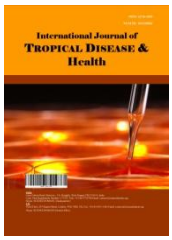

International Journal of TROPICAL DISEASE & Health

Volume 44, Issue 9, Page 22-32, 2023; Article no.IJTDH.99309
ISSN: 2278–1005, NLM ID: 101632866

An Overview of COVID-19 and Its Progression in Ghana

John Antwi Apenteng [a], Samuel Korsah [a*], Miriam Tagoe [a] and Anthony Sarfo [a]

[a] *Department of Pharmaceutical Science, School of Pharmacy, Central University Accra, Ghana.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJTDH/2023/v44i91429

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/99309

Review Article

Received: 05/03/2023
Accepted: 09/05/2023
Published: 19/05/2023

ABSTRACT

This research focuses on the progression of the coronavirus pandemic in Ghana, measures put in place to fight the pandemic and evaluation of Ghana's response in terms of both containing the pandemic and mitigating the social and economic effects of the COVID 19 pandemic.
Methods: The study mainly assessed the COVID-19 situation in Ghana within the period of March 2020 to MAY 2021. Data from reputable sources; Ministry of Health, Goggle scholar, Ghana Health Service, CDC, WHO, WTTC and online news articles were retrieved and assessed in quarterly basis. The results were further tabulated and graphically represented using Microsoft Excel application.
Results: A total of 94011 cases were recorded by the end of the of May 2021; first quarter of the second year. The highest number of active cases (11897), deaths (295) and critical cases (280) recorded were from December 2020 to February 2021. In the first quarter, the infection rate recorded was 3.77% which increased to 16.10% in the second quarter. However, with reinforcement of the COVID-19 protocol there was a significant decrease in infection rate in the final quarter for the studies; from March to May 2021 (3.60%).
Conclusion: Actions adopted by the Ghanaian government so far in handling the pandemic have

**Corresponding author: Email: korsahjnr@gmail.com, skorsah@central.edu.gh;*

generated significant achievements. It is however recommended that more control measures such as mass vaccination, mass testing and contact tracing will help track the infection and further reduce the rate of infection.

Keywords: Covid-19; pandemic; Ghana health service; SARSCoV2; center for disease control.

1. INTRODUCTION

Globally, over one hundred and seventy-two million cases of COVID-19 have been confirmed with not less than three million deaths as at June 21st 2021. The virus has affected 220 countries and territories so far with the United States of America being its worse victim (over 34 million cases and 600,000 deaths). As at June 2021, 47 countries in Africa have been affected by the pandemic with more than 4.8 million confirmed cases and 130,000 mortalities. South Africa has recorded the highest number of cases with over 1.6 million cases and over 56,000 deaths [1].

Coronavirus is large family of viruses which can inflict several mild and severe diseases in humans. There are several endemic human coronaviruses globally; HCoV-229E, HCoV-NL63, HCoV-HKU1 and HCoV-OC43 including the zoonotic Middle East Respiratory Syndrome coronavirus (MERS-CoV) and Severe Acute Respiratory Syndrome coronavirus (SARS-CoV), which have higher case fatality rates [2]. The history of this family of viruses dates as back as the years between 2002 and 2003 there when there was an outbreak of severe acute respiratory syndrome (SARS) [3]. SARS-CoV-2, another coronavirus that causes coronavirus disease 2019 (COVID-19), was first discovered in Wuhan, China, in December 2019 [4]. The World Health Organization (WHO) declared the COVID-19 outbreak a public health emergency of international concern on January 30, 2020. By March 2020, the outbreak was referred to as pandemic and countries were cautioned on the effect hence actions to detect and stop the spread must be ensured globally [5].

Since the first case was detected in Wuhan, China in 2019, human life has been impacted by the pandemic, including religious activities, funerals, business, education, public healthcare systems, and sociocultural events. According to the United Nations (2020) [6], the COVID-19 pandemic has been recognized as one of the world's most serious pandemics, resulting in crisis around the world, plunging the world's economy into a recess with historical levels of unemployment, restrictions on free movement of people, and increased levels of deprivation.

This study examine how various policies and measures implemented by the Ministry of Health and government, such as social distancing, frequent handwashing, travel bans, and lockdowns, affected the disease progression in Ghana. Findings from the study seek to provide stakeholders of the health departments such as the Ghana health service and the ministry of health with information on the measures put in place in response to the COVID-19 pandemic and how these measures have impacted Ghanaians in various aspects of their livelihood, in order to help them in decision-making and policy formulations.

