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RT-PCR Time to Negative Conversion Among COVID-19 Patients in State Isolation Centers North Eastern Nigeria

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Abstract: This study is aimed at determining the real time reverse transcriptase polymerase chain reaction (RT-PCR) time to negative conversion among COVID-19 patients in the isolation camps in northeast Nigeria. All patients who were confirmed COVID positive from February 2020 till January 2021 were considered for this study. All patients were tested using RT-PCR. COVID-19 was confirmed by detecting SARS-CoV-2 RNA in throat swab samples. A total of 319 patients that met the criteria were used for this study, data for repeat RT-PCR was obtained from the patient's records. Of thee 319 patients there were more patients between the ages of 16-30 and 31 to 45 which represent 90 (28%) and 79 (24.8) respectively. History of recent travels within 14 days before diagnoses was the highest identifiable risk factor among the study population 169 (46.9). Symptoms of Fever 81 (19.9%), cough 77 (18.9%) and sore throat 40 (9.8%) were among the commonest presenting symptoms, while other symptoms like Sneezing, sputum, rhinorrhea, diarrhoea, Anosmia, vomiting and ageusia were also seen at varying frequencies. There were 22% of cases with co-morbidity, the most common among which were hypertension 43 (60.6%), diabetes 16 (22.5%), chronic kidney disease 4 (5.6%), heart failure 3 (4.2%), Ischemic heart disease 2 (2.8%) and chronic diseases 3 (4.2%). Within 3 weeks of isolation 86.2% of patients had negative RT-PCR repeat test and 306 (96%) had their symptoms resolved and a negative repeat RT-PCR at the end of the 6 weeks isolation period. There were 4.1% (13) mortality (p=0.001). In conclusion we found a median 2 weeks (14 days) period of negative conversion among affected patients, old age, presence of co- morbid conditions and sex are identifiable risks for delayed conversion and mortality among patients. Most patients converted within the first 3 weeks of isolation and prompt management. Therefore early presentation, prompt management and close monitoring of patients, that are aged and or with co-morbidities is paramount in reducing morbidity and mortality among SARS CoV 2 patients.

Keywords: Real Time RT-PCR, Time to Conversion, COVID-19

1. Introduction

The world was awaken by yet another pandemic following the announcement by the world health organization of a novel corona virus disease (SAR COV 2) which reported in Wuhan City in the Hubei province in China. [1] By 31st December 2019, Wuhan Municipal Health Commission, China, reported a cluster of cases of pneumonia in Wuhan, Hubei Province. A novel corona virus was eventually identified and the genetic sequencing of COVID-19 was made public by 12th January 2020 [1]. There is growing evidence which suggest that patient zero was confirmed as far back as November of 2019. [3] The first confirmed case of COVID-19 however was discovered in 1st December 2019 in Wuhan. [2] One unconfirmed report suggests the earliest case was on 17 November. [3] Doctor Zhang Jixian observed a cluster of pneumonia cases of unknown cause on 26 December, upon which her hospital informed Wuhan Jianghan CDC on 27 December. [4, 5] Initial genetic testing of patient samples on 27 December 2019 indicated the presence of a SARS-like coronavirus. [4].

The COVID-19 pandemic, also known as the coronavirus pandemic, is an ongoing pandemic of Corona virus disease 2019 (COVID-19) caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) [6].

The animal reservoir of the virus has not yet been identified, but genomics of COVID-19 is so similar to bat coronavirus (98%), reinforcing the presumption that the virus was transmitted by an animal in the shopping center in Wuhan. With regard to genomic similarity, the virus differs from its predecessors, namely SARS (79%) and Middle East respiratory syndrome (MERS) (50%). As indicated by genetic data, CVOID-19 pathogen is classified as a member of the beta-coronavirus genus, and can bind to the angiotensin-converting enzyme 2 receptor in humans [7, 8].

SARS-CoV-2 is a member of subgenus Sarbecovirus (previously lineage b) in the family corona viridae, genus Betacoronavirus, and is closely related to SARS-CoV, which caused the SARS epidemic during 2003, and to SARS-related-CoVs (SARSr-CoVs) in horseshoe bats discovered in Hong Kong and mainland China (9-11). Whereas SARS-CoV and MERS coronavirus were rapidly traced to their immediate animal sources (civet and dromedaries, respectively), the origin of SARS-CoV remains obscure.

SARS-CoV-2 showed high genome sequence identities (87.6%–87.8%) to SARSr-Rp-BatCoV-ZXC21/ZC45, detected in Rhinolophuspusillus bats from Zhoushan). A closer-related strain, SARSr-Ra-BatCoV-RaTG13 (96.1% genome identity with SARS-CoV-2), was recently reported in Rhinolophusaffinis bats captured in Pu'er. Subsequently, Pangolin-SARSr-CoV/P4L/Guangxi/2017 and Pangolin-SARSr-CoV/Guangdong/1/2019 (85.3% and 89.7% genome identities, respectively, to SARS-CoV-2) were also detected in smuggled pangolins captured in Nanning, China, during 2017) and Guangzhou, China, during 2019 [12, 13].

