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Review

Challenges of healthcare delivery in the context of COVID-19 pandemic in Sub-Saharan Africa

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ABSTRACT

Introduction: Public health security is concerned with infection prevention and control worldwide. These measures are the concern of all and sundry to ensure prevention of any outbreaks of diseases that has epidemic potential. Africa may be uniquely positioned to have the most severe and under-detected outcomes related to COVID-19 infection. This article seeks to highlight such challenges of healthcare delivery systems in the context of the COVID-19 pandemic in sub-Saharan Africa. The communique also suggests possible strategies for improvement in such settings.
Method: We identified relevant articles to date using a manual library search, journal publications on the subject, and critically reviewed them.
Results: We identified and exhaustively discussed the main limitations to public health security in sub-Saharan Africa as follows i) Continuing deterioration of the public health infrastructure for disease control, ii) The changing outlooks of contagious diseases, iii) Private sector reforms like the managed care, iv) Relatively weak health care systems, and v) Poor organizational structures.
Conclusion: Most Africans are eager to see the desired transformation in our public health systems. Unfortunately, the political will to invest in public health infrastructure is lacking. Also, the system is characterized by human resources shortage and diverted resources, which significantly impacted the provision for emerging COVID-19 pandemic –related care. Interestingly the monumental breakthroughs in research development for bio-therapeutics and vaccines in African countries appear a mirage even with extensive past study experience with such products from China and the Western world. Finally, notwithstanding these challenges in our public health systems as elaborated, the facts are that enormous capacities exist that can be harnessed in African countries for the COVID-19 preparedness and response.

1. INTRODUCTION

Public health security is concerned with infection prevention and control worldwide. These measures are the concern of all and sundry to ensure prevention of any outbreaks of diseases that has epidemic potential [1]. The monumental desired success is achievable with i) shrewd-clinicians, ii) presence of modern facilities i.e., state of the art tools, iii) lack of secrecy, iv) lucidity, and v) prompt report vi) accountability [1]. Interestingly, for maximum outcome collaboration is crucial between laboratory

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scientists and clinicians, especially those to detect unusual pattern of cases that should be reported immediately [1].

Africa may be uniquely positioned to have the most severe and under-detected outcomes related to a 2019 novel coronavirus (SARS-CoV-2), and the syndrome of clinical manifestations also termed COVID-19 infection [2, 3]. The continent's countries are among those most at-risk of widespread disease threats, per several indices of epidemic preparedness. The World Health Organization's (WHO) State Party Self-Assessment Annual Reporting (SPAR) database assigns scores to countries based on capacities to detect, report, and respond to public health risk of local and international concern [2, 4, 5]. Similarly, the Infectious Disease Vulnerability Index (IDVI) developed by the RAND Corporation and the Global Health Security Index (GHSI) by Johns Hopkins University [2, 6] use a variety of healthcare, economic, demographic, and political factors to assess the vulnerability of a country to prevent or contain an infectious disease outbreak [2, 7]. Interestingly, recent work has shown most of Sub-Saharan Africa (SSA) to be at risk of COVID-19 importation and at reduced capacity to contain outbreaks due to lack of economic and medical resources [2, 4]. While it appears that the age groups at highest risk of severe COVID-19 disease and death (those >60 years old), [2, 8, 9] may be proportionately less in many SSA countries than in other parts of the world, the populations in many of these countries are at increased risk of having untreated chronic conditions due to weak health systems [2, 10]. As a result, individuals with cardiovascular diseases or diabetes [2, 11, 12] sickle-cell disease or requirements associated with immunosuppression, which exacerbate the immune response to SARS-CoV2 infection, may contribute to higher-than-expected mortality for younger age groups [2, 13, 14].

Within the first 30 days of the first introduction into the region on February 27, 2020, imported seeding events have occurred almost universally in SSA; however, capacity for detection, reporting, and control efforts vary [2, 4, 6]. Across the region and with ranging degrees of enforcement, [2, 15, 16] countries have implemented suites of preventative interventions, including school closures, [2, 17] curfews, and other social distancing measures, [17] as well as border and airport closures [2, 19]. Countries reporting high numbers of cases since the original seeding in SSA were hypothesized to have more robust detection/preparedness systems, such as South Africa and Rwanda. Lower observed case counts or delayed reporting of initial cases, relative to the date of first seeding in SSA, could be due to poor detection [2, 19]. This paper equally discusses the far-reaching implications of the COVID-19 pandemic on our severely overburdened health systems in SSA [2, 20].

