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RESEARCH ARTICLE

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Clinical characteristics of 4499 COVID-19 patients in Africa: A meta-analysis

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Abstract

The novel coronavirus disease-2019 (COVID-19) pandemic that started in December 2019 has affected over 95 million people and killed over 2 million people as of January 19, 2021. While more studies are published to help us understand the virus, there is a dearth of studies on the clinical characteristics and associated outcomes of the severe acute respiratory syndrome coronavirus 2 on the African continent. We evaluated evidence from previous studies in Africa available in six databases between January 1 and October 6, 2020. Meta-analysis was then performed using Open-Meta Analyst and Jamovi software. A total of seven studies, including 4499 COVID-19 patients, were included. The result of the meta-analysis showed that 68.8% of infected patients were male. Common symptoms presented (with their incidences) were fever (42.8%), cough (33.3%), headache (11.3%), and breathing problems (16.8%). Other minor occurring symptoms included diarrhea (7.5%) and rhinorrhea (9.4%). Fatality rate was 5.6%. There was no publication bias in the study. This study presents the first description and analysis of the clinical characteristics of COVID-19 patients in Africa. The most common symptoms are fever, cough, and breathing problems.

KEYWORDS

coronavirus, pathogenesis, research and analysis methods, virus classification

1 | INTRODUCTION

A disease that was first reported in early December 2019[1] has led to a pandemic in 2020 that has resulted in about 95 million people and killed over 2 million people as of January 19, 2021.[2] Nearly every continent of the earth, except Antarctica, has felt the impact of the novel coronavirus disease 2019 (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[3,4] It was predicted that Africa would be the worst hit with the pandemic, having no less than 223 million cases and more than 150,000 fatalities.[3,5] However, 8 months into the pandemic, this is not the case. The World Health Organization African Region, comprising only 47 member states on the continent (without Djibouti, Egypt, Libya, Morocco, Somalia, Sudan, and Tunisia), has reported only 3.2% of all COVID-19 cases (1,259,192 of 39,596,858) and 2.6% of deaths (28,313 of 1,107,374) globally as of October 18th, 2020.[2,6]

Nevertheless, to improve our understanding and management of this novel disease, it remains pertinent to define and analyze the clinical characteristics and outcomes of the disease in patients.[7] Several studies have described the clinical and epidemiological characteristics, risk factors, case management, and associated outcomes of different patient cohorts with COVID-19 globally.[1,7–15] Clinical features, diagnosis, and treatment of COVID-19 have also been reviewed elsewhere.[16] However, there is limited information on the clinical characteristics of COVID-19 in patients in Africa. In this study, we describe a meta-analysis of the clinical characteristics of COVID-19 patients in Africa.

2 | METHODOLOGY

2.1 | Search databases and search strategy

PubMed, Google Scholar, Scopus, The Cochrane Library, EMBASE, and Africa Journal online (AJOL) were electronically searched to collect clinical studies on the clinical characteristics of COVID-19 from January 1, 2020 to October 6, 2020. We also performed a manual search of the reference lists of included studies to avoid omitting any eligible study. Only studies written in the English language and published online were included. The following terms were used in search alone OR in combination: "Coronavirus" OR "2019-nCoV" OR "COVID-19" OR "SARS-CoV-2" AND "Africa" OR "Comoros" OR "Djibouti" OR "Madagascar" OR "Malawi" OR "Seychelles" OR "Cameroon" OR "Central African Republic" OR "Chad" OR "Congo" OR "Equatorial Guinea" OR "Atlantic Islands" OR "Gabon" OR "Morocco" OR "South Sudan" OR "Sudan" OR "Botswana" OR "Lesotho" OR "Swaziland" OR "Benin" OR "Burkina Faso" OR "Cape Verde" OR "Ghana" OR "Guinea" OR "Guinea-Bissau" OR "Mauritania" OR "Niger" OR "Senegal" OR "Sierra Leone" OR "Togo" OR "Burundi" OR "Eritrea" OR "Ethiopia" OR "Kenya" OR "Mozambique" OR "Rwanda" OR "Somalia" OR "Tanzania" OR "Uganda" OR "Zambia" OR "Zimbabwe" OR "Angola" OR "Algeria" OR "Egypt" OR "Tunisia" OR "Namibia" OR "South Africa" OR "Gambia" OR "Liberia" OR "Mali" OR "Nigeria" AND English [lang]. Figure 1 shows the flow chart of the literature screening process.