As of 12 May 2020, more than 4.17 million cases of COVID-19 have been reported in over 187 countries and territories, resulting in more than 286,000 deaths. More than 1.45 million people have recovered. [14].

Over the past few decades, a large number of people have been affected with the negative conversion among affected patients three epidemics caused by corona virus family (SARS-2003, MERS-2012, and COVID-2019) in the world. Nevertheless, there is substantial genetic dissimilarity between pathogens of the three previous epidemics, in particular MERS with COVID-19. In the previous epidemics, initial hotspots of diseases were Middle East, Saudi Arabia (MERS) and China and animal to human, and then human to human transmissions of pathogens were reported in other countries [15, 16].

There have been a few studies done especially on the African continent, which looked into the rate and time to conversion among hospitalized/ isolated COVID-19 patients, this study sought to bridge that knowledge gap.

The novel respiratory virus SARS-CoV-2, which causes COVID-19, has caused global pandemic and has infected more than 185 million people globally with over 4 million related death as at July 2021, about 91% of the infected persons have recovered fully or with some form of disabilities [1, 14]. In the United States alone it has affected over 34 million people with over 600 thousand deaths as of July 2021 [1, 14]. Nigeria with an estimated over 200 million population has over 160 thousand persons infected with COVID-19 ranking 84th globally as at July 2021, with over 2 thousand deaths recorded so far [1, 14].

Right from the identification of SARS CoV 2 infection among humans there has been a lot of controversies regarding its actual mode of transmission and our knowledge of its transmissibility has been dynamic and it continue to evolve as we gain more understanding of its behaviour among humans. Human to human transmission via either respiratory droplets or close contacts was initially proposed as the main routes of transmission of the pathogen based on experience gained in the previous two epidemics caused by corona viruses (MERS-CoV and SARS-CoV). [17] Based on world Health Organization (WHO) report, 2019-nCoV is a unique virus that causes respiratory disease, which spreads via oral and nasal droplets. The pathogen of COVID-19 can float in the air in the form of aerosols and cause infection in healthy people. [18] some studies among COVID-19 patient shows increased level of viral load during early stage of the disease which decreases dramatically over time as the patient's condition improves. [19].

SARS CoV2 has been found to be a highly contagious virus however a lot of scientific models with clear and acceptable assumptions have been used to ascertain the infectivity index of this virus which is termed as basic

reproduction number (R0). This is the expected number of cases directly infected by one contagious case in a susceptible population. [20] For viral pathogens in MERS and SARS epidemics, the index value was approximated to be 2, indicating that each infected person could infect two people on average in an effective contact. However, for COVID-19, the calculated value in a study was slightly higher and the index value based on data calculated in Wuhan, China was 2.2 (95% CI, 1.4 to 3.9). [20] There are still limited data on the conclusive evidence of fecal-oraltransmission. However COVID-19 RNA has been isolated in the fecal specimens of about 10% of confirmed COVID-19 cases who presented with gastrointestinal symptoms [21].

Symptoms of COVID-19 can be relatively non-specific and infected people may present in diverse ways, some may be asymptomatic but yet transmitting infection seen in about 44%. Fever (88%) and initial dry cough (68%) are the two most common symptoms. Less common symptoms include fatigue, respiratory sputum production (phlegm), loss of the sense of smell, loss of taste, shortness of breath, muscle and joint pain, sore throat, headache, chills, vomiting, coughing out blood, and diarrhea. [1] One out of every five patients will experience difficulty in breathing and some will have severe form of disease requiring emergency medical treatment and or oxygen therapy, these is characterized by difficulty breathing, persistent chest pain or pressure, sudden confusion, difficulty walking, and bluish face or lips. Further progression of the disease process could lead to potentially fatal complications including pneumonia, acute respiratory distress syndrome, sepsis, septic shock, and kidney failure. [1].

Pathogen of COVID-19 has been detected in upper and lower respiratory tracts in initial assessments. Moreover, viral RNA has been detected in fecal and blood samples in later studies.

According to WHO guideline, laboratory diagnosis of COVID-19 is based on a positive RT-PCR test. The targeted gene for diagnosis may differ in various countries. Accordingly, target genes for screening and confirmatory assays by Real time RT-PCR are ORF1ab and N in Chinese laboratory protocol, while RdRP, E and N are checked in Germany. Furthermore, three targets in N gene are considered in the US protocol. [22] Computerized tomography (CT) scan is also a diagnostic tool of significance in COVID-19 as this will indicate the pathological damage associated with COVID-19 and disease progression The sensitivity of CT scan when compared with RT-PCR which is the gold standard was appropriate [23]. However, the large number of hospitalized cases due to false positive results by CT scan may increase the risk of transmission to healthy people. On the other hand, RT-PCR test may be subject to some limitationsIn the clinical case management of COVID-19. [24].

