territory, Abuja, bringing total confirmed cases in Nigeria to 25,694, 9,746 recoveries and 590 deaths as at 30th June, 2020. This was therefore designed to examine the impact of the lockdowns and border closures of states on the spread of SARS-CoV-2 in the five states of South Eastern, Nigeria. COVID-19 data of the five South Eastern States of Abia, Anambra, Ebonyi, Enugu and Imo between April 1st and 30th June were retrieved from the Nigerian Center for Disease Control (NCDC) microsites and analyzed using GraphPad software, Version 5.01. Results showed that the South Eastern states recorded a total of 1,415 COVID-19 cases between April when all the five states had their first cases and June, 30th with Ebonyi with a total of 438(31.0%) producing the highest confirmed cases. The highest rate of infection was observed in the month of June with Ebonyi recording the highest (28.1%), followed by Abia and Imo with 21.2% and 20.9% respectively. The use of face masks, social distancing, community lockdown and other containment measures are necessary to prevent further upsurge in the rate COVID-19 infection in the South East, and indeed the whole Nigeria.

Keywords: COVID-19; Nigeria; Pandemic; Public health; SARS-CoV-2

INTRODUCTION

The novel SARS-CoV-2, the causative agent of COVID-19, is an enveloped, positive sense, single stranded RNA virus belonging to the family Coronaviridae and subfamily Orthocoronavirinae. SARS-CoV-2 is the seventh member of human coronaviruses in the Coronaviridae family, a family of zoonotic viruses, meaning that they are harbored in animals such as camels, cattle, cats, dogs and bats. SARS-CoV-2 shares 87.6% genome sequence similarity with bat coronavirus [1] and 79% and 50% respectively, genome homology with SARS-CoV and MERS-CoV [2]. This finding implicated bats as the most likely primary hosts for SARS-CoV-2 [3] while pangolins are thought to be the intermediate hosts since their genetic sequence were found to be 85.5% to 92.4% identical to SARS-CoV-2 [4].

SARS-CoV-2 has four important structural proteins which are (E) the envelope protein (M) the membrane protein (S) the spike protein and (N) the nucleocapsid protein, which are required to regulate their function and viral structure [5]. Among these four proteins the most important ones are N and S, where the former one helps the virus to develop the capsid and the entire viral structure appropriately and the latter helps in the attachment of virus to the host cells [6]. Coronaviruses, including SARS-CoV-2 derive their name from this crown-like spikes on their surface [7].

Coronaviruses are most commonly transmitted from person to person through droplet inhalation such as cough and sneeze and close personal contact with one another through touching or shaking of hands [8]. Viral RNAs have been found in nasal discharges, sputum, blood and feces [9]. This may indicate that the fecal-oral route of transmission may be possible as well. A possible airborne transmission has also been suggested. A high temperature and high humidity however reduce rate of transmission of the virus [10]. Coronaviruses are very stable in a frozen state and have been shown to survive for up to two years at -20˚C. They are however thermolabile and are susceptible to normal cooking temperatures of 70˚C [10].

COVID-19 was first reported in Wuhan, China in December, 2019, declared a pandemic by the World Health Organization (WHO) on March 11, 2020 and has been reported in 216 countries globally [10]. The SARS-CoV-2 is pathogenic, contagious, and spreads more easily and rapidly. The disease has affected 10,360,822 million and claimed the lives of 507,014 people worldwide as at June 30, 2020 [10], with the number of recoveries at 5,739,339. The elderly and those with impaired immune system may have specific immune response dysfunction which could lead to delayed immune response. Non-specific response may therefore be working continuously leading to cytokine storm which is responsible for the high mortality rate recorded among this group of patients [11].

The first case of COVID-19 in Nigeria was confirmed on the 27th of February, 2020. The case was an Italian citizen who works in Nigeria and returned from Milan, Italy to Lagos, on the 25th of February, 2020 [12]. Since then the disease has spread to 35 states and the FCT bringing total confirmed cases in Nigeria as at June 30th, 2020 to 25,694, 9,746 recoveries and 590 deaths, with more reported cases amongst the male than the female populace [13]. The five South Eastern Nigeria states of Abia, Anambra, Ebonyi, Enugu and Imo had their first confirmed cases of COVID-19 in April with the total figure, as at the 30th June, 2020, rising up to 310, 73, 438, 261 and 332 respectively [13].

