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Determination of Mortality Rate of Covid-19 Patients with Co-Morbidities at Amachara Isolation Center

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ABSTRACT : BACKGROUND:The COVID-19 pandemic has led to a dramatic loss of human life worldwide and presents an unprecedented challenge to public health, food systems and the world of work. The presence of co-morbidities in patients hospitalized with Covid-19 is common and may negatively affect their prognosis. This study aims at evaluating the correlation between mortality rates of COVID-19 patients with co-morbidities in Amachara isolation center, Umuahia-south, Abia State, Nigeria.

OBJECTIVE: To determine the mortality rate of covid-19 patients with comorbidities at Amachara isolation centre.

MATERIALS AND METHODS: A retrospective cross-sectional study was conducted among Covid-19 patients isolated at Amachara Isolation center. The data was gotten from medical records of the patient and was then presented using Tables and figures.

RESULTS: Mean age of the patients was 28±7.342. Out of the three hundred and thirty-seven Covid-19 patients, seventy-four patients (22%) had co-morbidities, the prevailing co-morbidity was hypertension (Hypertension alone, 8.3%, Hypertension with Peptic-ulcer disease and Diabetes mellitus 1.4%, Hypertension with Diabetes mellitus, 1.4%). Among the three deceased patients, the prevailing co-morbidity was hypertension (100%). Therefore, the mortality rate of covid-19 patients with co-morbidities is 0.89%.

CONCLUSION: At the time of this study, Covid-19 had taken quite a toll on the world. Its disastrous impact was as a result of the novelty of the virus. Vast preventive measures were put in place to curb the continuous spread of the virus such as; proper health education, immunization programmes, etc. Nigeria as well as most West African nations did not suffer as much as her western counterparts, hence the reason for the low mortality rate recorded. There were a number of theories why this was so, but it was fortunate as we were most unprepared for an attack of such magnitude, had it hit with its full weight.

KEYWORDS: Covid-19 patients, co-morbidities, mortality rate.

I. INTRODUCTION

The COVID-19 pandemic has led to a dramatic loss of human life worldwide and presents an unprecedented challenge to public health, food systems and the world of work. The economic and social disruption caused by the pandemic is devastating: Tens of millions of people are at risk of losing their lives, falling into extreme poverty, while the number of undernourished people, estimated at nearly 690 million, by 13 October, 2020, increased by up to 132 million by the end of the year, and increased even more in the second wave. [1]

Since the declaration of the Covid 19 as a pandemic, in March 15, 2020 by the World Health Organization (WHO), in-depth research has been made to discover more about this illness. It has been discovered that patients, with co morbidities have increase mortality rate, and this study aims to determine what these co-morbodities are, how it can be prevented, and how to manage them better, for a better outcome.[2]

Mortality rate, or death rate, is a measure of the number of deaths (in general, or due to a specific cause) in a particular population, scaled to the size of that population, per unit of time. Mortality rate is typically expressed in units of

deaths per 1,000 individuals per year; thus, a mortality rate of 9.5 (out of 1,000) in a population of 1,000 would mean 9.5 deaths per year in that entire population, or 0.95% out of the total. It is distinct from "morbidity", which is either the prevalence or incidence of a disease, and also from the incidence rate (the number of newly appearing cases of the disease per unit of time).

Merriam Webster defined Covid-19 as: a mild to severe respiratory illness that is caused by a coronavirus (Severe acute respiratory syndrome coronavirus 2 of the genus Beta coronavirus), is transmitted chiefly by contact with infectious material (such as respiratory droplets) or with objects or surfaces contaminated by the causative virus, and is characterized especially by fever, cough, and shortness of breath and may progress to pneumonia and respiratory failure.

Coronavirus disease 2019 (COVID-19) is a contagious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The first case was identified in Wuhan, China, in December 2019 [3]

Coronaviruses possess an unsegmented, single-stranded, positive-sense RNA genome of around 30 kb, enclosed by a 5′-cap and 3′-poly (A) tail. [4]

In medicine, co-morbidity is the presence of one or more additional conditions often co-occurring (that is, concomitant or concurrent with) with a primary condition. Co-morbidity describes the effect of all other conditions an individual patient might have other than the primary condition of interest, and can be physiological or psychological.

As at the time of this study,deaths from COVID-19 in Africa had surged by 40%. This pushed Africa's death toll past 100 000 since the first reported case on the continent on 14 February 2020.

