International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 8 Aug. 2022, pp: 871-883 www.ijaem.net ISSN: 2395-5252

Virological and immunological consequences of Covid -19 pandemic distribution across different countries; A seven days update study

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Submitted: 10-08-2022 Revised: 17-08-2022 Accepted: 20-08-2022

ABSTRACT

Introduction/Aim: The pandemic is not ending—and it may not end soon. There will be endless debate for years to come about the best ways to mitigate the pandemic. Because of lack of complete knowledge of the virus, shortage in vaccine supply etc, understanding how the virus spread per country may determine relativity in infectivity and vaccine emergency. The aim of these study is to determine the Virological and immunological consequences of Covid -19 pandemic distribution across different countries; A seven days update study

Method: Data from one hundred and forty-two countries were studied based on continents, countries and cases of infection. Data were obtained from United Nations Geoschemeand WHO. They were analyzed and compared to values obtained for the United State of America (USA). **Result:** Data analyzed showed that the USA has made progress in containing the virus compared to previous months and years. Most African countries are relativelyunaffected while Americans and Europeans appear to be most affected. **Conclusion:** The result from the study shows that the Africansystem may have developed various mechanisms to cope and survive the virus pandemic compared to other regions of the world. Hence, vaccination may be Africa's least problem.

Keywords: Omicron, COVID-19, transmissibility, USA, Africa

I. INTRODUCTION

Coronaviruses (CoV) is from a family of viruses that causes different form of illness ranging from the common cold to more severe diseases. On 30 January 2020[1,2,3,4]. Dr Tedros Adhanom Ghebreyesus, WHO Director-General declared the novel coronavirus outbreak a public health emergency of international concern (PHEIC), WHO's the highest level of alarm[5]. At that time there were 98 cases and no deaths in 18 countries outside China[6,7,,8,9]. On 11 March 2020, the rapid increase in the number of cases outside China led the WHO Director-General to announce that the outbreak could be characterized as a pandemic[10,11]. By then more than 118 000 cases had been reported in 114 countries, and 4291 deaths had been recorded. By mid-March 2020, the WHO European Region had become the epicentre of the epidemic, reporting over 40% of globally confirmed cases[12,13,14]. As of 28 April 2020, 63% of global mortality from the virus was from the Region[15,16]. Several possibly variant of the Covid virus, particularly delta and omicron variant has been identified. This has complicated the progress so far achieved.

The Omicron variant of COVID-19 has been called a variant of concern by WHO based on the evidence that it has several mutations that may have an impact on how it behaves[15,16,17,18]. There is

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still substantial uncertainty regarding Omicron and a lot of research is underway to evaluate its transmissibility, severity and reinfection risk. It is not currently known if the Omicron variant is more or less severe than other strains of COVID-19, including Delta.

The different waves of the disease have been of concern which may be due to changes in weather and mutated strain of the virus identified in some countries[19-24]. There is the need to understand this surge per country with the virulent and spreading ability of the newly mutated strain of the virus. Also, several studies have been carried out on the demographics strength and nature of the virus, but analyzing updated information per time is very essential in managing the trend[25-27]. The aim of these study carryout a Seven days Update study with Virological and immunological implication of Covid -19 pandemic distribution across different countries

II. MATERIAL AND METHOD

Study area: Data from 23th 29th December, 2021, were obtained from the United Nations geoscheme and WHO (WHO 2021).

Methodology:

A total of one hundred and forty-two (142) countries across different regions of the the world was selected based on COVID-19 incidences. The listed countries and territories with their continental regional classification were based on the United Nations geoscheme and WHO. Data obtained for each country over 7 days per 1000000 respective populations were analyzed and directly compared to that of the United States of America (USA).

The USA was used as a Comparison Factor (CF) also referred to as Oyepata Factor (OF), because it has one of the best healthcare systems and still the highest cumulative COVID-19 cases with a relatively large population in the world. All data used in these analyses are from publicly available data sets.