2. METHODS

This review drew and assessed data from reputable sources; Ministry of Health, Google scholar, Ghana Health Service, Center for Disease Control (CDC), World Health Organization (WHO), World Travel Tourism Council (WTTC) and online news articles. Impact reports on COVID-19 from several agencies including Association of Ghana Industries (AGI), and the Institute of Statistical Social and Economic Research (ISSER) were examined. The studies were conducted with reference to recent published article on COVID-19. The study mainly assessed the COVID-19 situation in Ghana within the period of March 2020 to MAY 2021. The literature search was conducted using the main online databases (PubMed, Google Scholar, MEDLINE, Embase and Web of Science) with the following keywords: “COVID-19 pandemic”, “Ghana’s response strategy, “Impact”, “Africa”, “Ghana’s economy”, “Socio Economic impact”, “Government policy”, “COVID19 vaccines”, “Measures Taken”, “Vaccination Process”.

2.1 Data Collection and Analysis

The data retrieved was analyzed on a quarterly basis from the onset of the pandemic in Ghana, March 2020 to May 2021. The quarterly basis for the analysis is summarized below;

1st Quarter (March to May 2020),
2nd Quarter (June to August 2020),
3rd Quarter (September to November 2020)
4th Quarter (December 2020 to February 2021)
1st Quarter of the second Year (March to May 2021)

The results of the data retrieved were further tabulated and graphically represented using Microsoft Excel application.

3. RESULTS

A total of 15 months from the onset of the pandemic in Ghana were considered. The data for the first year was considered on a quarterly basis as well as the first quarter of the second year of the pandemic in Ghana.

3.1 Table of Results

Tables 1, 3, 5, 7, and 9 show confirmed cases of COVID-19 for 1st Quarter (March to May 2020), 2nd Quarter (June to August 2020), 3rd Quarter (September to November 2020) 4th Quarter (December 2020 to February 2021) and 1st Quarter of the second Year (March to May 2021) respectively. These tables further showed the total recovery, severe cases, number of deaths, active cases and the total number of confirmed cases for each of the months with this period in their respective quarter. The mortality rate for each quarter is shown in Tables 2, 4, 6, 8 and 10 for the respective quarter below.

The Critical Cases and the Number of Death in Ghana for 1st Quarter (March to May 2020), 2nd Quarter (June to August 2020), 3rd Quarter (September to November 2020) 4th Quarter (December 2020 to February 2021) and 1st Quarter of the second Year (March to May 2021) are represented on Figs. 1 and 2 respectively.

4. DISCUSSION

4.1 Total Number of Confirmed Cases in Ghana

The first two COVID-19 cases were detected in Ghana on March 12, 2020. Fourteen months later in May 2021, the country had 94,011 COVID-19 confirmed cases.

Table 1. Number of reported cases by the first quarter from March to May 2020

Months	New Confirmed cases	Total Recovery/ Discharged	Severe & critical cases	Number of Death Cases	Active Cases	Total number of confirmed cases
March	152	22		5	125	152
April	1922	190	6	12	1839	2074
May	6223	8085	16	21	5257	8297

Table 2. Covid-19 mortality rate and infection rate by the first quarter, Ghana

First Quarter	Total number Tested	Total number of Infection	Total no. of Death cases	Mortality Rate	Infection Rate
March-May 2020	219,825	8,297	38	0.46%	3.77

Table 3. Reported cases within the second quarter from June to August 2020

Months	New Confirmed cases	Total Recovery/ Discharged	Severe & critical cases	Number of Death cases	Active Cases	Total number of confirmed cases
June	9837	13550	25	79	4467	18134
July	19678	34313	28	74	3308	37,812
August	6846	43478	22	85	904	44658

Table 4. Covid-19 mortality rate and infection rate by the second quarter, Ghana

Second Quarter	Total number Tested	Total number of Infection	Total no. of Death cases	Mortality Rate	Infection Rate
June-August 2020	225828	36361	238	0.66	16.10

Table 5. Covid-19 reported cases for the third quarter from September to November 2020

Months	New Confirmed cases	Total Recovery/ Discharged	Severe & critical cases	Number of Death cases	Active Cases	Total number of confirmed cases
September	2145	46006	22	27	494	46803
October	1708	47372	13	17	819	48511
November	3585	50924	19	5	847	52096

Table 6. Covid-19 mortality rate and infection rate by the third quarter, Ghana

Third Quarter	Total number Tests	Total number of Infection	Total no. of Death cases	Mortality Rate	Infection Rate
Sept.-Nov. 2020	155,354	7,438	49	0.66	4.79

Table 7. Reported cases for the fourth quarter from December to February 2020

Months	New Confirmed cases	Total Recovery/ Discharged	Severe & critical cases	Number of Death cases	Active Cases	Total number of confirmed cases
December	3,072	53,928	12	13	905	55,168
January	13,391	62,340	172	95	5786	68,559
February	16,191	78,924	96	187	5,206	84,750

Table 8. Covid-19 mortality rate and infection rate by the third quarter in Ghana

Fourth Quarter	Total number of Tests	Total number of Infection	Total no. of Death cases	Mortality Rate	Infection Rate
December-Feb.2021	309666	32654	295	0.90	10.55

Table 9. Reported cases for the first quarter of the second year from March 2021 to May 2021