Clinical features, radiographic and laboratory indices are paramount in deciding the management option for COVID-19 case, as majority of patients present with mild to moderate symptoms such as dry cough, sore throat, low-grade fever or body aches, Ageusia, Anosmia. etc Because of wide spectrum of clinical symptom, a criteria comprising of laboratory clinical and biomarkers is paramount to serve as a guide for treatment and prognostication of patients. [25].

There is currently no known treatment for COVID-19 although a lots of drugs are currently undergoing clinical trials, however treatment and management of symptoms is currently been done. Treatment is based on presenting complaints to alleviate symptoms and is divided into Home-based care and Hospital/ supportive care. [26, 27].

Adequate hydration and good nutrition with vitamin supplements and adequate fluid intake is important in mild form of disease.

For severely ill patients, Oxygen therapy through intra nasal cannula or mechanical ventilation may ensue. Anti viral agent-Remdesiviris used if no improvement among hospitalized patients, Steroid-Dexamethasone improves survival especially on those requiring O_2 therapy, methyl prednisolone, hydrocortisone can be used. [27] Immuno-therapy-monoclonal antibodies has also shown promising results in some patients. [28] Ventilatory support for very severe cases with desaturation with or without steroids might also improves patients survival [27].

Study objective

1) To determine the RT-PCR negative conversion time among COVID-19 patients in isolation camps in North Eastern Nigeria.
2) To determine the demographic pattern of COVID-19 among patients.
3) To ascertain pattern of transmission among COVID-19 patient.
4) To determine mode of presentation based on disease severity.
5) To describe co-morbidity among COVID-19 patients and clinical outcome.
6) To determine clinical outcome associated with COVID-19 infection in our settings.

2. Methodology

This wasa prospective study in which all patients with positive RT-PCR wereadmitted into isolation centers at ATBU Teaching Hospital, Bauchi, Federal Medical Center Azare, Bauchi and Federal Medical Center Yola in Adamawa state.

A COVID-19 case report form was designed to capture data regarding demographic, clinical, laboratory, radiological, co-morbid and therapeutic characteristics. Other information on gender, age, medical history, presenting complaints and severity assessment on admission, laboratory findings, treatment and negative conversion time of SARS-CoV-2 were extracted from the medical record of each patient.

All patients were tested using RT-PCR which was confirmed by detecting SARS-CoV-2 RNA in throat swab samples using a virus nucleic acid detection kit according to

the manufacturer's protocol (BioGerm Medical Biotechnology Co., Ltd.) the test targeted *RdRp, E and N genes*. In monitored patient a detection of one gene was considered positive. All patients were admitted and isolated for treatment within one week from onset of symptoms, negative conversion time of SARS-CoV-2 was defined as the interval between symptom onset and the first of two consecutive negative virus tests.

Patient case files without confirmatory result by RT-PCR were excluded from this study.

All follow up RT-PCR results of patients admitted into the isolation centers were obtained after 14 days of admission and a second repeat test separated by 3-7 days from the last test were also obtained. Patients were declared negative if repeat RT-PCR of first and second test were found negative in the presence of resolution of symptoms of fever, cough and dyspnoea. Impact of Co-morbidity and Age were considered during the analysis of the results.

2.1. Sample Size

All patients who were confirmed COVID positive from February 2020 to January 2021 were considered for this study. A total of 319 patient's data that had repeat RT-PCR was extracted from case file into our preformed questionnaire and was inputted to excel spread sheet before exporting into SPSS version 27.0 on a secured PC for analysis.

2.2. Results

Results are presented as the clinical characteristic of patients with COVID-19. Frequency of symptoms is shown as rates, while differences in the rates among age groups and co-morbid patients are shown with 95% C.I. and p-values from Fisher's exact test. Continuous variables like age, sex and weight are presented as means. A one way ANOVA test was used to test the statistical difference between test results. Adjustment was made for confounders using negative binary regression.

2.3. Ethical Approval

This was obtained from the ethical committee of the ATBUTH, Federal Medical Centers Azare and Yola where the study was conducted.

2.4. Data Management

Data collected from the patient folder was entered into the proforma, excel spreadsheet, coded and exported into the SPSS software for analysis with a secured pass word.

3. Analysis of Results

Demography of the study group

There were 319 patients who met the inclusion criteria for this study, there were more patients among the 16-30 (28%) and 31 to 45 (24.8%) age groups. Patient greater than 60 years were among the third highest 20.1% among the study group, there were less number of cases among those between 1-15 age (7.2%). There were more males 229 (71.8%) than females 90 (28.2%) among the study group. Similarly cases were seen more among patients whose level of education was Senior secondary school and First primary leaving certificate (SSCE/FPSLC) representing 169 (59.8%) and National Diploma/National Certificate on Education (ND/NCE) holder 86 (27%), there were fewer cases among graduates with degree/ HND 74 (23.2%). More than half of the study population were public servants 176 (55.2%) compared to civil servants 107 (35.5%), there were less cases among students 36 (11.3). see Table 1.