STATISTICAL ANALYSIS

Parameters such as seven days incidences and deaths per 1000000 of the respective country population were compared against factors obtained for the USA. Bivariate analysis was done with a Chi-square test to compare proportions for variables. In reporting these results, country-level characteristics are scaled to represent a comparison of two countries similar in all other respects. Thus, rate ratios greater than one means that higher levels of a given characteristic are associated with higher rates of COVID-19 cases or deaths, while rate ratios less than one means that lower levels of a given characteristic are associated with lower rates of COVID-19 cases or deaths.

III. RESULT

Compared to other parts of the world and previous analyses, the USA has made tremendous progress in infectivity and mortality rate. Europe appears to be most affected, while most African countries except for South Africa have progressive control of the situation. Also, it was observed that most African countries have lower mortality compared to cases of infection **(Table 1).** Figure 1 and 2 shows comparison factors of different countries as compared with that of USA

Table 1: Infectious and mortality rate of COVID-19 based on country

#	Country	Cases in the last 7 days	Cases in the last 7 days/1M pop (A)	B A/2138	Deaths in the last 7 days	Deaths in the last 7 days/1M pop ©	D C/23
1	USA	713,768	2,138	1.00	7,814	23	1.00
2	UK	355,660	5,200	2.43	834	12	0.52
3	Germany	351,073	4,171	1.95	2,727	32	1.39
4	France	341,428	5,214	2.44	896	14	0.61
5	Russia	215,283	1,474	0.69	8,205	56	2.43
6	Poland	156,825	4,150	1.94	2,804	74	3.22
7	Turkey	139,062	1,624	0.76	1,321	15	0.65
8	South Africa	135,803	2,249	1.05	171	3	0.13

9	Netherlands	128,472	7,474	3.50	444	26	1.13
10	Italy	116,436	1,930	0.90	636	11	0.48
11	Vietnam	103,959	1,054	0.49	1,579	16	0.70
12	Spain	98,530	2,106	0.99	250	5	0.22
13	Czechia	93,257	8,685	4.06	714	66	2.87
14	Belgium	87,011	7,461	3.49	280	24	1.04
15	Switzerland	63,530	7,264	3.40	126	14	0.61
16	Ukraine	61,615	1,421	0.66	2,747	63	2.74
17	India	56,299	40	0.02	2,099	1	0.04
18	Hungary	48,053	4,993	2.34	1,307	136	5.91
19	Brazil	46,776	218	0.10	1,267	6	0.26
20	Slovakia	45,382	8,306	3.88	528	97	4.22
21	Denmark	45,278	7,777	3.64	68	12	0.52
22	S. Korea	44,237	862	0.40	401	8	0.35
23	Greece	36,656	3,542	1.66	650	63	2.74
24	Jordan	34,077	3,293	1.54	221	21	0.91
25	Malaysia	32,867	997	0.47	265	8	0.35
26	Norway	32,394	5,909	2.76	43	8	0.35
27	Austria	29,556	3,255	1.52	366	40	1.74
28	Ireland	29,373	5,854	2.74	81	16	0.70
29	Zimbabwe	28,094	1,851	0.87	28	2	0.09
30	Portugal	27,501	2,708	1.27	121	12	0.52
31	Thailand	27,405	391	0.18	227	3	0.13
32	Canada	25,861	677	0.32	146	4	0.17
33	Georgia	23,993	6,031	2.82	387	97	4.22
34	Croatia	23,165	5,694	2.66	401	99	4.30
35	Iran	20,348	238	0.11	522	6	0.26
36	Argentina	17,779	388	0.18	125	3	0.13
37	Mexico	17,068	130	0.06	1,466	11	0.48
38	Colombia	12,470	241	0.11	327	6	0.26
39	Sweden	11,914	1,169	0.55	5	0.5	0.02
40	Bulgaria	11,528	1,677	0.78	684	100	4.35
41	Lithuania	11,280	4,229	1.98	131	49	2.13
42	Lebanon	11,253	1,659	0.78	73	11	0.48
43	Australia	11,088	428	0.20	54	2	0.09
44	Belarus	10,910	1,155	0.54	114	12	0.52