2.2 | Inclusion and exclusion criteria

The inclusion criteria were as follows: (1) cohort studies, case-control studies, and case series studies; (2) the study population included individuals diagnosed with COVID-19; and (3) the primary outcomes were: clinical symptoms, signs, demographics, and fatality rate, and so forth. The exclusion criteria were as follows: (1) overlapping or duplicate studies; (2) the epidemiological analysis with only secondary outcomes such as fatality rate, without the primary outcomes; and (3) had no clinical indicators or lacking necessary data.

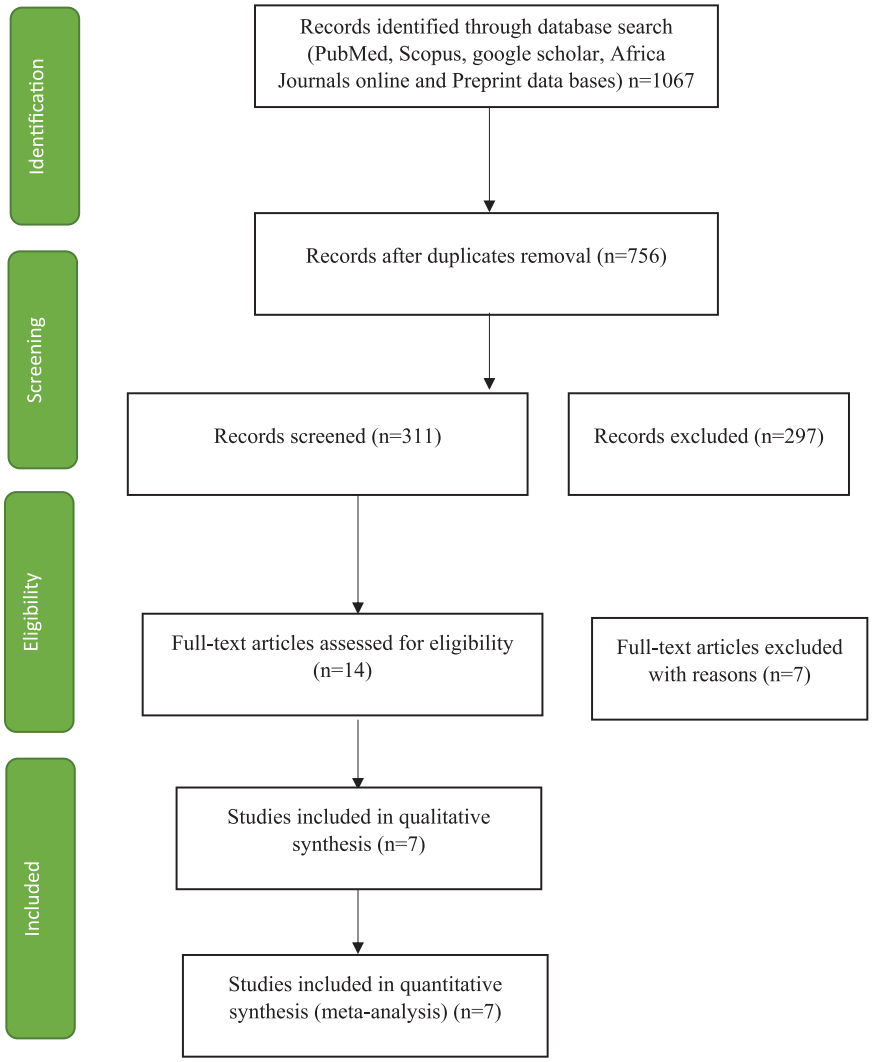

FIGURE 1 Flow chart of the literature screening process

2.3 | Data extraction and quality assessment

Two reviewers, using the inclusion and exclusion criteria, independently selected the literature and extracted data to an Excel database, and any disagreement was resolved by consensus. Data extraction included the first author's surname and the date of publication of the article, study region/country, study design, sample size, age, and outcome measurement data such as clinical symptoms. The included studies of these meta-analyses were observational case series studies, so the British National Institute for Clinical Excellence (BNICE) was used to evaluate the study quality by the independent reviewers. The evaluation included eight items and the total score was 8. Studies with a score greater than 4 were seen as high-quality.