Not unlike other pandemics in history of its nature, mortality rate seems more driven by individual physiology, pre-existing condition, age etc., than gender, healthcare facility or ethnic predisposition.

An electronic literature review search was performed, and applicable data was then collected from peer-reviewed articles published from January to April 20, 2020. From what is known at the moment, patients with COVID-19 disease who have comorbidities, such as hypertension or diabetes mellitus, are more likely to develop a more severe course and progression of the disease.

Furthermore, older patients, especially those 65 years old and above who have comorbidities and are infected, have an increased admission rate into the intensive care unit (ICU) and mortality from the COVID-19 disease. [5]

This problem is more worrisome in developing African countries like Nigeria, where the incidence of such troublesome co-morbidities is on the increase and the management grossly substandard. The COVID-19 pandemic has rapidly spread across the globe at an exceptional speed. This outbreak has led to the death of many.

This study is significant in the field of health sciences because data collected will assist in gaining more information, and would also contribute towards development of educational awareness, of the relationship of mortality rate as regards COVID-19 patients with co-morbodities.

If we discover the most prominent co-morbidity we will design a good educational, material in how to manage the underlying diseases and help reduce the mortality rate of COVID-19 patients with co-morbodities.

In a study done by Akin Osibogun, MobolanleBalogun, Akin Abayomi, JideIdris, YetundeKuyinu, OluwakemiOdukoya, Kingsley Akinroye. Published in PLOS ONE article, 2021, case study of 2184 confirmed patients. The mortality rate was 3.3% and a significantly higher proportion of patients with comorbidities died compared to those with none. The comorbidities that predicted death were hypertension, diabetes, renal disease, cancer, and HIV[6]

Another study in a research done by Louis Gorospe et al, in 2020, on comorbidities and mortality in patients with Covid-19, aged 60 years and older in a university hospital in Spain.Study was done on 834 patients Mortality was 2.79 and 1.60 for patients with chronic kidney disease and heart failure, respectively. Patients with malignancy, chronic liver disease, obesity and diabetes also presented higher. [7]

In another study done Patients admitted for covid-19- 34,142. Patients with co-morbidities were 3,797. According to this report the most common comorbidities are hypertension (66% of deaths), type 2 diabetes (29.8% of deaths), ischemic heart disease (27.6% of deaths), atrial fibrillation (23.1% of deaths) and chronic renal failure (20.2% of deaths). [8] Chronic renal failure caused the least mortality among the patients.

In another study done by Wei-jie et al Wen-hua et al, Yi Zhao, et al, Heng-rui et al, Zi-sheng et al, published in the European Respiratory Journal 2020; among 1590 confirm covid-19 patients.

Significantly more patients with hypertension (19.7% versus 5.9%), cardiovascular diseases (22.0% versus 7.7%), cerebrovascular

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diseases (33.3% versus 7.8%), diabetes (23.8% versus 6.8%), COPD (50.0% versus 7.6%), chronic kidney diseases (28.6% versus 8.0%) and malignancy (38.9% versus 7.9%) reached to the composite endpoints compared with those without. [9] The least prevailing co morbidities that led to increased mortality rate was Hypertension

II. METHODS AND MATERIALS

STUDY AREA

This study on the assessment of the mortality rate of covid-19 patients with comorbidities at Amachara isolation centre was done among COVID-19 patients managed at Amachara isolation centre, Umuahia south LGA, Abia state, Nigeria, May, 2021.Abia state is one of the 36 states in Nigeria located in south-east of the six geopolitical zones[10]. It is one of the constituents of the Niger Delta region.Abia State was created on the 27th of August 1991. The state covers an area of 6,320 square kilometers which is approximately 5.8 percent of the total area of Nigeria. According to the population census of 2016, it has a population of about 3,720,000 people.[11] It is located along the coordinates 5□ 25' N7□ 30'.

Umuahia south LGA is one of the seventeen Local governments in Abia state. Its headquarters is at Apumiri in Ubakala. It has an area of 140km2 and a population of 138,570 at the 2006 census. Umuahia south LGA is located along the coordinates of 5□ 32N 7□ 29'E

Umuahia is the capital of Abia State; it's located at 5.5250□ N, 7.4922□ E

The isolation centre in Amachara specialist hospital is one of the two (2) isolation centres in Abia state at the time of this study.