45	Serbia	10,384	1,195	0.56	261	30	1.30
46	Chile	10,257	530	0.25	185	10	0.43
47	Slovenia	9,888	4,755	2.22	106	51	2.22
48	Finland	9,825	1,769	0.83	61	11	0.48
49	Bolivia	9,727	817	0.38	90	8	0.35
50	Azerbaijan	8,092	788	0.37	121	12	0.52
51	Peru	7,612	226	0.11	271	8	0.35
52	Romania	7,113	373	0.17	528	28	1.22
53	Egypt	6,036	57	0.03	333	3	0.13
54	Trinidad and Tobago	5,473	3,892	1.82	145	103	4.48
55	Sri Lanka	5,220	242	0.11	153	7	0.30
56	Kazakhstan	4,334	227	0.11	83	4	0.17
57	Singapore	4,151	702	0.33	35	6	0.26
58	Israel	4,109	441	0.21	12	1	0.04
59	Cyprus	4,019	3,294	1.54	9	7	0.30
60	Ecuador	3,841	213	0.10	74	4	0.17
61	Venezuela	3,765	133	0.06	46	2	0.09
62	Iraq	3,491	84	0.04	93	2	0.09
63	Moldova	3,403	846	0.40	151	38	1.65
64	Bosnia and Herzegovina	3,384	1,041	0.49	234	72	3.13
65	Estonia	3,286	2,475	1.16	29	22	0.96
66	Libya	3,116	445	0.21	60	9	0.39
67	Namibia	3,053	1,171	0.55	3	1	0.04
68	Nigeria	2,859	13	0.01	1	0	0.00
69	Myanmar	2,254	41	0.02	42	0.8	0.03
70	Pakistan	2,224	10	0.00	63	0.3	0.01
71	Palestine	2,122	402	0.19	27	5	0.22
72	Albania	2,057	716	0.33	24	8	0.35
73	Bangladesh	1,882	11	0.01	27	0.2	0.01

74	Philippines	1,832	16	0.01	894	8	0.35
75	Armenia	1,815	611	0.29	119	40	1.74
76	Mongolia	1,810	540	0.25	17	5	0.22
77	Mozambique	1,750	54	0.03	3	0.1	0.00
78	Panama	1,728	392	0.18	12	3	0.13
79	Nepal	1,630	55	0.03	13	0.4	0.02
80	Uruguay	1,584	454	0.21	11	3	0.13
81	Indonesia	1,458	5	0.00	69	0.2	0.01
82	Uzbekistan	1,414	41	0.02	18	0.5	0.02
83	DRC	1,388	15	0.01	5	0.1	0.00
84	Algeria	1,379	31	0.01	42	0.9	0.04
85	Tunisia	1,143	95	0.04	31	3	0.13
86	Qatar	1,131	403	0.19	2	0.7	0.03
87	Sudan	1,040	23	0.01	44	1	0.04
88	Madagascar	994	35	0.02	8	0.3	0.01
89	Maldives	908	1,638	0.77	4	7	0.30
90	Ethiopia	900	8	0.00	29	0.2	0.01
91	Kenya	898	16	0.01	13	0.2	0.01
92	Morocco	891	24	0.01	8	0.2	0.01
93	Iceland	885	2,569	1.20	0	0	0.00
94	Japan	861	7	0.00	9	0.1	0.00
95	Botswana	788	326	0.15	2	0.8	0.03
96	Zambia	765	40	0.02	3	0.2	0.01
97	New Zealand	689	138	0.06	2	0.4	0.02
98	Mali	676	32	0.01	11	0.5	0.02
99	Isle of Man	654	7,633	3.57	1	12	0.52
100	Syria	653	36	0.02	37	2	0.09
101	Ghana	627	20	0.01	34	1	0.04
102	Malta	612	1,381	0.65	2	5	0.22
103	El Salvador	593	91	0.04	12	2	0.09
104	Cuba	538	48	0.02	4	0.4	0.02
105	China	537	0.4	0.00	0	0	0.00