In order to break the chain of transmission and flatten the exponential curve of SARS-CoV-2 in the region, the State Government of the five States introduced an initial fourteen-day lockdown of their states on the 30th of March, 2020 in line with that set up by the Federal Government of Nigeria in the major epicenters of the disease (namely, Lagos and Ogun states and the Federal Capital Territory) in the country. Shops, markets, churches and worship centers and offices were closed during the period as well as total ban on social activities including wedding and burial ceremonies. There was also a total restriction of movement except for those on essential duties. The first phase of the lockdown ended on the 13th of April and was renewed on the 14th for another two weeks. In addition, the states introduced a curfew from 10pm to 6am. At the end of the second phase, there was need to extend it for a further 14 days in line with the directive of the Federal Government of Nigeria in some states. However, at this third phase, the states had started a gradual relaxation of the lockdown rules with movements allowed within each state. But there were still total closure of interstate borders preventing travels between neighboring states, with the dusk-to-dawn curfew still in place. Total relaxation of the lockdown in each of the five states of the region was made on 31st May, 2020 by allowing offices, businesses, markets, and stores to resume operation with limited hours of operation and staff capacity, but with compulsory wearing of face masks in public and checking of body temperatures with infra-red thermometers as well as hand washing.

There are no effective drugs and vaccines to control the novel coronaviruses [14]. Preventive measures include non-pharmaceutical

interventions like social distancing (5-6 feet or more), hand hygiene (washing with soap and running water for 20 seconds or use of alcohol based sanitizers), avoid touching nose, eyes and mouth with unwashed hands, avoid close contact with anyone who has a fever and cough or who is sick, and wearing of masks.

In view of the efforts of the various governments of South Eastern Nigeria to introduce several measures aimed at preventing the spread of COVID-19, this study was designed to examine the impact of the lockdowns and border closures between the states on the spread and containment of SARS-CoV-2 in the five states that make up the region.

MATERIALS AND METHODS

COVID-19 data of the five South Eastern States of Abia, Anambra, Ebonyi, Enugu and Imo between April 1st and 30th June were retrieved from the Nigerian Center for Disease Control microsites (NCDC, 2020). Data were assessed by one-way Analysis of Variance (ANOVA) followed by Duncan multiple comparison, Turkey's multiple comparison and student's t-test. All statistical analysis was performed at the $p < 0.05$ level of significance. All the statistical analysis was done using GraphPad software version 5.01 (GraphPad Software Incorporated, U.S.A, 2007).

RESULTS

The result obtained from analysis of COVID-19 cases in South Eastern, Nigeria showed that the region recorded a total of 1,415 cases between April when all the five states had their first cases and June, 30th. Ebonyi with a total of 438(31.0%) produced the highest confirmed COVID-19 cases in the region, followed by Imo and Abia with 332(25.3%) and 311(22.0%) respectively. Enugu produced 261 (18.4%) while Anambra produced the least confirmed cases with 73(5.2%) (Table 1).

The month of April shown in figure 1 revealed that Enugu State produced the highest rate of infection with 0.21%. Abia, Ebonyi and Imo States showed equal infection rate of 0.14% each while Anambra brought up the rear with 0.07%.

In the month of May, the highest rate of confirmed cases was recorded in Ebonyi State with 2.61%, followed by Imo State with 2.40%. Enugu State was third with 1.06%, while Abia State was the least with 0.57% (Figure 2).

In June, all the states witnessed a spike in cases with Ebonyi recording the highest (28.1%). Abia was second with 21.2%, Imo was third with 20.9%, while Enugu and Anambra States recorded 17.1% and 4.4% confirmed cases respectively as shown in figure 3.

An investigation into deaths caused by COVID-19 complications within the period under review showed that the state with the highest death rate in the region was Anambra (12.3%), followed by Enugu (3.4%) and Imo (1.8%). Abia showed 1.0% death rate while Ebonyi was the least with 0.7% (Figure 4).

DISCUSSION

Lockdown, including restricted social contact and keeping open only those businesses essential to the states' supply chain has had a beneficial effect in South Eastern, Nigeria. The Federal Government of Nigeria introduced an initial lockdown of Lagos and Ogun States and the FCT on the 30th of March, 2020. Although the five South Eastern States of Abia, Anambra, Ebonyi, Enugu and Imo, like most

other states in Nigeria, were yet to record any case of COVID-19, they followed the directive of the FG, locked down their States, closed their borders to their neighbors and continued campaigning, educating, and promoting measures that will ensure their States do not experience any outbreak of the disease. Yet, in spite of all these efforts, all the States recorded their first few pockets of cases of the diseases during the lockdown in April, with some experiencing the outbreak in the first phase while others were in the second. The disease was introduced into the region by asymptomatic indigenes of the respective states, ignoring the border closure, and returning home from the epicenters of the disease in Nigeria namely, Lagos, Ogun, Kano and the FCT.

The increased number of COVID-19 cases observed in Ebonyi, Imo, Abia and Enugu could be attributed to the scaling up of tests for

Table 1: Confirmed cases of COVID-19 in South Eastern Nigeria.