Interestingly, we commence this presentation by highlighting three main highlights that significantly impact on the effectiveness of our public health officials per control of the infectious condition [20]. First, some authors submitted that there is a continuing deterioration of the public health infrastructure for disease control [20]. The decay in the infrastructure has gone so neglected that it is beyond repair, in some instances; therefore, impair the public health system's ability to carry out its core functions [20]. The second development is the emergence and re-emergence of contagious conditions that seem to put enormous pressure on the existing resources of our public health. The third submission is the private sector reform of the health care system, especially the advent of managed care [20].

2. OBJECTIVE OF THE STUDY

This article seeks to highlight such challenges of healthcare delivery systems in the context of the COVID-19 pandemic in sub-Saharan Africa. The communiqué also suggests possible strategies for improvement in such settings.

3. ORIGIN AND VIROLOGY OF SARS-COV-2

"Coronaviruses belong to the subfamily Coronavirinae in the family of Coronaviridae and the order Nidovirales. The subfamily Coronavirinae comprises four genera –Alphacoronavirus, Betacoronavirus, Gammacoronavirus, and Deltacoronavirus. Alphacoronavirus and betacoronavirus infect only mammals, while gammacoronavirus and deltacoronavirus can infect both birds and mammals" [21, 22]. "Most coronaviruses that infect humans (HVoV-NL63, HCoV-229E, HCoV-OC43, and HKU1) cause mild upper respiratory infections in immunocompetent hosts; however, two coronaviruses that are new to humans and highly pathogenic caused epidemics in 2002-2003 (severe acute respiratory syndrome coronavirus, SARS-CoV) and 2012-2015 (Middle East respiratory syndrome coronavirus, MERS-CoV)" [21, 23-25]. "Several coronaviruses that are genetically related to SARS-CoV (SARSr-CoVs) have been identified in bats from China, Southeast Asia, Europe, and Africa," [21, 23-25]. "In 5-year surveillance of SARSr-CoVs found in caves in Yunnan Province, China, investigators discovered 11 novel strains of SARSr-CoV in multiple species of horseshoe bats" [21, 26]. "Just a few years after their discovery, SARS-CoV 2 emerged as the seventh human coronavirus. SARS-CoV-2 shares 79.5% sequence homology with SARS-CoV," [21, 27]. "SARS-CoV-2 is genetically closer to two bat-derived coronavirus strains—bat-SLCoVZC45 and bat-SL-CoVZXC21" [21, 28].

"SARS-CoV-2, like other coronaviruses, is an enveloped, single-strand, positive-sense RNA virus. The envelope spike (S) protein, which determines host cell tropism and transmissibility, mediates receptor binding and membrane fusion" [21, 29]. "Like SARS-CoV, SARS-CoV-

2 uses human angiotensin-converting enzyme II (ACE2) receptor for cell entry. The structure of its receptor-binding domain is similar to that of SARS-CoV, although there are a few variations in amino acids at critical residues" [21, 28]. "Although its genome encodes an exonuclease enzyme, it still has a relatively high mutation rate per genome replication. Thus, it may quickly adapt to its new host and become efficiently transmitted from person to person" [21, 28, 29].

4. IMPORTATION AND SPREAD OF THE COVID-19 EPIDEMIC IN AFRICA

"In December 2019, an outbreak of unexplained cases of pneumonia was reported in Wuhan, Hubei Province, China" [21, 30, 31]. "By January 7, 2020, the etiological agent was identified as a novel coronavirus (SARS-CoV-2), and the syndrome of clinical manifestations was termed COVID-19. Soon COVID-19 cases were imported from China to other countries; Africa was not spared due to the high influx of air traffic and trade between China and Africa" [21, 30, 31].

"On February 14, the first case of COVID-19 in Africa was reported from Cairo by the Egyptian Ministry of Health and Population. The first case in Cairo was an asymptomatic individual who was identified through contact screening of an index case who traveled from China to Cairo between January 21 and February 4 on a business trip and tested positive for SARS CoV-2 on February 11 in China" [21, 32]. "On February 27, Nigeria reported a case of COVID-19, the first case in SSA, in an individual who had traveled from Italy to Lagos, Nigeria. He was immediately isolated and contact tracing revealed 216 individuals linked to this index case" [21, 33]. "As Africa braced for the epidemic, the hope was that all claims would continue to be travel-related and not from community transmission" [21, 33].