Table 1. *Socio-demographics.*

Variables		Frequencies	%
Age	1-15	23	7.2
	16-30	90	28.2
	31-45	79	24.8
	46-60	63	19.7
	>60	64	20.1
Total		319	100
Gender	Male	229	71.8
	Female	90	28.2
Total		319	100.0
Education			
	Degree/HND	74	23.2
	ND/NCE	86	27
	SSCE/FSLS	159	49.8
Total		319	100.0
Occupation	Civil servants	107	35.5
	Public servants	176	55.2
	Students	36	11.3
Total		319	100.0

Exposure history among cases

History of recent travel in the last 14 days was the highest identifiable risk factor among the study population 46.9% (169), this was followed by contact with undiagnosed symptomatic patients 22.5% (81). History of contact with COVID-19 patients was also a significant risk amongst the study group 11.9% (43), a visit to crowded places like market and religious gathering (church/mosque) also carried a significant risk among the study group representing 8.3% (30) and 7.8% (28) respectively, there was lower risk associated with participation /or attending burial rite among the study group. See table 2.

Table 2. *Exposure History of COVID-19 Patients.*

History	Frequencies	Percentage
Travels Within The Past 14 Days	169	46.9
Contact With Known COVID-19 Patient In Past 14 Days	43	11.9
Contact With A Person With Persistent Cough & Fever	81	22.5
Visit To A Crowded Market In Past 14 Days	30	8.3
Attended Mosque/Church Prayer In Past 14 Days	28	7.8
Attended/Participated In Burial Ceremony In Past 14 Days	9	2.5
Total	360	100.0

Table 3. *Clinical Presenting Symptoms among COVID-19 Patients.*

Clinical presentation	Frequencies	%
Fever	81	19.1
Cough	77	18.9
Sore throat	40	9.8
Headache	35	8.6
Sneezing	27	6.6
Sputum	27	6.6
Rhinorrhea	20	4.9
Diarrhoea	19	4.7
Anosmia	16	3.9
Limb weakness	15	3.7
Vomiting	14	3.4
Myalgia	10	2.5
Ageusia	9	2.2
Coma	6	1.5
Seizure	4	1.0
Cranial nervepalsy/cerebellar sign	4	1.0
Convulsions	3	0.7
Total	407	100.0

Pattern of symptoms among cases

The pattern of symptoms in the study group indicates fever 81 (19.9%), cough 77 (18.9%) and sore throat 40 (9.8%) were seen more compared to sneezing, production of sputum, rhinorrhea, diarrhoea, Anosmia, vomiting and ageusia were also seen at varying frequencies 27 (6.6%), 27 (6.6%), 20 (4.9%), 19 (4.7%), 16 (3.9%), 14 (3.4%), 9 (2.2%) respectively. With the exception of headache there were fewer CNS symptoms amongst the study population with coma, seizure, cranial nerve palsy/ cerebella signs and convulsions occurring at 6%, 4%, 4% & 3% respectively. See table 3.

Co-morbidity among cases

The most frequent co-morbid medical conditions were hypertension 60.6% (43), diabetes 16 (22.5%), chronic kidney disease 4 (5.6%), and heart failure 3 (4.2%). Ischemic heart disease and other chronic diseases constitute about 2 (2.8%) and 3 (4.2%) respectively. See figure 1.

Rate of conversion among COVID-19 Patients admitted

Of the 319 patients studied, 84 (26.3%) had converted to negative within the first week of isolation, 191 (59.9%) during the second week, 38 (11.9%) and 6 (1.9%) during the third and fourth week respectively, suggesting more rate of conversion within the first 3 weeks of isolation and management. See Tables 4, 5 and Figure 2.

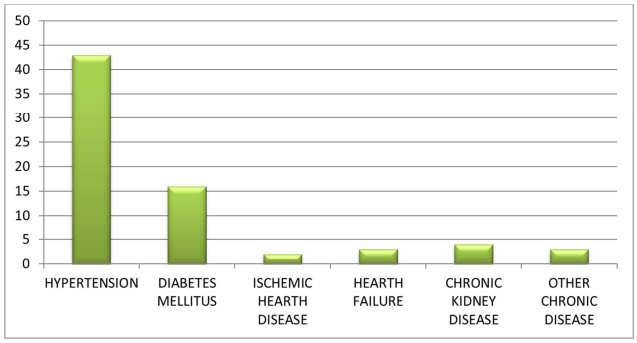

Figure 1. *Associated Co-Morbid Conditions of COVID-19 Patients.*

Table 4. *Time to Negative conversion among patients (weeks).*

Conversion Time (Weeks)	Frequencies	%
1st Week	84	26.3
2nd Week	191	59.9
3rd Week	38	11.9
6th Week	6	1.9
Total	319	100