2.4 | Statistical analysis

All the meta-analyses were performed by using Open-Meta Analyst[27] and Jamovi software. A single-arm meta-analysis was carried out. The heterogeneity was quantified using the I^2 statistic. The random model was utilized for statistical heterogeneity between the results of each study.

3 | RESULTS

3.1 | Literature retrieval and article characteristics

A total of 1065 records were identified during literature retrieval from databases. A total of seven studies involving 4499 COVID-19 patients were included in this meta-analysis[8,9,15,15,17–20] (Figure 1 and Table 1).

All studies included in this meta-analysis were conducted in African countries. The characteristics of the studies included in this meta-analysis were published between June 1, 2020 to October 2, 2020. The quality score of the included studies ranged from 5 to 7 on a maximum scale of quality score of 8 using the NICE criteria[28] (Table 1).

3.2 | Gender distribution

The random-effect model was used in the meta-analysis. Gender distribution showed that the proportion of male was 68.8% (95% CI, 64.6%–72.9%) with significant heterogeneity $I^2 = 65.16\%$, $p = .014$ (Figure 3), while the proportion of females in the study was 41.1% (31.8%–50.4%) with significant heterogeneity ($I^2 = 94.28\%$), $p = .001$ (Figure 5).

3.3 | Clinical symptoms

The incidence of commonly encountered symptoms was as follows: Fever (42.8%, 95% CI, 30.7%–54.9%), cough (33.3%, 95% CI, 24.0%–42.5%), headache (11.3%, 95% CI, 2.9%–25.4%), breathing problem (16.8%, 95% CI, 4.5%–29.1%), diarrhea (7.5%, 95% CI, 2.8%–12.2%), and rhinorrhea (9.4%, 95% CI, 8.5%–10.4%), as shown in Table 2.

3.4 | Fatality rate

The fatality rate in the 4490 patients included in the meta-analysis was 5.6% (95% CI, 2.7%–8.6%) with significant heterogeneity ($I^2 = 85.9\%$, $p \leq .001$) (Figure 4).

TABLE 1 Basic characteristics and quality score of included studies

S/N	Studies	Countries	Number of patients	Quality score according to NICE criteria	Date published
1	Chekhlabi et al.	Morocco	15	6	June 1, 2020
2	Abimbola-Bowale et al.	Nigeria	32	5	May 6. 2020
3	Abdoul Aziz-Diouf et al.	Senegal	9	5	
4	Nachega et al.	Congo	766	6	October 2, 2020
5	Kirenga et al.	Uganda	56	7	August 24, 2020
6	Elimian et al.	Nigeria	3467	6	August 26, 2020
7	Otuonye et al. (pre-print)	Nigeria	154	5	September 24, 2020
	Total		4499		

Abbreviation: NICE, National Institute for Clinical Excellence.

TABLE 2 Meta-analysis of different clinical symptoms in COVID-19 patients

Symptoms	No. of studies	No. of patients	Heterogeneity		Model	Meta-analysis	
			p	I^2		*E* (95% CI)	*p*
Fever	6	1108	<.001	88.25%	Random	0.428 (0.307, 0.549)	<.001
Cough	6	1003	<.001	79.99%	Random	0.332 (0.240, 0.425	<.001
Headache	3	31	<.001	85.99%	Random	0.113 (−0.029, 0.254	<.001
Rhinorrhea	5	354	.430	0.0%	Random	0.094 (0.085, 0.104	.430
Diarrhea	6	163	.003	72.15%	Random	0.075 (0.028, 0.122)	.003
Breathing problem	4	427	<.001	95.83%	Random	0.168 (0.045, 0.291)	<.001

Note: I^2, measure of heterogeneity; *p*, significant level.
Abbreviations: CI, confidence interval, E, estimate.

3.5 | Publication bias

The funnel plot (Figure 2) regarding the proportion of males in COVID-19 patients, with Egger's regression asymmetry test ($p = .317$) and Kendall's Tau test ($p = .239$) indicated there was no notable evidence of publication bias, while the female's proportion in the analysis also showed no significant bias ($p = .228$) (Figure 6).