5. EPIDEMIOLOGY OF COVID-19 PANDEMIC

5.1. DISEASE BURDEN IN SSA

"Since December 2019, multiple cases occurring unexplainable pneumonia were successively reported in some hospitals in Wuhan city with a history of exposure to a sizeable Hua'nan seafood market in Wuhan city, Hubei province, China" [34, 35]. "It has been confirmed to be an acute respiratory infection caused by a novel coronavirus. So far, the number of cases without a history of the Hua'nan seafood market exposure is increasing" [34, 35]. Besides, "clustered cases and confirmed cases without a history of travel to Wuhan emerged. Also, confirmed cases without precise exposure to the Wuhan seafood market had been found in many foreign countries or regions," [34, 35]. At 24:00 on April 07, 2020, Cases have been reported by WHO on the following continents [34, 36]:

AFRICA: Egypt (1,322), Algeria (1,423), South Africa (1,686), Senegal (226), Morocco (1,141), Tunisia (596), Cote d'Ivoire (223), Burkina Faso (345), Cameroon (555), The Democratic Republic of Congo (161), Ghana (214), Namibia (16), Nigeria (232), Seychelles (11), Equatorial Guinea (16), Ethiopia (43), Gabon (21), Guinea (111), Kenya (143), Rwanda (104), Botswana (6), Mali (39), Zimbabwe (9), Chad (9), Gambia (4), Namibia (16), Togo (44), and Ethiopia (43).

ASIA: China (83,071), Iran (60,500), South Korea (8,162), Japan (3,906), Qatar (1,832), Malaysia (3,793), Singapore (1,375), Bahrain (211), Israel (178), Philippines (111), Kuwait (104), Indonesia (96), Lebanon (93), India (4,067), Saudi Arabia (86), Iraq (1,031), United Arab Emirates (2,076), Thailand (2,220), Taiwan (59), Vietnam (245), Brunei Darussalam (40), Palestine* (254), Pakistan (3,864), Oman (371), Sri Lanka (176), Afghanistan (367), Maldives (9), Cambodia (7), Kazakhstan (6), Bangladesh (3), Bhutan (1), Jordan (1), Mongolia (1) and Nepal (1).

AMERICA: United States (333 811), Canada (15,806), Brazil (11,130), Chile (4,815), Argentina (1,554), Panama (1988), Peru (2281), Mexico (2143), Colombia (1485), Ecuador (3747), Costa Rica (454), Dominican Republic (1828), Bolivia (183), Venezuela (159), Jamaica (58), Paraguay (113), Uruguay (406), Cuba (350), Honduras (298), Saint Lucia (14), Trinidad and Tobago (105), Antigua and Barbuda (15), Guatemala (70), Guyana (29), Saint Vincent and the Grenadines (7) and Suriname (10).

EUROPE: Italy (132,547), Spain (135,032), France (73,488), Germany (99,225), Switzerland (21,574), United Kingdom (51,612), Netherlands (18,803), Sweden (7206), Norway (5755), Denmark (4681), Belgium (20,814), Austria (12,297), Greece (228), Czech Republic (4822), Finland (2176), Slovenia (1021), Portugal (11730), Iceland (1562), Ireland (5364), Estonia (1108), Romania (4057), Poland (4413), San Marino (277), Russia (6343), Serbia (2200), Slovakia (534), Bulgaria (549), Albania (377), Luxembourg (2843), Croatia (1222), Hungary (817), Georgia (195), Latvia (542), Belarus (700), Cyprus (465), Armenia (833), Moldova (20), Azerbaijan (19), Malta (241), North Macedonia (13), Lithuania 847), Liechtenstein (78), Bosnia and Herzegovina (695), Monaco (40), Ukraine (1462), Andorra (540), Turkey (30217) and Holy See (7).

OCEANIA: Australia (5844) and New Zealand (943).

OTHER: International conveyance in Japan (3906).

5.2. ROUTE OF TRANSMISSION

"The 2019 SARS-CoV-2 is a zoonotic communicable disease with possible source as wild animal, most especially bats" [34, 37-39]. "Up to the present, the primary infection source was the patients with

pneumonia infected by the 2019-SARS-CoV-2. Respiratory air-droplet transmission is the main route of communication, and it can also be transmitted through contact" [34, 37-39]. "Till date many details, such as the source of the virus and its ability to spread between people remain unknown, an increasing number of cases show the signs of human-to-human transmission," [34, 37-39].