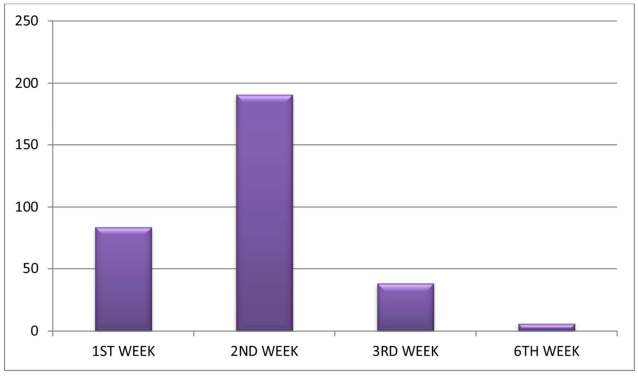

Figure 2. *Time to Negative conversion among patients (weeks).*

Table 5. *ANOVA results of Conversion (days) against Age and Co-Morbidity conditions of COVID-19 Patients.*

Dependent Variable: Conversion (Days)					
Source	**Type III Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
Corrected Model	2517.129	95	26.496	0.704	0.974
Intercept	6527.065	1	6527.065	173.497	0.000
Age	1508.184	58	26.003	0.691	0.952
Comorbid	24.521	2	12.260	0.326	0.722
Age * Comorbid	750.192	35	21.434	0.570	0.976
Error	8351.792	222	37.621		
Total	40681.000	318			
Corrected Total	10868.921	317			

Treatment outcome among COVID-19 patients

Negative conversion in relation to Age and co-morbidity

Out of the 319 patients studied, 71 (22.3%) had co-morbid conditions ranging from hypertension (43), DM (16), CKD (4), heart failure (3), ischemic heart disease (2) and other chronic disease conditions (3) There were only 0.6% of cases with co-morbidity that had negative conversion within the first 2 weeks of isolation though not significant *(p 0.722)* there were also 0.3% of cases >60 year that converted within first 2 weeks of isolation and management *(p=0.976)*.

Out of the 319 patients reviewed about 306 (96%) of them had their symptoms resolved with negative repeat RT-PCR at the end of the 6 weeks isolation period. There were however 13 (4.1%) mortality among the study group *p=0.001*, the mortality rate was 4/100 patients. Cormobidity though common among the mortality group but was not statistically significant *p=0.301*. However when co-morbidity, advanced age and male sex was combine there was an increase trend in the mortality *(p=0.001)*. see tables 6 and 7.

Table 6. *Treatment outcome among COVID-19 cases.*

Outcome	Frequencies	Percentage	mortality rate
Died	13	4.1	4/100 patients
P=0.001			
Cured	306	95.9	
Total	319	100.0	

Table 7. *Age, sex, co-morbidity associated mortality.*

Dependent Variable: Mortality					
Source	**Type II Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Model	4.079	21	.194	3.880	.000
Co-morbid	.364	6	.061	1.211	0.301
AGE	.230	4	.057	1.146	0.335
Gender	.112	1	.112	2.228	0.137
Co-morbid * AGE	2.252	7	.322	6.424	0.000
Co-morbid * Gender	.093	1	.093	1.865	0.173
AGE * Gender	.170	1	.170	3.389	0.067
Co-morbid * AGE * Gender	0.000	0		0.00	0.000
Error	14.921	298	.050		
Total	19.000	319			

4. Discussion

Among the 319 patients studied, there were more patients among the age group 16-30 and 31 to 45 years representing 90 (28%) and 79 (24.8%) respectively; patient greater than 60 years were among the third highest 64 (20.1%) among the study group; there were less number of cases among those between 1-15 years 23 (7.2%). There were more males 229 (71.8%) than females 90 (28.2%) among the study group, though most studies have shown equal distribution of COVID-19 among both sexes, however some studies have shown male preponderance among infected individuals with additional greater cases of severe form of disease and mortality [30]. One biological theory centers on the genetic differences between men and women, particularly with regard to the immune system. The X chromosome is known to contain the largest number of immune-related genes in the whole genome.[31] With their XX chromosome, women have a double copy of key immune genes compared to the single copy in XY men. This boost extends to both the general reaction to infection (the innate response) and also to the more specific response to microbes including antibody formation (adaptive immunity). [32].

History of recent travels within the last 14 days before diagnoses amongst cases was the highest identifiable risk factor among the study population 169 (46.9%), There were 81 (22.5%) of patients who had contact with undiagnosed symptomatic patients and 43 (11.9%) had history of contact with COVID-19 patients. A visit to crowded places like market and religious gathering (church/mosque) also carried a significant risk among the study group representing 30 (8.3%) and 28 (7.8%) respectively. However, there was low risk associated with participation /or attending burial rite among the study group. This is similar to earlier reported risk patterns [1, 6, 7]. The average range of the incubation time from exposure to symptoms is reported to be between 2–14 days [33]. We determined the proportion and time to negative conversion after COVID-19 infection, which is indicated by the negative RT-PCR test.