Months	New Confirmed cases	Total Recovery/ Discharged	Severe & critical cases	Number of Death cases	Active Cases	Total number of confirmed cases
March	6032	88585	37	128	1449	90782
April	1958	90376	30	32	1584	92740
May	1271	13133	18	5	1169	94011

Table 10. Covid-19 mortality rate and infection rate by the first quarterly of the second year, Ghana

1st Quarter (2nd Year)	Total number Tests	Total number of Infection	Total no. of Death cases	Mortality Rate	Infection Rate
March-May 2021	260,182	9,261	165	1.78	3.60

Table 11. Covid-19 total number of confirmed cases, Ghana, March 2020-May 2021(Quarterly) from March 2021 to May 2021

Quarters	Number of confirmed cases
MARCH- MAY 2020	8297
JUNE-AUGUST 2020	44658
SEPTEMBER-NOVEMBER 2020	52096
DECEMBE-FEBRUARY 2021	84750
MARCH-MAY 2021	94011

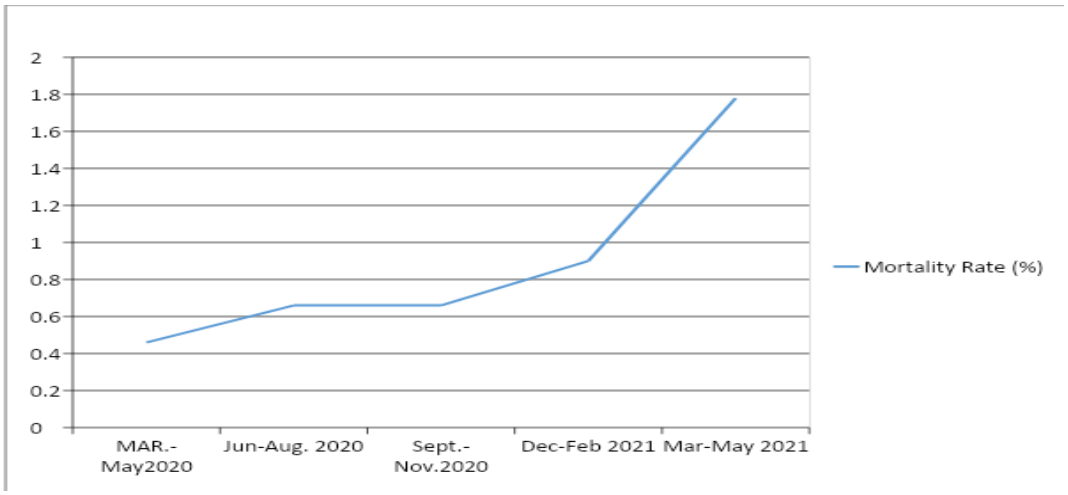

Fig. 1. Covid-19 mortality rate, Ghana, March 2020-May 2021(Quarterly)

Table 12. Severity of the Covid-19 pandemic on quarterly basis

Quarters	No. Critical Cases	No. Death	No. Active Cases
MARCH -MAY 2020	22	38	7221
JUNE-AUGUST 2020	75	238	8677
SEPTEMBER-NOVEMBER 2020	54	49	2160
DECEMBER 2020-FEBRUARY2021	280	295	11897
MARCH-MAY 2021	85	165	4202

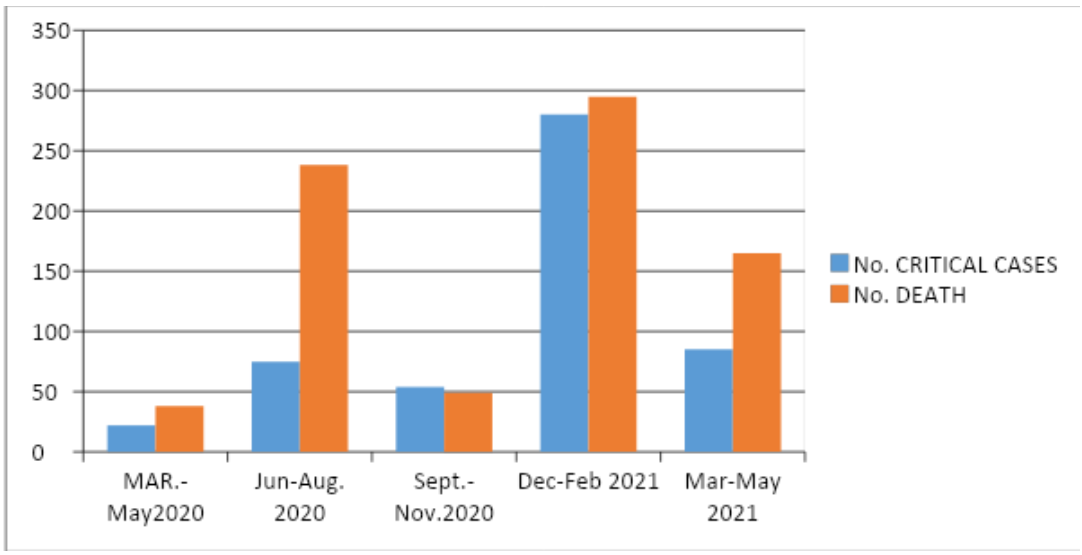

Fig. 2. COVID-19 Critical cases and number of deaths, Ghana, March 2020-May 2021(Quarterly)