6. CURRENT CHALLENGES TO EFFECTIVE COVID-19 DISEASE CONTROL

6.1. THE ORGANIZATIONAL CHALLENGES

1. The problem of Apathy: This is otherwise remarked as "Lack of Political-will." "In essence, good public health requires both personal and social change, as well as the utilization of existing resources in creating the conditions in which people can be healthy" [20]. "The most significant responsibility of our Policymakers in Africa is the provision of adequate resources and support programs for effective public healthcare. This responsibility is expectedly a common societal goal and to overcome any resistance to change in their own lives" [20]. Therefore, "most Africans are eager to see the desired transformation in our public health systems. Unfortunately, our government and public health officials rarely worry about the same ones in the same way. The converse is also true because the political will to invest in public health infrastructure is lacking" [20].

"Our government officials as individuals tend to be concerned about their health, and modern medicine obliges a short medical trip abroad for the normal state of the art medical care even at a staggering cost. This attitude has produced over time, progressively weakening healthcare delivery systems, which is further stressed in the face of an emerging pandemic like COVID-19" [20].

"Most individuals lack foresight; therefore, they tend to worry more about immediate threats. They hardly get concerned about essential matters in the distant future. Surprisingly, such persons ordinarily trade health tomorrow for satisfaction today, mainly when the people most at risk are strangers" [19]. Thus, "public health authorities' budgets allotted insufficient funds for control programs even in the face of rising estimated figures for Tuberculosis and STDs, which occur among poor rural residents in the 1970s and 1980s" [20].

"The shocking part of the policy is that political and public support for effective programs revived mainly when the epidemics seemed poised to endanger the "general population." This pattern is visible in most countries in SSA and resulting further in depressed productivity in our public healthcare system with far-reaching implications of emerging COVID-19 pandemic" [20].

2. The Jurisdiction Problem: "In practice, a public health department possesses two kinds of jurisdiction, which simply refers to the official power to make legal decisions and judgments" [20]. "They include 1) Actual jurisdiction, which means the ability to regulate directly, and 2) Persuasive jurisdiction, in which the regulatory power stems from coalitions with other agencies, relationships with policymakers, and public support" [20]. "Thus the responsibility of health agencies needs to facilitate others to take actions that are consistent with the goals of public health utilizing the available expertise and persuasive power to achieve, such in general" [20].

"Furthermore, in the face of emerging COVID-19 pandemic, the public health department must stand as an expert for other agencies. This responsibility entails the coordination of the activities of government agencies affecting human health," [20]. "Coordination mechanisms remain crucial to facilitate emergency and contingency plans, which must be in place. The operational structures exist with clear communication channels, and adequate resources are available for impending threats" [40-43]. Currently, "seven out of the ten countries have met their minimum targets for Ebola Viral Disease (EVD) coordination" [40-43]. "The statement of a Public Health Emergency of International Concern (PHEIC) is a timely intervention; focused to encourage all African countries to mobilize resources domestically and through international sources to operationalize preparedness plans. The utilization of existing structures will be critical for the rapid organization of preparedness and response efforts. Yields from this resource have been significant in starting SARS-CoV-2 testing capacity in most SSA countries within one month of PHEIC declaration," [40-43].

3. The Problem of Stigma and Social Hostility: "Throughout the modern history of disease control, the stigma associated with severe diseases and the social hostility that is often directed at those with, or risk of, illness have interfered with the effective operation of public health programs" [20].

Interestingly, "the illness itself can be stigmatizing for persons who are already ill or are perceived to be at risk of disease. Stigmatization is not without severe implications for the stigmatized person. Another author submitted that one severe consequence is the strategy of concealment; Concealment of disease is unethical to public health programs that require the infected and others at risk to identify them" [20]. For instance, "such contributed to why some travelers from Italy who tested positive for COVID-19 at the Douala Airport, Cameroon escaped their planned isolation on February 20, 2020, and failed to show up despite government effort to extricate them increasing the risk of infecting other unsuspecting persons in the community" [20].

"Concealment of any contagious disease can put others. It significantly interferes with health education and prevention programs by deterring individuals from identifying their condition as risky; Therefore, preventing such persons from modifying their behavior to make it safer" [20].