4 | DISCUSSION

SARS-COV-2 is a positive-stranded single-stranded RNA virus within the β-coronavirus cluster.[11] Humans have experienced two prior outbreaks of coronavirus infections—SARS in 2002 and Middle East Respiratory Syndrome (MERS) in 2012, all within the past two decades.[21] Since the outbreak of COVID-19 in China, and the first infection record on African soil, identifying the clinical characteristics and its dynamics in COVID-19 patients has been the key effort of most clinical studies. In this study, we evaluated evidence from previous studies in Africa and conducted this meta-analysis to systematically review the clinical characteristics of COVID-19 patients on the continent between June 1 and October 2, 2020. Our analysis included 4490 COVID-19 patients from seven studies conducted in five countries (Morocco, Senegal, Uganda, Congo, and Nigeria). To the best of our knowledge, this is the first description and analysis of the clinical characteristics of COVID-19 patients in Africa.

From our analysis, males were the most affected subjects. This finding agrees with the finding of several studies conducted on other continents, such as China,[10,11,13,13,14] Kuwait,[7] and the United States.[12] Although, during the SARS-CoV pandemic in 2002, there was a female dominance,[22] and in a study of 869 patients confirmed with COVID-19 in Wuhan, China, there were fewer men (43.4%).[13] The most common symptoms of patients with COVID-19 encountered were fever, cough, breathing problem, and headache, while diarrhea and rhinorrhea were the least encountered. Fever as a clinical symptom of SARS-CoV-2 infection has been found to be associated with other previous coronaviruses infections as documented by SARS-CoV, MERS-CoV, and SARS-CoV-2.[22,23]

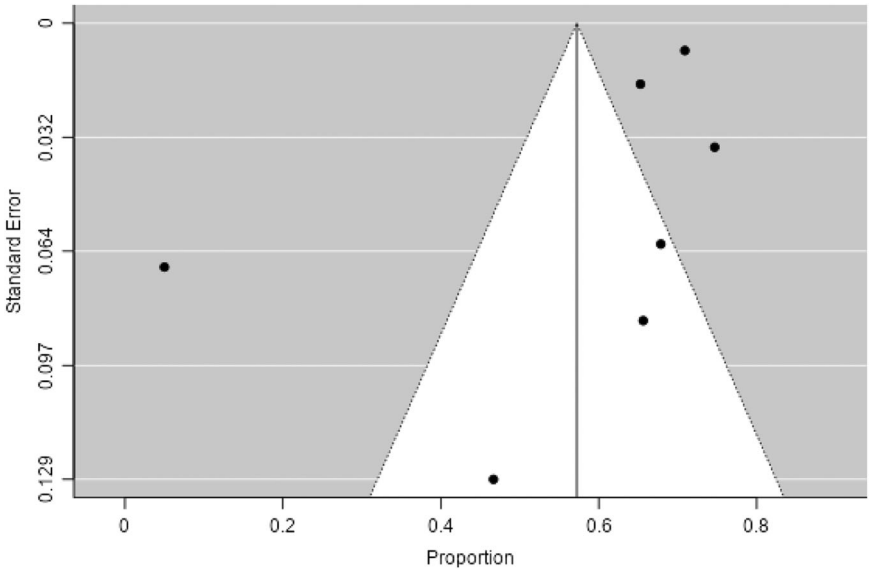

FIGURE 2 Evaluation of publication bias using a funnel plot based on the proportion of males