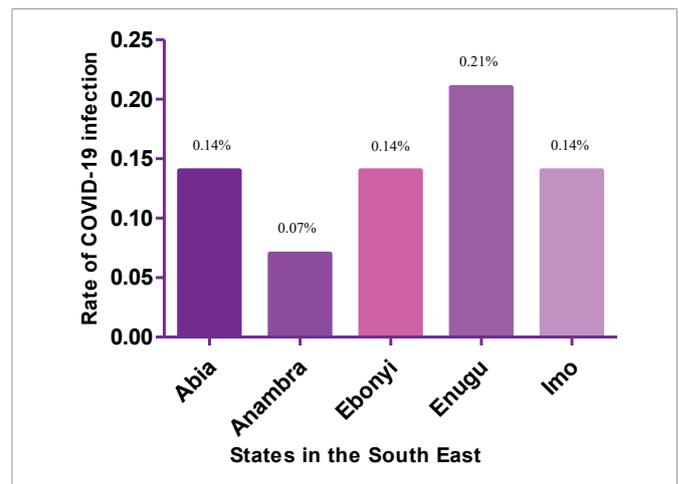| Month	Abia	Anambra	Ebonyi	Enugu	Imo	Total
			States in the South East/No (%) of cases			
April	2	1	2	3	2	10
May	9	10	38	15	34	106
June	300	62	398	243	296	1299
Total	311 (22.0)	73 (5.2)	438 (31.0)	261 (18.4)	332 (23.5)	1,415

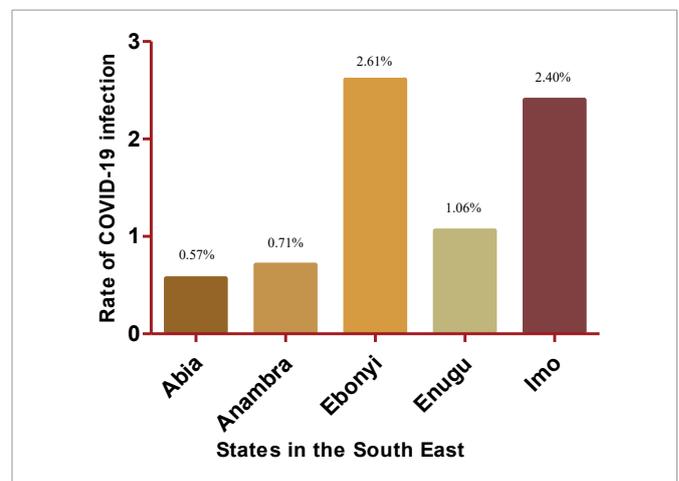**Figure 1:** Confirmed cases of COVID-19 in South Eastern Nigeria in April.

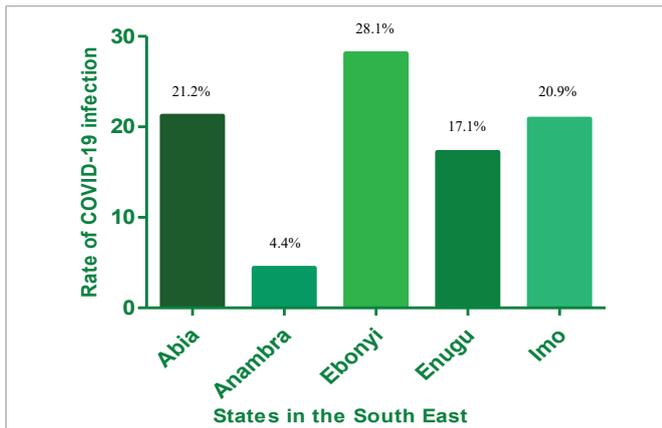**Figure 2:** Confirmed cases of COVID-19 in South Eastern Nigeria in May.

Figure 3: Confirmed cases of COVID-19 in South Eastern Nigeria in June.
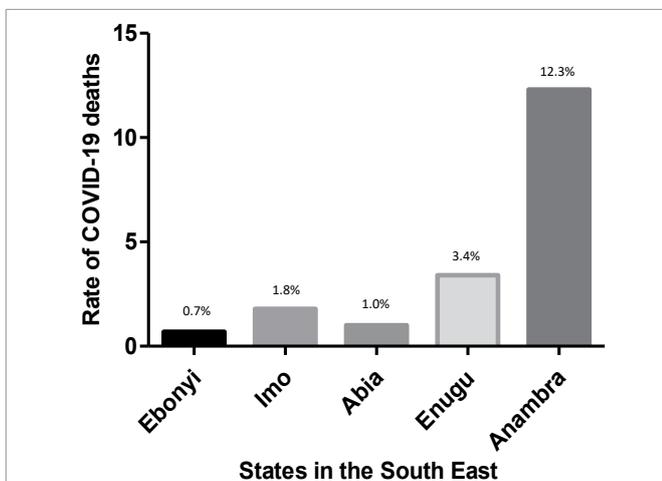