106	Mauritius	523	410	0.19	86	67	2.91
107	UAE	474	47	0.02	3	0.3	0.01
108	Faeroe Islands	456	9,281	4.34	0	0	0.00
109	Costa Rica	432	84	0.04	15	3	0.13
110	Cameroon	401	15	0.01	19	0.7	0.03
111	Paraguay	383	53	0.02	27	4	0.17
112	Burkina Faso	334	15	0.01	4	0.2	0.01
113	Saudi Arabia	328	9	0.00	9	0.3	0.01
114	Uganda	318	7	0.00	14	0.3	0.01
115	Jamaica	296	99	0.05	15	5	0.22
116	Malawi	284	14	0.01	1	0.1	0.00
117	Honduras	251	25	0.01	8	0.8	0.03
118	Mauritania	248	51	0.02	9	2	0.09
119	Bahrain	234	131	0.06	0	0	0.00
120	Haiti	234	20	0.01	11	0.9	0.04
121	Kuwait	220	50	0.02	1	0.2	0.01
122	Rwanda	220	16	0.01	1	0.1	0.00
123	Monaco	209	5,272	2.47	0	0	0.00
124	Burundi	193	16	0.01	0	0	0.00
125	Eritrea	188	52	0.02	2	0.6	0.03
126	Afghanistan	179	4	0.00	16	0.4	0.02
127	CAR	170	34	0.02	0	0	0.00
128	Angola	145	4	0.00	2	0.1	0.00
129	South Sudan	115	10	0.00	0	0	0.00
130	Gabon	114	50	0.02	2	0.9	0.04
131	Congo	96	17	0.01	5	0.9	0.04
132	Togo	96	11	0.01	0	0	0.00
133	Taiwan	85	4	0.00	0	0	0.00
134	Ivory Coast	81	3	0.00	0	0	0.00
135	Niger	81	3	0.00	7	0.3	0.01
136	Senegal	62	4	0.00	0	0	0.00

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137	Yemen	44	1	0.00	17	0.6	0.03
138	Tanzania	39	0.6	0.00	4	0.1	0.00
139	Benin	34	3	0.00	0	0	0.00
140	Sierra Leone	19	2	0.00	0	0	0.00
141	Liberia	9	2	0.00	0	0	0.00
142	Chad	0	0	0.00	0	0	0.00

Sources and data used were provided under Latest Updates from WHO/World meter's from 25thOctoer to 31st October 2021

The data in Fig. 1-2 obtained for the USA were used as the comparison factor (CF) or Oyepata Factor, which is a ratio of the figure obtained to the respective country population divided by the value obtained for the USA.
Values of CF1 (or OF1) and CF2 (or OF2) represent the case/incidence and mortality index.
Factor of more than 1 = very high infection and mortality index
Factor of approximately 1 = high infection and mortality index
Factor of ≤1 but ≥0.5 = moderately high infection and mortality index
Factor of ≤ 0.5 but ≥ 0.1 = low infection and mortality index
Factor of <0.1 = very low infection, mortality and recovery index
Oyepata factor= data obtained from a particular country divided by that of another country with significant or most prevalent case (in this case USA).