In the first quarter (March to May 2020) the total number of confirmed cases were 297 as shown in Table 1 above. The first two recorded cases which were all imported cases led to the initiation of measures to mitigate the importation and the spread of COVID-19 in Ghana by the President and Ministry of Health (MOH). These measures include; the closure of the country's borders, contact tracing process (COVID-19 tracker App, a mobile application designed to raise awareness of novel coronaviruses, assist in the contact tracing of COVID-19 cases, and provide patient information to essential health care providers in the country) and a subsequent partial lockdown

in the major cities (Accra and Kumasi) [7] and restriction of social and religious gatherings in Ghana [8]. The measures to control the imported cases, the overall policy was successful as it was able to reduce the infection rate and the mortality rate in the first quarter as shown on the Table 2 above. Entering into the second quarter, the president eased some restrictions allowing for meetings of up to 100 persons. Easing the restrictions exacerbated the spread of COVID-19 as the number of new daily cases increased in the month of June 2020 as shown in Table 3. From June 15, senior high schools and tertiary final year students started to go back to school, which increased the risk of viral transmission.

As shown in Table 11, there was no great increase in the confirmed cases in the third quarter as the government enforced strict adherence to the COVID-19 protocols, promotion of COVID-19 awareness education due to previous spikes and with the introduction if COVID-19 tracker app on the April 13, 2020 [9].

In the fourth quarter from the onset of the pandemic, December 2020 to February 2021 as shown Table 9 a drastic increase in the number of confirmed cases due the celebration of Christmas coupled with the presidential elections. Additionally, according to CDC(2021) [10], the alpha, beta and gamma variant that were initially detected in the United States in December 2020,South Africa in December 2020 and Brazil, in early January may have been one of the reasons in the drastic increase of confirmed cases in the quarter.

On 24 February, Ghana became the first country to receive COVID-19 vaccines by COVAX, as vaccination had started in the beginning of the second year March 2021. Studies suggest that the current authorized vaccines work on the circulating variants of COVID-19 [11].

Comparing this data to other African countries, the measures and policies put in place by the Government of Ghana had effect in containing the virus. Ghana was ranked as the best responsive country in Africa on COVID-19 preventive measures as reported by Hadzide (2020) [12].

4.2 Ghana's Covid-19 Active Cases

In spite of the measures and policies in the first quarter of the pandemic in Ghana, the country recorded 7,221–active cases of COVID-19 as shown in Table 12 above. From the first quarter, there were about 1,456 increases in active cases in the second quarter. The Active case count of Covid-19 in Ghana was fast rising. One major contributor to the increase in the active cases was the enhance case and contact tracing strategies during the period of lockdown from March 31st, 2020 to April 27, 2020. The enhanced surveillance and contact tracing strategy helped the country to identify a significant number of cases. This enhanced surveillance and contact tracing strategy is the reason for the drastic increase in Active cases in April and May 2020 as shown in Table 1. Although the lockdown was lifted after three weeks, post lockdown measures were enforced to control the spread of the infection. These included personal hygiene measures, mandatory wearing of masks, ban on social gathering, social distancing, increasing the number of testing sites and humanitarian support for the people of Ghana. Albeit all these measures the rise in new cases were constant from the first quarter through to the second quarter as shown in Table 12. However, in the third quarter (September to November 2020) the number of active cases begun to nosedive meaning the previous strategies has yielded positive effect. The number of active cases for the third quarter has reduced by about 6,517.

The increase in the number of active cases in June 2020 led to the government announcing new measures to help curtail the spread of Covid-19. The mandatory wearing of face masks was the one of such measures. It was an offence for anyone in Ghana to be in public without a face covering (mask). An offender risks being imprisoned for a period up to 10 years or fined a sum from GHS 12,000.00 to GHS 60,000.00.

4.3 Ghana's Covid-19 Critical Cases and Mortality Rate

The number of critical cases recorded within the quarter of first confirmation in Ghana was 22 as shown in Table 12 and Fig. 2. In the second quarter, the critical cases had shot up to 75 as the number of confirmed cases had increased as well placing a high demand on ventilators and hospital facilities. Majority of infected people with underlying conditions such as asthma, COPD, diabetes, heart failure, hypertension as well as the aged were in critical care. The death toll was 38 as shown on Table 2 above with a mortality rate of 0.46% and in the second quarter, it had risen to 238 with mortality rate of 0.66%

(Table 4). The confirmation of death increased the tension, stress level and the anxiety level among Ghanaians. The majority of news websites were swamped with hourly cases. The number of deaths reported around the world, particularly in many European nations, had sparked concerns that many Ghanaians may also die as a result of the virus.