Figure 4: Percentage Rate of COVID-19 deaths in the South East.

the detection of the disease in those states. Several hundreds of tests were conducted daily, of which many confirmed cases were recorded. This agrees with the assertion that the more tests are conducted, the more positive results are recorded. However, this was advantageous in a way since it led to early detection of cases, prompt patient management to save life and immediate implementation of safety measures such as isolation to protect other non-infected members of the community.

The increase in the number of COVID-19 cases was more pronounced in the month of June with all the states recording a fair number of the viral infection. At the early stage in April and May, when the lockdown measure was implemented, few cases were recorded. The few positive cases detected were promptly isolated, thus breaking the chain of transmission. At a stage, Imo and Anambra States declared their states COVID-19-free during these months. However, with the coming of June when the lockdown was completely relaxed to open the economy in the region, there was a spike in the rate of infection in all the states. In addition to the scaling up of the tests already adduced, the other reason that could be considered for the surge in infection in June was community transmission occasioned by the lifting of the lockdown. This was the most dangerous phase of the disease when unsuspecting asymptomatic carriers transmit the infection inadvertently. This could have been more pronounced in

June and accounted for the high infection rate recorded. Mistrust of government and lack of belief in the existence COVID-19 leading to lack of compliance with government imposed safety protocols will not be ruled out as another reason why there was an upsurge in cases of the disease in June. In addition, since coronaviruses have been reported to survive at low temperatures [10], the low temperature of the South East occasioned by increase in the amount of rainfall in the month of June could also have contributed to the high infection rate in this month than in previous ones. There was a significant difference ($p < 0.05$) between the months of April and May, and June in rate of transmission of the disease in the five states. All the COVID-19 related deaths observed in the states all occurred in the month of June also.

Similar reasons could also have accounted for the surge in infection in other states in Nigeria in the month of June. However, the rates of infection within the months under review in the South East was far less in comparison to other states such as Lagos (48.4%), FCT (70.5%), Ogun (56.2%), and Kwara (73.3%) among others [13].

The lockdown measure was also implemented in other countries as it was in Nigeria. In Italy and Spain, Aurelio [15] reported that the lockdown implemented in the months under review in those countries were quite effective in breaking the chain and flattening the transmission curve. South Africa implemented lockdown containment and their daily reported cases slowed abruptly, with the number remaining more or less constant at about 70 new cases per day [16]. Other countries, including China [17], South Korea [18], Switzerland [19] etc. implemented lockdown restrictive measures within the months under review and R_0 was decreased to below 1, thereby flattening the transmission curve.

According to Iboi, et al. [20], the basic reproduction number (R_0) of 2.24 transmission rate means that during the early stages of the pandemic, a typical COVID-19 infected individual in Nigeria was transmitting, on average, to two other people. In other words, the pandemic was spreading at an exponential rate until the time control and mitigation measures were implemented, when the Federal Government of Nigeria announced lockdown measures in three epicenters of the disease and other States, including the five in the South East, thereby bringing down R_0 to below 1.

Some schools of thoughts believe that the lockdown implemented in Nigeria should have been maintained for at least three or four months to completely break the chain of transmission of the SARS-CoV-2 in the country. Hence, relaxing or fully lifting the lockdown sooner in other to reopen the economy, contributed to the upsurge in the rate of infection in the country in the month of June as this study has shown. COVID-19 exponential curve can however be flattened and R_0 brought down to below 1 in the South East, and indeed, the entire country, if the use of non-pharmaceutical interventions, including social distancing, community lockdown, use of face masks in public places, provision and use of Personal Protective Equipment (PPE) by frontline healthcare providers, provision of well-equipped molecular laboratories and widespread diagnostic testing, quarantine and isolation of suspected and confirmed cases respectively, and adequate personal hygiene including hand-washing could be further sustained.

CONCLUSION

The declines of R_0 could be exploited as strong evidence for the effectiveness of government interventions in the South East States,

and indeed, Nigeria. This included the use of face masks, social distancing, community lockdown and other containment and mitigation measures in April. Relaxation of the lockdown in June led to upsurge in infection rate and higher R_0 in the region. The rate is likely to go up in subsequent months due to lack of compliance to the containment and mitigation measures laid down to control the spread of the virus.

Authors' Contributions

Conception and design of the study was conducted by RKO, literature search was done by INC, while supervision was by CCI. All authors read and approved the contents of manuscript.

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