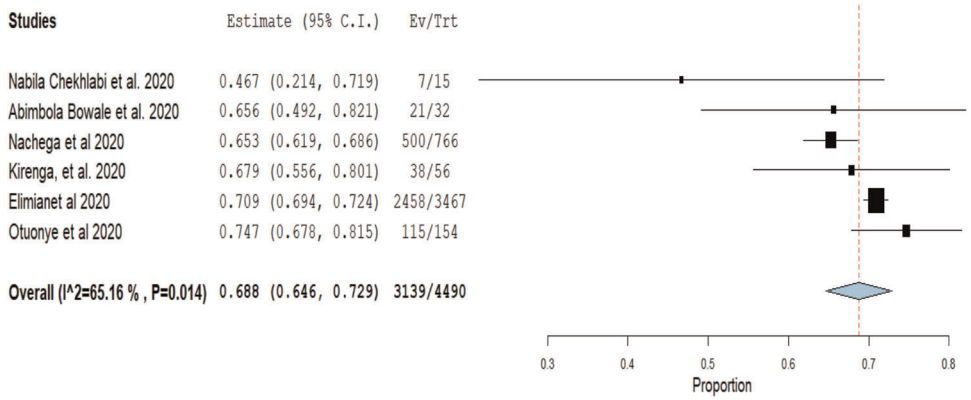

FIGURE 3 Proportion of males in COVID-19 patients

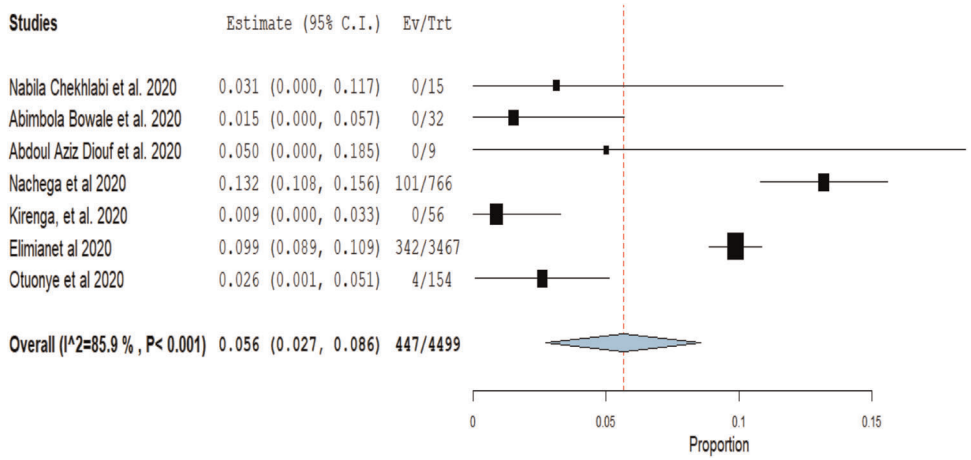

FIGURE 4 Proportion of death rate in COVID-19 patients examined

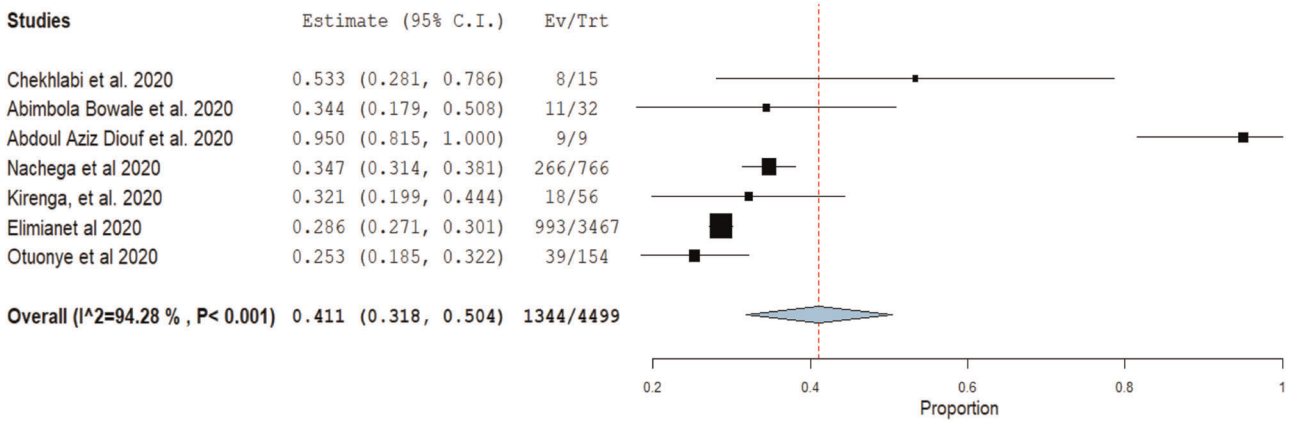

FIGURE 5 Proportion of females in COVID-19 patients

Our findings of fever, cough, and breathing problems as clinical symptoms of COVID-19 were in tandem with the findings of other studies, with up to 99% of patients experiencing fever.[22] However, the proportion of patients who developed a fever in our analysis was lower than that reported from meta-analysis done in China and other countries, where over 80% of the patients examined had fever.[10,12,24] Our study also reported a low proportion in cough and breathing problems as compared with studies done outside Africa,[11,12] this could be attributed to the number of studies that has reported pool clinical presentation in Africa as compared to those reported in other continents and probable missed cases that might have been attributed to malaria cases and other illnesses that