"The concept of social hostility is also crucial to the social construction of disease. Social hostility involves negative social attitudes towards specific individuals. In most cases, the person concerned is not ashamed of suffering from an infectious disease. For example, tuberculosis or herpes simplex patient may be afraid of impending consequences of social hostility like the termination of employment as well as the loss of intimate relationships; The impact of social hostility undermines the conditions necessary for human health" [20].

4. The Problem of Legitimacy: "In many instances, where the public health team establishes agreement on what to do to promote public health, there may be deep disagreement about the government's role in setting a good plan" [20]. "The legitimacy problem has three forms, two of which are 1) the paternalism, and 2) the endorsement objections," 3) Neutrality- which is the third common variant suggesting that the government ought to be neutral on questions of values" [20]. For example, a senior government official was said to have tested positive for COVID-19 disease at the Douala airport on arrival from Europe. He failed to accept the recommended isolation but still went on with his usual official duty. Consequently, in the process, infecting unsuspecting other government staff and the public [20]. "All public health agencies need to uphold social community values to promote public health. They must make smoking unfashionable. They must make the driver look out of place to drink before picking his passengers. Nonetheless, our public health authorities must be prepared for meeting objections concerning legitimacy," [20].

5. The Problem of Trust: "Health departments depend on public confidence in the expertise and judgment of health officials for fiscal and political support" [20]. "This trust is a crucial challenge to public health officials, which is well-summarized in the International Organization on Migration (IOM) Report. Public health professionals must be an expert in Epidemiology and Biostatistics to identify and deal with the health needs of whole populations," [20]. "Thus they aim to maximize the influence of accurate data and professional judgment on decision-making, subsequently make decisions as comprehensive and objective as possible" [20].

"The problem of trust has apparent links to both legitimacy and apathy. It is also related closely to the issue of stigma. 'Compliance without enforcement' is crucial to public health," [20]. "One of the most critical determinants of voluntary compliance is the credibility of the health department. This compliance is accurate of the medical validity of its advice, the rationality, and fairness of its procedures. Also, it is the ability to assure protection from discrimination, ostracism, and other forms of mistreatment for those who comply with the advice," [20].

"For instance, suspicion of government intentions was a significant factor responsible for why gay men individually demonstrate reluctance to HIV testing. Similarly, the Tuskegee Syphilis Study is significant reason why many African Americans mistrust the public health authorities," [20]. "Gaining the trust of those with any contagious disease is a must for any effective public health programs, which helps explain the importance of solving the problems of stigma and social hostility" [20].

6.2. DECAY OF THE PUBLIC HEALTH INFRASTRUCTURE

"The vulnerability of our public health systems in Africa at large to limited economic resources cannot be overemphasized. For instance, funding for essential public health functions has been in chronic decline," [20]. Also, "the system is characterized by human resources shortage, and diverted resources also significantly impacted the provision for emerging COVID-19 pandemic –related care" [20]. "An estimated 3.5 million untreated cases of malaria and 10,623 additional deaths from HIV/AIDS, tuberculosis, and malaria during the period of March 2014–March 2015 were an indirect result of the diversion of health resources" [44-46].

Furthermore, "hiring freezes prevent public health agencies from filling staff vacancies. Consequently, overburdened public health departments cannot investigate all reported cases of the disease. Lack of diagnostic testing kits for COVID-19 disease and poorly equipped public health agencies are unable to track new conditions," [44-46]. "Strained public health resources compound the situation from rising provisions for indigent patient care. Some literature submitted that lack of access to regular medical services increases populations' vulnerability to reemerging diseases, including tuberculosis and measles, and even new ones like COVID-19" [44, 47-49]. Meanwhile, "the failure of surveillance has been one bain of adequate support to the most basic public health functions. Federal and local support for infectious disease surveillance has declined during the last decade, with potentially alarming results" [20]. "The existing authority submitted that our ability to detect and monitor infectious disease threats to health is in jeopardy," [20]. "We become complacent because of false perceptions that such threats had dwindled or disappeared. They decreased vigilance regarding contagious diseases, resulting in a weakening of surveillance--the foundation for control of infectious diseases," [20]. In a related development, "the decay of

the disease control infrastructure is a striking instance of the apathy problem in public health. In most settings, careful logistics planning is critical to prevent panic buying of face masks and respirators by the countermeasures (vaccines and experimental drugs)," [50-54]. "Most recently, remdesivir was used with some impressive outcomes from the COVID-19 trials set to be made available soon. Besides, Africa has a unique opportunity for the general public, which ultimately does not lead to scarcity in health units," [50-54].
"The existing stockpiles of personal protective equipment earlier utilized for EVD could, in the interim, support some needs for COVID-19. Still, such decisions should only be made after careful assessment," [50-54].