The overall median days to conversion were found to be greater between the first and the second weeks of isolation in health facilities, this was observed in studies conducted elsewhere [33].

The pattern of symptoms amongst the study group showed that fever was more frequent 81 (19.9%), cough and sore throat were also common among these patient 77 (18.9%) and 40 (9.8%) respectively. Sneezing, sputum, rhinorrhea, diarrhoea, anosmia, vomiting and ageusia were also seen at varying frequencies 27 (6.6%), 27 (6.6%), 20 (4.9%), 19 (4.7%), 16 (3.9%), 14 (3.4%), 9 (2.2%) respectively. With exception of headache there were fewer CNS symptoms amongst the study population with coma, seizure, cranial nerve palsy/ cerebella signs and convulsions occurring at 6%, 4%, 4% & 3% respectively. A similar pattern has also been observed in most countries globally. [34-36]. Hypertension 43 (60.6%), diabetes 16 (22.5%), chronic kidney disease 4 (5.6%), heart failure 3 (4.2%). Ischemic heart disease 2 (2.8%) and other chronic diseases constitute 3 (4.2%).

Of the 319 patients studied 84 (26.3%) had converted to negative within the first week of isolation, 191 (59.9%) during the second week, 38 (11.9%) and 6 (1.9%) during the third and fourth week respectively, suggesting more rate of conversion occurs within the first 3 weeks of isolation and management 86.2%with a median period of 21 days. Early diagnosis and prompt isolation and management was observed to be associated with early conversion among patients. [33].

About 71 (22.3%) patients studied had co-morbid conditions ranging from hypertension (43), DM (16), CKD

(4), heart failure (3), ischemic heart disease (2) and other chronic disease conditions (3). Similar trends were observed in two Chinese studies. [36, 37] Co-morbidities were positively correlated with age and delayed conversion. These age-related defects may make it more difficult for the host cell immunity to eradicate the invasive pathogen, resulting in prolonged viral shedding in the elderly, Although disease severity and co-morbidities were not significant predictors from univariate and multivariate analysis, meaning the two factors had no direct effect on time to RT-PCR conversion, however they may indirectly influence viral nucleic acid clearance via effect of age. Few cases of co-morbid and aged patients within the study population could have affected the direct effect of these 2 factors on the RT-PCR negative conversion among this population. This was similar to observation made in Hubei studies [36].

The infection fatality rate (IFR) among COVID-19 patients is within 0.5-1% [39, 40], there were 96% (306) of the study populationwho had their symptoms resolved and negative repeat RT-PCR at the end of the 6 weeks isolation period, we observed that greater percentage of patients (80%) presented with mild to moderate disease condition and had shown significant recovery with prompt supportive care. Severe form of disease was seen commonly among the elderly and amongst those with co-morbid conditions like cardiovascular disease, chronic respiratory disease, diabetes, CKD etc, similar trend was also observed in some studies [39-41] there were however 13 (4.1%) mortality among the study group $p=0.001$, the mortality rate was 4/100 patients. Cormobidity though common among the mortality group but was not statistically significant $p=0.301$. Hypertension and diabetes as a disease entety is associated with weakened immune system, similarlalythe use of angiotensine-converting enzyme (ACE) inhibitors and angiotensine receptor blockers (ARBs) among hypertensives couldcause a rise in blood levels of ACE2. [7, 8, 42, 43] This is thought to enhance viral entry by utilizing ACE2 as a receptor. [43] However when co-morbidity, advanced age and male sex were combined there was an increased trend in mortality $(p=0.001)$. This was also consistant with some studies done. [44-46].

5. Conclusion

In conclusion COVID-19 is a global pandemic whose negative impact on the global stage has continued since it first identification in Wuhan, Hubei province in China in November 2019. This study has looked into demographic characteristics of SARS CoV 2 positive patient indicating its high prevalence among younger and middle aged population (16 and<60) years. history of recent travels within 14 days before diagnosis was found to be an important factor for acquiring infection. Fever, cough, sore throat and headache are the most frequent symptoms presented by patients among others. There is a median 2 weeks period of negative conversion among infected patients, elderly, presence of co-morbid conditions and sex are identifiable risk for delayed conversion and mortality among patients. We hope these predictors could provide clues for early identification of patients with prolonged viral shedding, paving the way for development of optimal isolation protocols and treatment strategies.

Most patients will convert within the first 3 weeks of isolation and prompt management, therefore early presentation and prompt management and close monitoring of patients that are elderly and or with co-morbidities will help in reducing morbidity and mortality among SARS-CoV-2 patients.

We therefore conclude that COVID-19 infections is an infectious diseases that is associated with high level of transmission of humans, while prevention strategies still remain the viable option of limiting its spread, early detection, isolation and prompt management of cases will reduce the negative conversion time, symptoms resolution with reduction in morbidity and mortality among patient.

Conflict of Interest

All the authors do not have any possible conflict of interest.