The isolation centre was commissioned by Gov. OkezieIkpeazu, Governor of Abia state at the time of this study, had a 100-bed capacity with a full complement of medical equipment. It also had a laboratory for testing samples of COVID-19 infection in Abia state, the laboratory was approved by the Nigerian centre for disease control (NCDC) whose officials inspected it and supervised analysis of the first test samples.The results tallied with those obtained from NCDC's Abuja facility.

The director of Amachara testing laboratory is Dr. OkorieOnuka.

STUDY DESIGN

This is a case controlstudy.

STUDY POPULATION

Covid-19 patients managed at Amachara isolation centre.

SAMPLE SIZE DETERMINATION

Formula for sample size determination is given by[12]:

Minimum sample size (n) = z2pq/D2

Where;

P = estimated mortality rate in covid-19 patients with comorbidities (50%)

Z = confidence level at 95% (standard deviation of 1.96)

q = (1-p)

d = margin of error at 5% (standard deviation of 0.05)

n = (1.96)2 * 0.5 * 0.5/ (0.05)2

n = 384

SAMPLING TECHNIQUE

The case notes of the patients were used in this study.

STUDY INSTRUMENTS

The following instruments were used in this study: Microsoft Excel software, Computers

DATA COLLECTION METHOD

Data was collected from the medical files of the covid-19 patients

DATA MANAGEMENT ANALYSIS

Data was collected and analyzed by the computer using SPSS version 21 and other study instruments. The data analyzed includes; the mean of the age at last birthday. Tables and figures were used to present the data. Vital information about participants was handled confidentially.

MEASUREMENT VARIABLES

Measurements like age, sex, occupation, address, marital status, and existing comorbidity were all gotten from the patient's files

III. RESULTS:

TABLE 1: SOCIAL DEMOGRAPHIC CHARACTERISTICS

Mean age of the patients was 28±7.342

VARIABLES	FREQUENCY	PERCENTAGE
Age Range		
1-10	10	3.0
11-20	14	3.9
21-30	96	28.5

31-40	76	22.6
41-50	49	14.6
51-60	49	14.6
61-70	23	6.9
71-80	15	4.5
81 and above	5	1.5
Total	**337**	**100.0**
Sex		
Male	210	62.3
Female	127	37.7
Total	**337**	**100.0**
Residence		
Rural	157	46.6
Urban	180	53.4
Total	**337**	**100**
Marital status		
Single	133	39.5
Married	204	60.5
Total	**337**	**100**
Occupation		
Students	36	10.7
Entrepreneurs	35	10.4
Medical practitioners	24	7.3
Legal practitioners	8	2.4
Teacher	9	2.7
Banker	39	11.6
Farmer	10	3.0
Public servant	81	24.3
Clergy	8	2,4
Retired	18	5.4
Engineer	8	2.4
Unemployed	58	17.4
Total	**337**	**100**

Table one shows some demographic characteristic of covid-19 patients admitted at Amachara isolation center

Table 2: PATIENTS AND THEIR CO-MORBIDITY

Comorbidities with Covid-19	**Frequency**	**Percentage (%)**
Hypertension	28	8.3
Peptic ulcer	15	4.5
Diabetes mellitus	7	2.1
Asthma	2	0.6
Epilepsy	1	0.3
Lumbar spondylitis	1	0.3
Arthritis	2	0.6
Pregnancy	9	2.6
Tuberculosis	1	0.3
Heart disease	2	0.6
Hypertension, PUD, DM	3	1.4
Hypertension, DM	3	1.4
Nil	263	78.0
Total	**337**	**100.0**

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Out of the three hundred and thirty-seven Covid-19 patients, seventy-four patients (22%) had co morbidities, the prevailing co-morbidity was hypertension. Twenty-eight patients (8.3%) had hypertension alone. There are others like peptic ulcer diseases asthma that had varying percentages with Covid-19. Three people (1.4%) had hypertension, peptic ulcer and diabetes mellitus. Three people (1.4%) had Hypertension and diabetes mellitus