6.3. CHANGES IN COMMUNICABLE DISEASE THREATS

"In the twentieth century, medicine and public health appeared to be winning the battle against infectious diseases. A greater understanding of disease processes and the rapid development of antibiotics and vaccines dramatically decreased the impact of infectious diseases in developed countries," [20]. However, "in the 1980s, the emergence of HIV/AIDS, the re-emergence of tuberculosis, and other deadly contagious diseases in the USA and abroad served as a sobering reminder that infectious diseases continue to threaten the health of people worldwide" [20].
Globally, "diseases such as cholera, dengue, and yellow fever, are now pervasive but they were once under control. Besides, new virulent infectious conditions are emerging, such as Legionnaires' disease, Lyme disease, AIDS, and multidrug-resistant tuberculosis. We equally experienced an outbreak of Ebola in Zaire by 1995, a relatively new virus in humans, but one of the most damaging ever reported" [20].
"The 'return' of the infectious conditions is challenging the programs of public health to its root. Prevention and control of existing and emerging diseases is crucial, mandating our health authority to remain resilient by deploring available traditional tools of surveillance, vaccination, isolation, quarantine, and treatment, often on an international scale" [20].
"Some challenging conditions include i) Population growth, ii) urban migration, and iii) Overcrowding in the congregate settings of prisons, iv) Homeless shelters, v) Mental institutions, vi) Nursing homes, and vii) Child care centers facilitate the person-to-person contact of contagious conditions. Other include i) International travel, ii) Migration, Refugee movement, and iii) Commercial transport of goods and animals allow conditions to move across the state, national, and regional boundaries. Moreover, a)war, b)poverty, c)malnutrition, d)homelessness, e)poor sanitation, f)aging population, and g)the global spread of HIV infection, and h)tuberculosis, all result in the rising level of immunosuppression and susceptibility to a contagious disease. Risk behaviors, such as a) unprotected sex, and b) sharing of drug injection equipment, efficiently transmit certain viruses," [20].
Also, "changes in our ecosystem contributed by 1) deforestation, 2) flood, 3) drought and 4) climatic warming alter our existing natural environments and promote human exposure to a) insect vectors, and b) animal reservoirs. In a related development, technical innovations, such as large-scale food processing or the modern water systems, equally help to distribute microbes rapidly and extensively," [20].
Finally, "the widespread use of broad-spectrum anti-microbial drugs equally facilitates drug-resistant to microbes. These factors contribute to the development of the jurisdiction problem. Health agencies must help to provide leadership and an adequate understanding of the links between disease and social conditions and practices. They need to equally demonstrate how public and private action can make a difference," [20].

6.4. THE CHANGING HEALTH CARE ENVIRONMENT

To the best of our understanding, "our health care environment is changing rapidly per day. Notwithstanding the failure of some previous health care reform, significant modifications of our health care delivery systems are underway. Oblivious of whether the changes will produce any meaningful improvement in the public health system. The results may depend upon the emphasis that states, employers, and third-party payers place on delivery of preventive services and coordination with traditional public health activities" [20].
"Government partnership is also necessary, because, "when health emergencies strike a community, the citizens will pressure the local government health officials, for action on behalf of the community as a whole." Ultimately, the government cannot and should not seek to avoid responsibility for protecting public health" [20].

6.5. THE CHALLENGES OF MANAGEMENT OF COVID-19 PANDEMIC IN SSA

1. **Poor Knowledge of Covid-19: "**Poor Knowledge of COVID-19: The coronavirus has just been discovered with so much knowledge gap. So much research is ongoing to have a deep understanding of the virus and the disease. Capacity building is a must in the area of skill acquisition for effective care" [34, 55, 56].
2. **Lack of Diagnostic Testing Kits:** "These are unavailable locally, expensive and government support seriously required" [34, 55, 56]
3. **Inadequate Preventive Kits:** "These are gadgets aimed at protecting or supporting healthcare workers including PPE, Facemasks are out of the reach due to increased forces of demands" [34, 55, 56]
4. **The Problems of Isolation Wards:** "Essentially need to be equipped with ventilators and support facilities

that are not available locally; subsequently, lack of these facilities impacts significantly on the management of COVID-19 patients in the long run" [34, 55, 56].