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Availability of Data and Materials

The data sets collated and analyzed during this study will be are available from the corresponding author on request.

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References

[1] World Health Organization (WHO) Novel corona virus; 12 April 2020/ 4 May 2020 statement.

[2] Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. (February 2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China; *Lancet*. 395 (10223): 497–506.

[3] Ma J. China's first confirm COVID-19 case traced back to 17 November 2019. South china morning post 19th March.

[4] Yu G, Yanfeng P, Rui Y, Yuding F, Danmeng M, Murphy F, Wei H, Shen T "How early signs of the coronavirus were spotted, spread and throttled in China. *The Straits Times*. (28 February 2020). Retrieved 8 April 2020.

[5] How Li Wenliang's death sparked Chinese demand for freedom of speech. *South China Morning Post*. 12 February 2020. Retrieved 17 March 2020.

[6] Naming the corona virus disease (COVID-19) and the virus that causes it. www.who.int

[7] Lu R, Zhao X, Li J, Niu P, Yang B, Wu H, et al. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. Lancet (London, England) 2020; 395 (10224): 565–74. [PMC free article] [PubMed] [Google Scholar].

[8] Zhang L, Shen FM, Chen F, Lin Z. Origin and evolution of the 2019 novel coronavirus. Clinical infectious diseases: an official publication of the Infectious Diseases Society of America. 2020 [PMC free article] [PubMed] [Google Scholar].

[9] Lau SK, Woo PC, Li KS, Huang Y, Tsoi HW, Wong BH, et al. Severe acute respiratory syndrome coronavirus-like virus in Chinese horseshoe bats. *Proc Natl Acad Sci U S A*. 2005; 102: 14040–5.

[10] Ge XY, Li JL, Yang XL, Chmura AA, Zhu G, Epstein JH, et al. Isolation and characterization of a bat SARS-like coronavirus that uses the ACE2 receptor. *Nature*. 2013; 503: 535–8.

[11] Hu B, Zeng LP, Yang XL, Ge XY, Zhang W, Li B, et al. Discovery of a rich gene pool of bat SARS-related coronaviruses provides new insights into the origin of SARS coronavirus. *PLoS Pathog*. 2017; 13: e1006698.

[12] Liu P, Chen W, Chen JP. Viral metagenomics revealed sendai virus and coronavirus infection of Malayan pangolins (*Manis javanica*). *Viruses*. 2019; 11: E979.

[13] Lam TT, Shum MH, Zhu HC, Tong YG, Ni XB, Liao YS, et al. Identifying SARS-CoV-2 related coronaviruses in Malayan pangolins. *Nature*. 2020.

[14] COVID-19 Dashboards by the center for systemic science and Engineering (CSSE) at John Hopkins University (JHU). Retrieved 12 May 2020.

[15] Mavian, C., Marini, S., Prosperi, M. & Salemi, M. A snapshot of SARS-CoV-2 genome availability up to April 2020 and its implications: Data analysis. JMIR Public Health Surveill. 6, e19170. https://doi.org/10.2196/19170 (2020). Lancet (London, England) 2020; 395 (10224): 565–74.

[16] Cui, J., Li, F Shi, ZL. Origin and evolution of pathogenic coronaviruses. Nat Rev Microbiol 17, 181–192 (2019). https://doi.org/10.1038/s41579-018-0118-9

[17] Chan JF, Yuan S, Kok KH, To KK, Chu H, Yang J, Xing F, Liu J, Yip CC, Poon RW, Tsoi HW. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. The Lancet. 2020; 395 (10223): 514–23. [PMC free article] [PubMed] [Google Scholar].

[18] WHO Director-General's opening remarks at the media briefing on COVID-19 - 3 March 2020. [3-march-2020 Access Mar, 2020]. Available at: https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19

[19] Wong JEL, Leo YS, Tan CC. COVID-19 in Singapore-Current Experience: Critical Global Issues That Require Attention and Action. Jama. 2020 [PubMed] [Google Scholar].

[20] Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus–Infected Pneumonia. *New England Journal of Medicine*. 2020; 382 (13): 1199–207. [PMC free article] [PubMed] [Google Scholar].

[21] Gao QY, Chen YX, Fang JY. 2019 novel coronavirus infection and gastrointestinal tract. *Journal of digestive diseases*. Feb 2020.

[22] WHO. Laboratory testing of 2019 novel coronavirus (2019-nCoV) in suspected human cases: interim guidance, Available at 2 March 2020. No. *WHO/COVID19/laboratory/2020.4. World Health Organization; 2020*.

[23] Ai T, Yang Z, Hou H, Zhan C, Chen C, Lv W, et al. Radiology. Correlation of Chest CT and RTPCR Testing in Coronavirus Disease 2019 (COVID-19) in China: A Report of 1014 Cases; *PubMed 2020: 200642*.

[24] Lakes KD. Restricted sample variance reduces generalizability. Psychological assessment. 2013; 25 (2): 643. *PubMed.*

[25] Kurtz P, Bastos LSL, Dantas LF et al Evolving changes in mortality of 13,301 of critically ill adult patients with COVID-19 over 8 months Intensive care med 2021: 47; 538.