TABLE 3: SOCIAL DEMOGRAPHICS OF THE DECEASED PATIENTS

Variables	Deceased 1	Deceased 2	Deceased 3
Age	59	65	43
Sex	Male	Female	Male
Residence	Urban	Rural	Rural
Marital status	Married	Married	Married
Occupation	Transportation	Farmer	Pharmacist
Presenting complaints	Respiratory distress, body weakness, headache, fever	Unconscious	Respiratory distress, fever, cold
Drug regimen	Amlodipine, Zinc Sulphate, Vitamin c, Insulin, Gestid, Liquid Paraffin	Azithromycin, Zinc Sulphate, Vitamin .c, Hydrocortisol, Ceftriaxone, Oxygen,	Azithromycin, Vitamin c, Zinc Sulphate, Hydrocortisol, Clexaine, Dexamethasone, Nifidipine, Insulin, Losartan
Co-morbidities	Hypertension, Diabetes mellitus	Hypertension, Diabetes mellitus	Hypertension, Diabetes mellitus

The tables above show the information of patients with co morbidities that died following administration;

Two of those patients were male, the other was a female, and two were elderly while the last man was 43 years old. They presented with similar presenting complaints, except the 65year old female that was unconscious on arrival and died soon after (therefore her vital signs were not recorded).

The three patients had the same co-morbidities; Hypertension, and diabetes mellitus. Therefore, they were managed with similar drug regimen, taking into account their co-morbidity.Out of the seventy-four patients with co morbidity, three died.

Prevalence of mortality in Covid-19 patients with co morbidity = Number of patients' dead with co morbidities/ total number of patients with co morbidities * 100

3/74 *100 = 4.05.

The three deceased patients had hypertension and diabetes mellitus. Therefore, according to our research, the highest co morbidity among the deceased patients is hypertension and diabetes mellitus.

From our study, we were able to determine the lowest co-morbidity among deceased patients. There were no records of patients in the center without Covid-19 which could have formed the population at risk; we use 263 who had no co-morbidity as additional population at risk.

3/337x100 = 0.90

The routine drug regimen used to manage Covid-19 patients at Amachara isolation center are; Azithromycin, zinc sulphate, vitamin c, and chloroquine.

TABLE 4: VITAL SIGNS OF THE DECEASED PATIENTS

Vital signs	Deceased 1	Deceased 2	Deceased 3
Oxygen saturation (%)	90	23	Indeterminant
Temperature	37	38.6	Indeterminant
Respiratory (cpm)	38	38	Indeterminant
Systolic pressure (mmHg)	142	132	Indeterminant
Diastolic pressure (mmHg)	85	72	Indeterminant
Heart rate (Bpm)	103	141	Indeterminant

For the two patients that were conscious till their death; their body temperature was raised above the normal, their blood pressure was also elevated(due to the present co- morbidity, their heart rate was also significantly raised, and the oxygen saturated for the last patient was severely reduced.

Additionally, patients with co morbidities were managed with their routine drug regimen suited for the morbidities.

From our research at Amachara isolation center, considering that Amachara isolation center was the major isolation center in Abia state, it can be implied that Abia state did not suffer as much mortality as other states in Nigeria.

IV. DISCUSSION

This study was done to determine the mortality rate amongst covid 19 patients with co-morbidities at Amachara Isolation Center, Umuahia South, Abia State, Nigeria. As at the time of this study, Nigeria, like most countries in West Africa was not severely hit with the Covid-19 virus, unlike the western world.

There were three hundred and thirty seven (337) patients managed at Amachara Isolation Center as at the time of the study, a far less significant figure when compared to studies done in other parts of Nigeria and the world, as seen below;[13]

According to the data gotten from the official website of the Nigeria Centre for Disease Control(https://covid19.ncdc.gov.ng/) as at Wednesday, 28th April, 2021, the number of cases ever admitted in the isolation centers in Enugu State, Imo State, Ebonyi State and Anambra State was 2359, 1620, 1998 and 1890 respectively. [14]

In a research article by Akin Osibogun et al titled "Outcomes of COVID-19 patients with comorbidities in southwest Nigeria", published on March 15, 2021, it was recorded that exactly 2469 COVID-19 patients were admitted in the isolation centers. This was a retrospective analysis of medical records for all laboratory confirmed cases of admitted COVID-19 patients in Lagos isolation centers. [15]

3. Additionally, according to Ghana Health services' official website (https://www.ghanahealthservice.org/covid19/dashboardm.php), as at Wednesday, 28th April, 2021 the total number of 92,464 admitted COVID-19 cases was recorded and

90,103 of them discharged. [16]