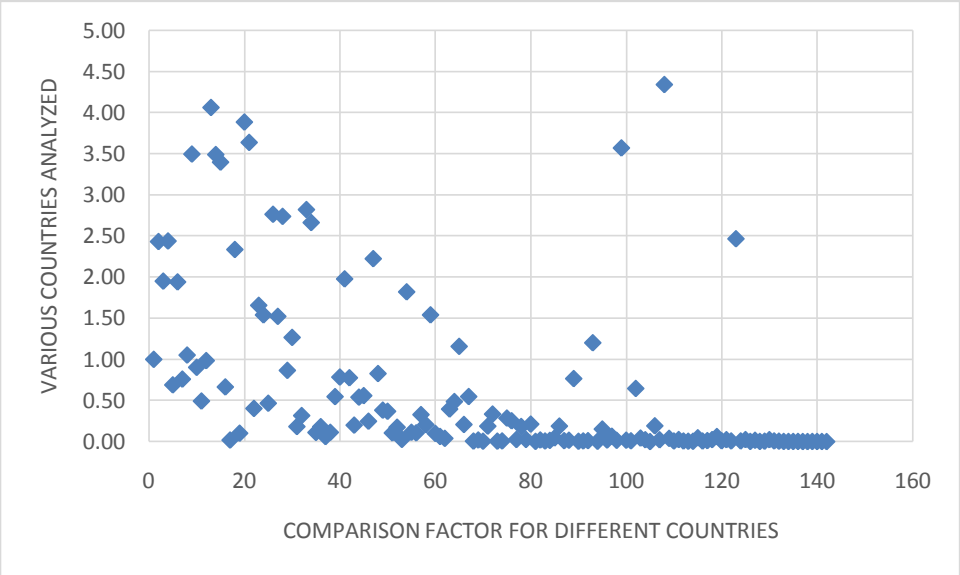

Figure 1:graph showing7 days infection case per country relative to the USA

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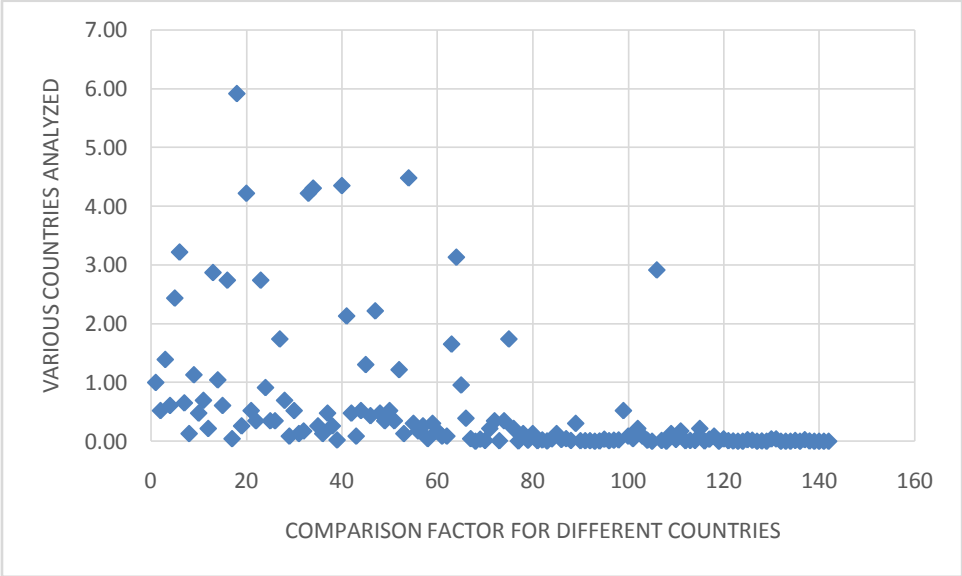

Figure 2: graph showing death over 7 days caused by Covid-19 per country relative to the USA
Footnote: X-axis represents comparison factor for different countries
Y-axis representsvarious countries analyzed

IV. DISCUSSION

The world has had to reset itself since the outbreak of the pandemic. Emergence of mutated strain has further complicated the success achieved so far[28]. The result emphasized a relationship between a virus that ravaged the West and a seemly undisturbed Africa. There are many factors to be made out and understood from the result. There is currently a gradual surge in cases of Covid -19 in several regions of the world[29-32]. Introduction Vaccination has been of tremendousgain in the fight against the virus[33-36]. But the recent emergence of a mutant strain, called Omicron[37-39] appears to take the world backward from steady progress been made. Although, current study and information seem to favour the idea that the new strain is less severe[41-46], particularly to those previously vaccinated[47-49]. This, therefore, emphasizes the need and global pressure for whole global vaccination. Vaccination seems to be in short supply in any part of the world. This necessitated consideration of regions or countries based on relative incidences and death. To date the best approach in combating the virus rampage is vaccination.