[26] Wang M, Cao R, Zhang L, Yang X, Liu J, Xu M, et al. Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) in vitro. Cell research *PubMed. 2020: 1–3*.

[27] WHO. Clinical management of severe acute respiratory infection when novel coronavirus (nCoV) infection is suspected: interim guidance 307. [Published January. 2020; 28.] https://www.who.int/docs/defaultsource/coronaviruse/clinical-management-of-novel-08cov.pdf?sfvrsn=bc7da517_2.

[28] Beigel JH. Polyclonal and monoclonal antibodies for the treatment of influenza. Current opinion in infectious diseases. *PubMed.* 2018; 31 (6): 527–34.

[29] Worlometer, coronavirus pandemic update 06 July 2021.

[30] Bianchi I, Lleo A, Gershwin ME, Invernizzi P. The X chromosome and immune associated genes. Journal of Autoimmunity. 2012 May; 38 (2-3): J187-92. DOI: 10.1016/j.jaut.2011.11.012.

[31] Klein SL, Flanagan KL. Sex differences in immune responses. Nature Reviews Immunology. 2016 Oct; 16 (10): 626-638. DOI: 10.1038/nri.2016.90.

[32] COVID-19 Sex-disaggregated data tracker. *Global health 50/50 April 2020.*

[33] Lauer SA, Grantz KH, Bi Q, et al. The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application. Ann *Intern Med. 2020; 172: 577-582.*

[34] Aigbokhaode AQ, Orhue NL, Ofili AN, Oseji M1, Osiatuma *et al* Patterns of Clinical Presentation of COVID-19 Patients in Federal Medical Centre, Asaba, Nigeria *Jour of Comm Med and Pri Health Care*. 33 (1) 115-127.

[35] A day-by-day breakdown of coronavirus symptoms shows how COVID-19 goes from bad to worse *Aria Bendix February 22, 2020 1: 29 PM.*

[36] Liang Chen, Sung liu, Juncai Tian, Haisong Pan et al Disease progression pattern and risk factors associated with mortality in disease patient with COVID-19 in Hubei province China *Immune Inflam, Dis 2020; 8: 584-594.*

[37] Fei Zhou, Ting Yu, Ronghui Du, Guohui Fan, *et al*. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet 2020; 395: 1054–62* https://doi.org/10.1016/S0140-6736(20)30566-3.

[38] Hu X, Xing Y, Jia J, Wei Ni *et al*. Factors associated with negative conversion of viral RNA in patients hospitalized with COVID-19. *Sci Total Environ*. 2020; 728: 138812. doi: 10.1016/j.scitotenv.2020.138812.

[39] Smriti Mallapaty How deadly is the coronavirus? Scientists are close to an answer *Nature. 2020; 582, 467-468.* doi: 10.1038/d41586-020-01738-2, Available from: https://www.nature.com/articles/d41586- 020-01738-2 (Cited 8 August 2020).

[40] Russell TW, Hellewell J, Jarvis CI, van Zandvoort K, e*t al*. Estimating the infection and case fatality ratio for coronavirus disease (COVID-19) using age-adjusted data from the outbreak on the Diamond Princess cruise ship, February 2020. *Euro Surveill. 2020; 25 (12):* pii=2000256. https://doi.org/10.2807/1560-7917.ES.2020.25.12.2000256

[41] Verity R, Okell LC, Dorigatti I, et al. Estimates of the severity of coronavirus disease 2019: a model-based analysis *Lancet Infect Dis.* 2 020; 20 (6): 669-677. doi: 10.1016/S1473-3099(20)30243.

[42] Vuille-dit-Bille RN, Camargo SM, Emmenegger L, Sasse T, *et al.* Human intestine luminal ACE2 and amino acid transporter expression increased by ACE inhibitors. *Amino Acids 2015; 47: 693–705.*

[43] Hoffmann M, Kleine-Weber H, Schroeder S, Kru¨ger N, *et al.* SARSCoV-2 cell entry depends on ACE2 and TMPRSS2 and is blocked by a clinically proven protease inhibitor. *Cell 2020; 18: 271–280.*

[44] World Health Organization. Coronavirus. Available at: https://www.who.int/healthtopics/coronavirus#tab=tab_1 (Cited 6 August 2020).

[45] Fang L, Karakiulakis G, Roth M. Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection? *Respir Med. 2020; 8 (4): e21*. Doi: 10.1016/S2213-2600(20)30116-8.

[46] Istituto Superiore di Sanità. Report sulle caratteristiche dei pazienti deceduti positivi a COVID-19 in Italia Il presente report è basato sui dati aggiornati al 13 Marzo 2020. https://www.epicentro.iss.it/coronavirus/bollettino/Report-COVID-2019_17_marzo-v2.pdf (Accessed 6 August 2020) 9.