According to a research done on the 17th of November 2020, by Naziru Bashir Mukhta, Auwal Abdullahi, Muhammad Aliyu Abba, Jibril Mohammed, titled "Views and experiences of discharged COVID-19 patients in Kano, Nigeria", Kano State was placed on the 7th position (out of 37 states including the FCT) in Nigeria with over 1,700 total positive cases in isolation centers and 54 deaths. [17]

Furthermore, majority of patients managed at this center was in the younger age range, a vast difference with these other studies above (In other parts of the world, where most patients would belong to the older age group). It could be implied that this was because of the difference in the shape of the population pyramid of developing countries (such as Nigeria were this study was carried out) having a broad base and a tapering off at the apex and that of the developed country having a broad base with a gradual decline towards the apex. The latter represents older population with a low death rate. Our study, however corresponded with the study by Ye Minn et al, where the mean (± SD) age was 44.81 (± 16.99) years with a range of 17–86 years and 178 (80.2%) patients were younger than 60 years. [18]

With another study done by Laura et al, published in the BMC infectious diseases magazine, where overall 61% of patients were <55; age > 75 was rarer in outpatient setting (11%) than ER (14%) or inpatient (24%) [19]. Another recent study byTürkan et al, published in the Scielo Brazil magazine, where the age range of the patients was 26-91 (average of 51.6 years)[20].

A greater percentage of patients in our study were males (62.3%). This could be attributed to the suggestion that Nigeria is a country where males contribute more to the active workforce than females and therefore are at risk of more exposure. This does corresponds to the study by Türkan et al, published in the Scielo Brazil magazine, where females made the greater percentage of patients (56.7%) [19]

Most patients at this isolation center were public servants (24.3%). This could be related to fact that public servants, generally interact more with people; at ports, offices, etc, and are therefore more prone to exposure to the virus.

In our study, very few patients were unemployed (17.4%) and even less patients were retired (5.4%), making a total of 22.8% patients that were unemployed as against 77.2 patients who were. This higher percentage of employed patients implies more interaction with the public, before, during and after the initial lockdown. This corresponds with the study done by Ye Minn et al, where 130 (58.6%) patients were employed[18].

Also, in our study, greater percentage of people resides in urban settlements (53.4%), which,

no doubt contributed to the spread of the disease. This only reinforces the point that it is of immense public health benefit that migration to urban settlements should be curbed as much as possible, as this congestion improves the spread of diseases.

The lesser percentage of patients presented with co morbidities at Amachara Isolation Center. Quite unlike the data gotten from other studies where majority of patients had at least a co-morbidity.

From our findings, the prevailing co-morbidity was hypertension. Twenty eight patients (8.3%) had hypertension alone. Three people (1.4%) had hypertension, peptic ulcer and diabetes mellitus. Three people (1.4%) had Hypertension and Diabetes Mellitus. This data agreed with those of other results by

Akin Osibogun et al; on the 5th march 2021, where the most prevailing comorbidity were hypertension (74.2%) and diabetes (30.3%). [6]

A meta-analysis study on Covid-19 done by Paudel SS, accessed in April 18 2020.

The study was done on a total number of 1786 patients. The prevailing comorbidities identified in these patients were hypertension (15.8%), cardiovascular and cerebrovascular conditions (11.7%), and diabetes (9.4%). The less common comorbidities were coexisting infection with HIV and hepatitis B (1.5%), malignancy (1.5%), respiratory illnesses (1.4%), renal disorders (0.8%), and immunodeficiency (0.01%).[21]

Garg S et al, in 2020, the study done on 1478 patients, the prevalent comorbidities being hypertension (49.7%) and obesity a close second (48.3%). Other medical conditions included chronic lung disease (34.6%), diabetes mellitus (28.3%), and cardiovascular diseases (27.8%). [22]

Louis Gorospe et al, in 2020, on comorbidities and mortality in patients with Covid-19, aged 60 years and older in a university hospital in Spain, the study was done on 834 patients among the prevalent comorbidity Hypertension was the most frequent (64.6%), followed by chronic kidney disease (29.3%), diabetes (28.1%), chronic respiratory disease (17.1%), heart failure (11.9%), obesity (6.6%), malignancy (5.4%), and chronic liver disease (2.3%).[7]

L, Andrianou X, Barbariol P, Bella A, Bellino S, Benelli E, et al in the year 22 July 2020, Patients admitted for covid-19- were 34,142, According to this report the most common comorbidities are hypertension (66% of deaths), type 2 diabetes (29.8% of deaths), ischemic heart disease (27.6% of deaths), atrial fibrillation (23.1% of deaths) and chronic renal failure (20.2% of deaths). [8]