Based on the above result, the USA has made a tremendous stride in preventing the spread of the virus and lowering mortality when compared to the previous studies[50-51]. Western countries, particularly, Europe is experiencingan upsurge in cases and mortality. This may be due to the winter season. Coronaviruses die very quickly when exposed to the UV light in sunlight and like other enveloped viruses, SARS-CoV-2 survives longest when the temperature is at room temperature or lower[52] . Infections caused by many respiratory viruses, which includes coronaviruses, swell in winter and drop in summer. Researchers believe it's too early in the COVID-19 pandemic to ascertain if SARS-CoV-2 becomes a seasonal virus[50]. But growing evidence suggests that a small seasonal effect will probably contribute to bigger outbreaks in winter, based on what is known about how the virus spreads and how people behave in colder months[50,52] .

Mortality records will make it appear the virus is abating, because we are becoming better at treating the symptoms and preventing death and because most people will have at least some degree of immunity, making death much less likely[33]. The virus has died down in both of the last summers. But with more contagious strains, far fewer controls and an exhausted tolerance for social distancing, that might not happen this year. It could be many years before a more-or-less-regular seasonal pattern emerges and it could be several decades before it is seen as a less serious disease because our immunity, especially among the now young, has grown. We have no useful historical analogue[15,22]. There is speculation that some previous pandemics thought to have been of influenza actually introduced a novel coronavirus (one of the current common-cold viruses). This remains however speculative and none is more recent than 120 years ago, when there were far fewer elderly and other causes of death were very

much more common[51]. Back then a Covid-19 equivalent would thus have killed or rendered seriously ill many times fewer people. Far too many think the pandemic is over—or at least coming to an end. The prevalence rates revealed by the various surveillance surveys negate that. Close population monitoring is thus imperative[51].

Africa seems to be least affected by the health effect of Covid-19. This success report remains steady with previous works[28,34,40,49], Also, Africans showed lesser mortality relative to the case of the infection. This means Africa is less symptomatically affected, and when they are exposed to the western lethal virus, their immune system seems to respond strongly to prevent further health complications. Africa is classified as a third world or anunderdeveloped continent[53]. The reason for the lesser tragedy from the pandemic in Africa has been a medical mystery. Most African communities exist as a community and in dense clusters which is an obvious contrast to most developed countries that are more solitary nature[53,54]. Therefore, there is a higher probability that most individuals in Africa may have been exposed to the virus without knowing or developing major symptoms. It has been reported, that because of poor health and lack of environmental hygiene, the immune systems of African children develop faster than those of Dutch children[55,56,57]. Exposure to bacteria, viral and fungi pathogens in childhood may have contributed to the strengthened immune system and protectchildren from developing asthma allergies and other infectious diseases, on subsequence exposure to the likely similar allergen/pathogen[58,59]. This view is also supported by data and comparison factors obtained from Haiti. Haiti is still the poorest country in the Latin America and Caribbean region and among the poorest countries in the world[60,61]. They have one of the least cases of infection and mortality with regards to Covid 19, resulting in little to no significant value of comparison factor. Thus, poor environmental condition, which increases the possibility of early exposure to some diseases in Africa and Haiti may have resulted in a more robust innate and/or adaptive immune response. As a result countries in Africa are both vulnerable and potentially more resilient to the coronavirus.

V. CONCLUSION

Africa needs a vaccine, but in an emergency when compared to the western world, its survival may not be desperately dependent on vaccination, because most individuals in African countries may have been naturally and unconsciously immune.

More studies and surveys need to be conducted to understand the virus infectivity and its significance to Africa and maybe the rest of the world.

Conflict of Interest

The authors declare that there are not any potential conflicts of interest

Acknowledgement

The authors wish to appreciate and thank everyone who has contributed to the success of this study. Special appreciation to the United Nations Geo scheme and WHO for access to raw data per country was gotten.

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