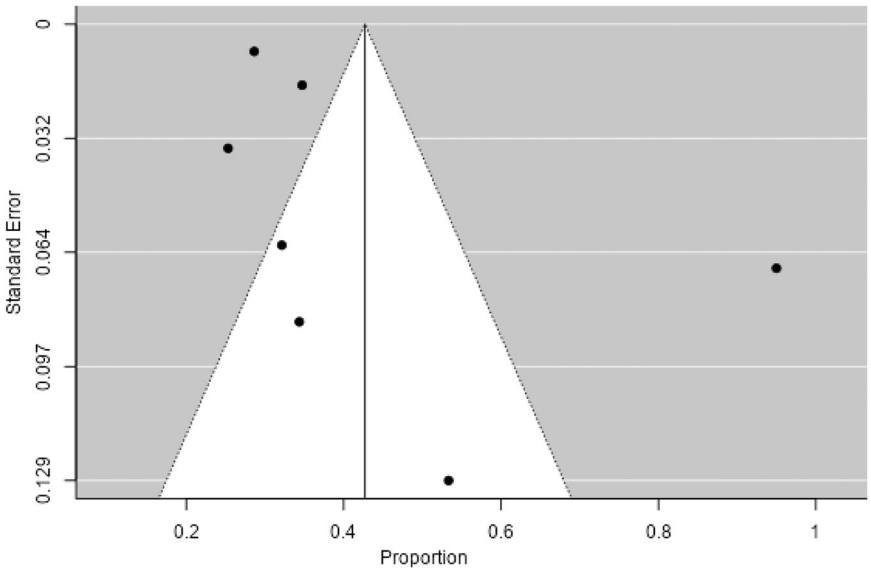

FIGURE 6 Evaluation of publication bias using a funnel plot based on the proportion of females

present similar signs and symptoms. The case fatality rate from the analyzed data for COVID-19 patients in Africa was lower than reported in other studies,[10,12,14] but was higher than reports reviewed by Zhu et al.[22] and Rodriguez-Morales et al.[25]

This study is not without its strengths and weaknesses. The strengths of this study include its large sample size and the high-quality score of studies included in the analysis. Some limitations were also encountered while conducting our meta-analysis. First, most studies included were retrospective and were single-center studies. This may have introduced admission bias and selection bias, so we cannot rule out the influence of other confounding factors. The sample sizes for two studies[9,17] were relatively small, so the test efficiency may be insufficient. Also, data collected in most of the included studies did not include laboratory findings; hence, it was difficult to analyze the clinicopathological characteristics of the disease in patients across Africa. This meta-analysis showed significant heterogeneity between the studies due to too many outcomes, and there was no subgroup analysis, which could affect the accuracy of the results presented.

5 | CONCLUSION

Currently, documented evidence shows that the most commonly encountered symptoms of COVID-19 patients in Africa were fever, cough, breathing problems, and headaches. The case-fatality was low, contrary to predictions and modeling results by experts. More high-quality prospective studies are required to verify the above conclusions and to gain more insights into the clinical characteristics of COVID-19 patients in Africa. However, in the absence of any vaccine, relevant measures such as those that address infectious disease outbreak response[26] should be put in place to slow down the spread of the virus.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

AUTHOR CONTRIBUTIONS

Conceptualization, data curation, methodology, article screening, writing original draft and review and editing: Uzairue Leonard Ighodalo and Testimony Jesupamilerin Olumade. *Database search and software*: Leonard Ighodalo Uzairue.

PEER REVIEW

The peer review history for this article is available at https://publons.com/publon/10.1002/jmv.26848.

DATA AVAILABILITY STATEMENT

The data used are available on reasonable request from the corresponding author, although, the data were got from published articles that are open sources.

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