Wei-jie Guan, Wen-hua Liang, Yi Zhao, Heng-rui Liang, Zi-sheng Chen, Yi-min Li, et al, on behalf of China medical treatment, expert group for Covid-19 in 2020, on 1590 patients with Covid-19, The prevalence of specific comorbidities was: hypertension (269; 16.9%), other cardiovascular diseases (53.7%) cerebrovascular diseases (30; 1.9%), diabetes (130; 8.2%), hepatitis B infections (28; 1.8%), chronic obstructive pulmonary disease (24; 1.5%), chronic kidney diseases (21; 1.3%), malignancy (18; 1.1%) and immunodeficiency (3; 0.2%).[9]

Contrasted with "Centers for Disease Control and Prevention" (CDC), 11 February 2020. Most critical respiratory comorbidities according to the CDC are: moderate or severe asthma, pre-existing COPD, pulmonary fibrosis and cystic fibrosis.[11]

We were able to determine the co-morbidity with the mortality risk as hypertension in this center, but were unable to determine the comorbidity with the least risk. This report, factored by our smaller sample frame compared with other studies;

A study done by Wei-jie et al Wen-hua et al, Yi Zhao, et al, Heng-rui et al, Zi-sheng et al

Published in the European Respiratory Journal 2020; among 1590 confirm covid-19 patients.

The least prevailing co morbidity that led to increased mortality rate was hypertension

Another study done by Akin Osibogun, MobolanleBalogun, Akin Abayomi, JideIdris, YetundeKuyinu, OluwakemiOdukoya, Kingsley Akinroye

Published in PLOS ONE article, 2021

Case study of 2184 confirmed patients[6] .The least prevalent co morbidity causing death is Human immune virus. Another study done by Palmieri L, Andrianou X, Barbariol P, Bella A, Bellino S, Benelli E, et al in the year (22 July 2020).

Chronic renal failure caused the least mortality among the patients. [8]

Most critical respiratory comorbidities according to the CDC are: moderate or severe asthma, pre-existing COPD, pulmonary fibrosis, cystic fibrosis.[13]

Another study in a research done by Louis Gorospe et al, in 2020, on comorbidities and mortality in patients with Covid-19, aged 60 years and older in a university hospital in Spain

Study was done on 834 patients

Obesity was the co-morbidity least implicated for increased mortality rate in this study.

Finally, as concerning the management of Covid-19 patients with co-morbidity, each management was tailored to the specific morbidity present, accompanying the routine Covid-19 drug regimens, according to this study. This is similar to the management plan gotten from other studies.

V. CONCLUSION

At the time of this study, Covid-19 had taken quite a toll on the world. Its disastrous impact was as a result of the novelty of the virus. Vast preventive measures were put in place to curb the continuous spread of the virus such as; proper health education, immunization programmes, etc.

Nigeria as well as most West African nations did not suffer as much as her western counterparts. There were a number of theories why this was so, but it was fortunate as we were most unprepared for an attack of such magnitude, had it hit with its full weight.

VI. RECOMMENDATIONS

Health Education: Educating the people on Covid 19 preventive protocols that have been shown to be helpful in reducing the spread of the virus. This is especially needful in the rural settlements.

Ensuring that people receive the vaccination by; advising on adequate government involvement and enforcements, implanting vaccinations campaigns to promote awareness and debunk popular conspiracy theories against it.

Counseling and encouraging of high-risk /target groups, especially individuals with co-morbidities to adhere strictly to their drug regimen, eat healthy food and fruits to boost their immune system and restrict their movement, all in a bid to reduce risk of infection.

Routine visits to isolation centers by health agencies to ensure that these individuals with co morbidities are properly managed to reduce the mortality rate.

Government aid to individuals; food security, accessibility to vaccines, etc. should be re-enforced to encourage individuals, especially among the low income families adhere better to covid 19 safety protocols.

In light of the newly discovered strains of the virus, the government and medical professionals should continue to encourage individuals who have previously been vaccinated to take the booster doses of the various vaccines to improve immunity against the disease.

Transparency on the side of the government and the various Pharmaceutical companies should be demanded so as to increase awareness of the various side effects of the vaccines.

CONFLICT OF INTEREST: The authors have declared no conflict of interest.

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