5. **Lack of Drugs/ Vaccines:** "The WHO has officially approved no drugs or vaccines for the treatment of the COVID-19 disease. What is therefore available is supportive therapy so far and therefore this remains a significant challenge" [34, 55, 56].
6. **The Problems of Transmission Method:** "The virus is airborne, and what is known now is that it spreads fast by the direct air contamination and human transmission. This mechanism of spread requires quarantine for the exposed untested persons, isolation for those who tested positive and social distancing, or complete lockdown in the region where the number of new cases is increasing rapidly" [34, 55, 56].

6.6. CHALLENGES OF COPING STRATEGIES

Interestingly, "many African countries have relatively weak health care systems, for which reason countries must step up awareness campaigns to educate the public on best practices, including promoting good hygiene and preventive education" [40, 44].

"The coping strategies for the health and economic effects of the COVID-19 pandemic in the SSA include i) social distancing, ii) discouraging large public gatherings, and iii) employers must protect the jobs of employees who require quarantine or treatment. These campaigns need the support of religious and civil society authority to make it useful. Rwanda, at the moment, has portable sinks throughout public areas to encourage handwashing in its capital, Kigali, provides an excellent example of how some of these measures can be undertaken" [40, 44].

Also, "governments should suspend all international travel to or from the most affected countries. They should quarantine citizens who have traveled to or through those areas for at least two weeks. Several states have already instituted measures, they include i) Ghana, ii) Kenya, iii) Morocco, iv) Senegal, and v) South Africa. Other countries, as a matter of urgency, should emulate the good example. Ensure health systems are prepared to treat those affected," [40, 44].

6.7. THE PROBLEM OF PRONOSTIC FACTORS

"The population is generally susceptible to the virus. The elderly and those with underlying diseases show more serious conditions after infection, and children and infants also get infected by the 2019-SARS-CoV-2" [34, 52, 54]. "From current knowledge of the cases, most patients have a good prognosis, the symptoms of children are relatively mild, and a few patients are in critical condition. Death cases are more frequently seen in the elderly and those with chronic underlying diseases" [34, 52, 54]. "The newest study, including the first 41 confirmed cases admitted to Wuhan between December 16, 2019, and January 2, 2020, showed the median age of patients was 49 years; and the primary underlying diseases were diabetes, hypertension, and cardiovascular diseases. Of them, 12 cases experienced acute respiratory distress syndrome (ARDS), 13 cases were admitted to the intensive care unit (ICU), and 6 cases died" [34, 52, 54].

7. RECOMMENDATIONS

1. COVID-19 reminds us once again that Africa is not exempt from pandemics (either imported to or originating from Africa). History will speak well of us that we did our best in due time.
2. There is advocacy for preparedness infrastructure for epidemics in SSA.
3. There is advocacy for infection prevention and control practices, especially in healthcare facilities across Africa.
4. There is a need for Africa and her development partners to take very seriously the Global Health Security Agenda (GHSA). This must be in the form of corresponding financial commitments to GHSA.
5. There is a strong need for research and development in SSA – African Governments should make political and substantial funding commitments to study and active surveillance activities that could help to detect and to contain epidemics.
6. There is an urgent need for an academic research partnership with intra- and inter-continental universities to define the research agenda and build research culture, infrastructure, and capacity in SSA.
7. Ultimately, global partnerships are needed to define the research agenda better and build a robust health infrastructure that provides SSA with the capacity to respond to the next epidemic.

8. CONCLUSION

Most Africans are eager to see the desired transformation in our public health systems. Unfortunately, the political will to invest in public health infrastructure is lacking. Also, the system is characterized by human resources shortage and diverted resources, which significantly impacted the provision for emerging COVID-19 pandemic –related care. Optimized supportive clinical care for EVD patients has been recently introduced but will be challenging to scale, even if adapted for COVID-19. Respiratory support in dedicated facilities may rapidly become inadequate, and consequently, efforts to detect early and contain imported cases remain crucial.

The monumental breakthroughs in research for medical countermeasures (vaccines and experimental drugs) in African countries appear a mirage even with vast experience working with some of the

investigational products being studied in China and the Western world. Finally, notwithstanding enormous challenges in public health systems as elaborated African countries, the facts are that enormous capacities exist that can be harnessed for the COVID-19 preparedness and response.

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