The government became strict in the reinforcement of restrictions and adherence to COVID-19 protocols. Regarding the contact tracing strategy adopted by the government, the Ghana Health Service enforced the tracing of every person suspected of having come in contact with any confirmed positive person to test, isolate, and treat them if necessary. The success of the approach is evident in (Table 12). This was one of the lowest fatality rates in the world – bested by only ten countries worldwide, including two from Africa; Namibia (0.3%) and Rwanda (0.3%) who only had a confirmed case of 1344 and 1629, respectively as at that time [13]. In the fourth quarter (December 2020-February2021), there was a rise in the number of critical cases as shown in Fig. 2. This can be attributed to the increased number of cases due to the non-adherence of COVID-19 protocols in the festive season. There was a slight increase in the mortality rate from the third quarter to the fourth quarter because the critical cases had worsened and cases may have been reported late. The new variants of COVID-19 were detected around the first quarter of the second year of the pandemic and were determined to be very infectious thus the death toll increased in this quarter. Even though vaccination had started, there were conspiracy theories concerning vaccination and so there was reluctance on the part of Ghanaians to get vaccinated.

4.4 An Outline on the Policy Steps to Control the Pandemic in Ghana

Akuffo-Addo, the Ghanaian president has been on the front lines of Ghana's COVID-19 outbreak since it began.

He had given 25 national addresses so far. On the 5th of April, in Ghana's fight against COVID-19, he announced five important objectives:

1. Prevent the infection from being imported.
2. Stop the infection from spreading.
3. Ensure that individuals infected with the virus receive sufficient care.
4. Minimize the virus's social and economic effects.
5. Increase Ghana's local capabilities and self-sufficiency [14].

4.5 Measures Taken Throughout the Quarters

Before any COVID-19 cases were identified in Ghana, the Ministry of Information launched a statewide public awareness campaign on COVID-19 prevention steps that all Ghanaians must follow in the event that new coronavirus cases come [15]. The Ghana Health Service issued self-quarantine guidelines on March 19. Close contacts of infected people were obliged to stay in their homes for 14 days after their last contact with the confirmed case, without socializing with the public or family members [16]. This happened in the first quarter of the year 2020.According to the government, this awareness would help to inform the public about all the formalities involved [17]. Moreover, the President announced in one of his addresses on March 28, 2020, the policy decision to impose movement restrictions in selected District Assemblies and implement the 3T approach. ‘Tracing' refers to aggressive contact tracing to identify infected and high-risk people in communities; ‘Testing' refers to increasing the country's testing capacity; and ‘Treatment' refers to isolating and treating people who have tested positive [18,19].

The vice president, as well as the Ministry of Communication and Technology launched the COVID-19 Tracker App on 23rd March, a digital tool to assist people in assessing and self-reporting symptoms, tracing those who have had contact with infected people, and assisting infected people in gaining access to health services [20]. The Noguchi Memorial Institute for Medical Research was the only facility in Ghana capable of testing for COVID-19 in early March 2020. It also had a very limited supply of test kits. As a result, Ghana adopted Pool testing as a method for COVID-19 testing [21]. Pooled testing, which is less expensive and takes less time, increased Ghana's testing capacity [2].

On July 30, 2020, the GHS announced that COVID-19 testing would be expanded to hospitals throughout Ghana. The government provided 50,000 PCR testing kits as well as other supplies to COVID-19 testing facilities throughout Ghana. This was within the second quarter of the year from the onset of the pandemic. The

government delivered laboratory equipment and supplies, increasing the nation's testing capacity [22]. Incas Diagnostics, a medical diagnostic development and manufacturing social enterprise, collaborated with Kwame Nkrumah University of Science and Technology to develop a rapid test that detects COVID-19 antibodies. This rapid test produces results in 15 to 20 minutes, greatly improving Ghana's testing capacity [23]. The COVID-19 National Trust Fund invested over GHS 32 million to help battle COVID-19 in the country [24].

Furthermore, in response to Ghana's COVID-19 outbreak, 7,791 health facilities and 18 intensive care units were activated President Akufo-Addo announced on April 26 a plan to build three infectious disease centers for each of the three ecological zones: coastal, northern, and middle belt zones, with the overall goal of establishing a Ghana Center for Disease Control [25]. President Akufo-Addo announced incentives for all health workers in order to provide relief to frontline health workers in response to COVID-19 on April 5, 2020 [26]. The Isolation and treatment centers were constructed within the second quarter that is June to August 2020, as part of government's efforts to ensure the management of COVID-19 across Ghana [27,28]. In the fourth quarter, The Ghana Food and Drugs Authority (FDA) and the National Medicine Regulatory Agency (NMRA) authorized an herbal medicine called *Cryptolepis Sanguinolenta* locally known as Nibima for Covid-19 clinical trials [29].

Additionally, three days after the first cases were confirmed in Ghana, President Akufo-Addo banned all public gatherings, including conferences, workshops, funerals, festivals, political rallies, and church activities and closed all schools and universities to reduce the spread of COVID-19 [30,31]. With most families at home, frequent handwashing under running water has become a necessity, and utility bills, particularly water and electricity (power), will rise. On April 9, the president announced that the government would cover all Ghanaians' water and electricity bills for the months of April, May, and June 2020. The policy initiative was intended to cushion citizens and lessen the impact of the imposed lockdown [32]. Following the outbreak of the novel coronavirus, the use of Veronica buckets became very popular in Ghana as it was used for hand washing to prevent the virus's spread [33]. Richard Kwarteng and his team in Kumasi invented the SolaWash, an automated and mobile hand washing machine powered by solar panels, to combat the novel coronavirus pandemic. The Ghana Standards Authority (GSA) certified the technology in four days rather than the usual twenty-one days. This was quickly commercialized in order to combat COVID-19 [34].

On April 11, within the first quarter of the onset of the pandemic, the government made a US$10 million loan to some local companies through the Ghana Exim Bank to help them manufacture face masks, scrubs, and protective gowns. This loan was intended to ensure that adequate PPE was available [35]. In the second Quarter, On June 15, President Akufo-Addo signed E.I.164, a new Executive Instrument that says that anyone who do not wear face masks in public face a four- to ten-year prison sentence, a fine of between GHS12,000 and GHS60,000 [36]. The Ghana Police Service was issued instructions on how to implement the mandatory wearing of face masks, according to the government [37]. Additionally, on April 19, this partial lockdown was lifted. This partial lockdown was, lifted but public gatherings were still banned [38,39].

Starting June 15, schools and universities reopened to final year students [40]. In order to control the risk from reopening of schools, the government had deployed over 200 staff members from the Ghana Education Service and the Ghana Health Service to monitor the COVID-19 situation in senior high schools [41]. The Ghanaian government responded to the virus by launching a nationwide disinfection and fumigation campaign in April 2020, within the first quarter from the onset of the pandemic. Over 464 markets were disinfected across the country beginning on April 3 [42]. In July, the second phase of nationwide fumigation began. On September 23, the MoE and GES collaborated with Zoom lion to disinfect and fumigate all SHS across Ghana in preparation for school reopening. Over 3700 schools in the Greater Accra alone, were fumigated. The third phase of the ongoing national disinfection exercise continued in the Upper West Region's markets and lorry stations [9,43] The police stations and facilities such as police cells, office rooms, barracks, offices were disinfected [44]. In the last quarter, March to May 2021, Meridian Port Services' Terminal 3 was disinfected. Zoom lion also disinfected Kumasi airport. Some departments at the Police Hospital were closed for disinfection and some football match centers were disinfected [45]. The government declared that it would construct 14 medical waste

treatment units and collect a COVID-19 surcharge [46]. The government had set aside €890 million for the development of 33 health facilities [47].

Lastly, 2,262 Ghanaians were evacuated from Lebanon during the COVID-19 lockdown, and a total of $1,062,600 was spent according to the Minister for Foreign Affairs [48]. On September 13, the Ministry of Foreign Affairs announced that it had completed the evacuation of Ghanaians who had become stranded abroad as a result of the COVID-19 restrictions. Over 9,000 Ghanaians and resident permit holders from countries such as South Africa, The Gambia, Ukraine, United Arab Emirates, United Kingdom, United States of America, China, Benin, Burkina Faso, and Togo returned home following the closure of borders in an effort to contain the spread of COVID-19 [49].

4.6 Government Response to Vaccines

In the last quarter, March 2021**,** President Akufo-Addo had announced that the country would purchase 42 million COVID-19 vaccines [50]. The government arranged for the supply of 3.4 million doses of Sputnik V through the Private Office of Sheikh Ahmed Dalmook Al Maktoum [51]. President Nana Akufo-Addo claimed the country would receive 350,000 doses of the AstraZeneca vaccine [52]. Ghana was the first recipient of COVID-19 vaccine doses distributed by COVAX, a national vaccine sharing project. Ghana had received 600,000 doses of AstraZeneca COVID-19 vaccine from India's Serum Institute. The vaccines were delivered to the Kotoka International Airport by senior government and health officials, as well as diplomats. A plane loaded with 600,000 boxes of AstraZeneca on 24th February [53].

5. CONCLUSION

Ghana's COVID-19 response strategy has been successful in reducing the pandemic's impact. The study concludes that the actions adopted by the Ghanaian government have generated significant achievements, despite some challenges encountered due to the non-adherence of protocols. The policy responses of the Ghanaian government have so far been positive and continue to contribute greatly to mitigating the impact of COVID-19 on the citizens. The Ghanaian situation serves as an excellent model for other African countries and the rest of the world. Future studies can continue to analyze measures by various governments throughout the world even as limitations are eased as the crisis continues and governments continue to make policies to reduce the impact of the pandemic.

DATA AVAILABILITY

The data used to support the findings of this study are included in the article and also available from the corresponding author upon request.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

ACKNOWLEDGEMENTS

The authors are grateful to the Ghana Health Service for their support in the study

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. European Centre for Disease Prevention and Control. COVID-19 situation updates worldwide, as of 6 August. Epidemiol Update. 2020;1-23.
2. WHO Regional Office for Africa. COVID-19 situation updates for the WHO African Region. 2020;8:1-11.
3. Drosten C, Günther S, Preiser W, van der Werf S, Brodt HR, Becker S, et al. Identification of a novel coronavirus in patients with severe acute respiratory syndrome. N Engl J Med. 2003;348(20):1967-76.
4. 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. N Engl J Med. 2020;382(13):1199-207.
5. Glass CA et al. Coronavirus disease (COVID-19) in family practice guidelines; 2020.
6. United Nations. A UN framework for the immediate response to Table of Contents [accessed Apr 20. 2021]. United Nations; 2020.
7. Assan A, Hussein H, Agyeman-Duah DNK. COVID-19 lockdown implementation in

Ghana: lessons learned and hurdles to overcome. J Public Health Policy. 2022;43(1):129-39..
8. Barbieri DM, Lou B, Passavanti M, Hui C, Lessa DA, Maharaj B et al. A survey dataset to evaluate the changes in mobility and transportation due to COVID-19 travel restrictions in Australia, Brazil, China, Ghana, India, Iran, Italy, Norway, South Africa, United States. Data Brief. 2020;33:106-459.
9. Osei-Tutu A, Kenin A, Affram AA, Kusi AA, Adams G, Dzokoto VA. A. Ban of religious gatherings during the COVID-19 pandemic: Impact on Christian church leaders' well-being in Ghana. Pastoral Psychol. 2021;70(4):335-47.
10. CDC. Understanding how COVID-19 vaccines work the immune system—the Body's defense against infection how COVID-19 vaccines work Most COVID-19 vaccines require more than one shot [accessed Apr 21. 2021]. Center for Disease Control and Prevention; 2021.
11. CDC. About variants of the virus that causes COVID-19 variants in the United States COVID-19 protect yourself from COVID-19 [accessed Apr 21. 2021]; 2021.
12. Quakyi NK, Agyemang Asante NAA, Nartey YA, Bediako Y, Sam-Agudu NA. Ghana's COVID-19 response: the Black Star can do even better. BMJ Glob Health. 2021;6(3):e005569.
13. Hopkins J. Cases and mortality by country. [Accessed Mar 18. 2021].
14. Friday O. Act R. Up Date Inf Corona Virus Ghana. 2021;1-5.
15. Nyarko J, Serwornoo MYW, Azanu B. Communication lapses to combating COVID-19 pandemic: evaluating Ghana's COVID-19 campaign. J Afr Media Stud. 2021;13(2):159-75.
16. Service H. Ghs T. GHS issues guidelines for self-quarantine. 2021;1-6.
17. Jacobs DP. COVID-19: GES, others to begin sensitisation campaigns ahead of schools reopening. [accessed Mar 18. 2021]. 2020;5-9.
18. WHO. Contact tracing in the context of COVID-19 [WHO guidelines]. [Accessed Apr 20. 2021]; 2019;1-7.
19. World A, Sport V, Most E, Agyemang-manu HMK. Coronavirus symptoms: Ghana don record first cases of Covid-19 outbreak, patients enter Ghana one week before symptoms start dey show – BBC News pidgin. [accessed Apr 20. 2021]. 2021;1-6.
20. Menu ST. ITU News. [accessed Apr 14. 2021]; 2021:1-9.
21. Dzansi J. Authors Ramping up early detection of COVID-19 with limited resources: the role of pool testing. [accessed Apr 19. 2021]. 2021;1-6.
22. Tarlue BM, Expands GHS. Coronavirus testing – DailyGuide network [accessed Apr 20. 2021]; 2021.
23. Roy R. Diagnostic start-up, KNUST Develop Rapid COVID-19 Test developed by Incas Diagnostics detects COVID-19 antibodies in 20 minutes. [Accessed Apr 20. 2021]; 2021.
24. Opoku DM. Speaker threatens to sanction Parliamentary staff breaching COVID-19 protocols. Citinewsroom – comprehensive news in Ghana. (accessed Mar 18]. 2021; 2020.
25. Equitable A.C.T. latest news. [Accessed Mar 18. 2021]. 2021;1-5.
26. Alert GT. Ghana announces plans to provide relief to frontline health workers in response to COVID-19. [accessed May 12. 2021]. 2020;1-3.
27. Sibiri H, Zankawah SM, Prah D. Coronavirus diseases 2019 (COVID-19) response: highlights of Ghana's scientific and technological innovativeness and breakthroughs. Ethics Med Public Health. 2020;14:100537.
28. Kissiedu V. Coronavirus: Government to expand isolation centers. [Accessed Mar 18 2021]; 2021.
29. Kumatia EK, Ofosu-Koranteng F, Appiah AA, Barimah KB. Standardization and quality control of the herbal medicine mist Nibima, employed to treat malaria and COVID-19, using physicochemical and organoleptic parameters and quantification of chemical markers via UHPLC-MS/MS. Int J Anal Chem. 2021; 2021:6390481.
30. Matters WHYT. Ghana – COVID-19-related travel restrictions and safety directives. [accessed Feb 14 2021]. 2020;1-4.
31. Us A, Us C, Gallery P. Policy P. Coronavirus: Government bans religious activities, funerals, all other public gatherings. [accessed Feb 20 2021]. 2021;1-7.
32. Us A, Us C, Gallery P. Policy P. Akufo-Addo Announces Free Water Ghanaians Gov Intensifies COVID. 2021;19:1-5.

33. Nishiura H, Linton NM, Akhmetzhanov AR. Initial cluster of novel coronavirus (2019-nCoV) infections in Wuhan, China is consistent with substantial human-to-human transmission. J Clin Med. 2020;9 (2):488.
34. Dodoo A. GSA approves solar automated hand washing machine to fight. 2021; 4-7.
35. Amoah C, Bamfo-Agyei E, Simpeh F. The COVID-19 pandemic: The woes of small construction firms in Ghana. Smart Sustain Built Environ. 2022;11(4):1099-115.
36. Dzisi EKJ, Dei OA. Adherence to social distancing and wearing of masks within public transportation during the COVID 19 pandemic. Transp Res Interdiscip Perspect. 2020;7:100191.
37. Osseo-Asare AD. Making masks: The women behind Ghana's nose covering mandate during the COVID-19 outbreak. J Mater Cult; 2022.
38. Essel HB, Tachie-Menson A, Osei M, Yeboah E. Towards the easing of restrictions during an infectious outbreak: A cross-sectional online survey to assess the knowledge, misperceptions, attitudes and behaviour of Ghanaians on the COVID-19 pandemic; 2020.
39. Osei-Tutu A, Kenin A, Affram AA, Kusi AA, Adams G, Dzokoto VA. Ban of religious gatherings during the COVID-19 pandemic: Impact on Christian church leaders' well-being in Ghana. Pastoral Psychol. 2021;70(4):335-47.
40. Nantwi WK, Boateng B. Covid-19 and education in Ghana: A tale of chaos and calm. Afr J Emerg Issues. 2020;2(5):41-52.
41. Bariham I, Ondigi SR, Kiio M. Preparedness of Ghanaian senior high school instructors for application of online learning in social studies instruction amid the Covid-19 pandemic. Soc Educ Research. 2021:52-64.
42. Dadzie CA. Ghana's response to the COVID-19 pandemic. In: Community, economy and COVID. Cham: Springer. 2022;19:233-50.
43. GhanaWeb. Ghana has capable institutions to make coronavirus vaccines safe for; 2021.
44. Newsroom. C. 50 police facilities disinfected in Bono Region. 2020:1-7. [Accessed Mar 14. 2021].
45. Wallace LJ, Afun NEE, Ofosu AA, Aryeetey GC, Arthur J, Nonvignon J et al. Strengths, disconnects and lessons in local and central governance of the response to the first wave of COVID-19 in Ghana. Ghana Med J. 2022;56(3):85-95.
46. Lartey NL. Police to be given guidelines on mandatory wearing of face masks enforcement – government. Citinewsroom – comprehensive news in Ghana. [accessed Feb 18 2021]. 2020;1-6.
47. Nimako BA, Baiden F, Awoonor-Williams JK. Towards effective participation of the private health sector in Ghana's COVID-19 response. Pan Afr Med J. 2020;35(2); Suppl 2:47.
48. Bamfo I, Sarfo JO, Ansah EW, Amoah SK. The impact of health on economic development: Ghana's COVID-19 management so far; 2020.
49. Achempong B. Report of the Parliamentary select Committee on Foreign Affairs on the 2021 budget estimates of the ministry of Foreign Affairs and Regional Integration; 2021.
50. Alhassan RK, Aberese-Ako M, Doegah PT, Immurana M, Dalaba MA, Manyeh AK et al. COVID-19 vaccine hesitancy among the adult population in Ghana: Evidence from a pre-vaccination rollout survey. Trop Med Health. 2021;49(1):1-13.
51. Akufo-addo P. New Covid-19 variant detected in Ghana – Akufo-Addo; 2021.
52. Atinga RA, Koduah A, Abiiro GA. Understanding the policy dynamics of COVID-19 vaccination in Ghana through the lens of a policy analytical framework. Health Res Policy Syst. 2022;20(1):94.
53. Worldwide W. Coronavirus disease (COVID-19): Vaccine access and allocation. 2021;19-22.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/99309