Covid-19 and orthodox healthcare facilities and professionals in Lagos State, Nigeria: Challenges and lessons for the future

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Abstract

Coronavirus is a viral infection that has spread across the globe at an alarming rate. The cases were worsened by the limited epidemiological knowledge about the disease and initial lack of vaccination. This research assessed the scourge of COVID-19 in the context of Nigeria's orthodox healthcare facilities and professionals, the challenges and lessons for the future using the International-Health-Regulations (IHR) Preparedness-framework. The assessment involved gauging the performance of selected indexes namely detect, report, respond, enabling-function, and operational-readiness of Lagos-State healthcare facilities. The IHR for State Party self-assessment annual reporting (IHR-SPAR) tool was adapted into a questionnaire via Google-form and the link generated was shared on the WhatsApp-platform of the healthcare-workers of randomly selected healthcare facilities in the three Senatorial-Districts of the State. 210 respondents were targeted for COVID-19 related information but only 157 responded. The data obtained were processed using Arithmetic-mean as suggested by the adopted methodology. Findings showed that Lagos-State has a level-3 capacity across the five-indexes which include detect-capacity (41.94%), report-capacity (45.41%), respond-capacity (45.77%), enabling-function (45.99%) and operational-readiness (44.78%). Findings also revealed that some of the challenges encountered in managing COVID-19 are perennial, thus, the research recommends that decision making during emergencies should be based on important demographics and that specific indicators require revamping to bring the needed improvement to the sector.

Keywords: COVID-19, Preparedness, IHR-SPAR, Healthcare-System.

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Introduction

The Coronavirus pandemic 2019 commonly referred to as COVID-19 is a viral infection that took the world by surprise. At the outset, the infection was as a suspected outbreak of pneumonia of unknown cause at the animal market in Hubei District, Wuhan-China (Olapegba *et al.*, 2020). Visitors to the market contracted the disease and also infected their contacts, thus leading to the realization that the virus was transmitted from person-to-person. The disease was eventually confirmed by the World Health Organization (WHO) to be a new and severe type of Coronavirus which the world health body officially named "COVID-19", while the virus was described as the "severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) (WHO, 2020). This disease is caused by the Coronaviruses (CoV) which belong to the genus 'coronavirus' of the Coronaviridae-family (Woo *et al*., 2010; Sahin, 2020).

COVID-19 is a contagious respiratory illness from the family of Coronavirus (others include: SARS, Hemagglutinin Type-5 and Neuraminidase Type 1 (H5N1), Hemagglutinin Type-1 and Neuraminidase Type-1 (H1N1) and Middle-East-Respiratory-Syndrome (MERS)) which is transmitted through the eyes, nose, and mouth, via droplets from coughs and sneezes, close contact with an infected person and contaminated surfaces (Olapegba *et al.,* 2020). It has an incubation period of five to fourteen days. The symptoms include cough, fever and shortness of breath, and it is diagnosed through a laboratory test while contagion could lead to severe respiratory problems or death, particularly for the elderly and persons with underlying chronic illnesses. However, some infected persons are carriers of the virus with no symptoms while others may experience only a mild illness (Sauer, 2020).

The outbreak of the disease coupled with the lack of containment and vaccination birthed fear and panic amongst the people and authorities alike; subsequently, the perceived risk that the infection portends led to the lockdown of cities and communities, travel restrictions or outright travel ban, border closures and mandatory quarantine, as well as cancellation of local and international sporting events, a decline in airline revenue and uncertainties in stock markets (Ogonna, 2020). Inspite of these reactive measures, the infection still metamorphosed into a full-fledged worldwide pandemic and spread to practically all countries of the world causing significant mortality.

Beyond these tragic health hazards and consequences of the pandemic, the economic uncertainties and disruptions that have resulted from COVID 19 pandemic came at a significant cost to global economy (Akanni & Samuel, 2020). Economists, investments-analysts and related professionals had speculated that the unplanned changes and disruptions to global economic activities caused by COVID-19 would be expensive and the sustenance of the lockdown might have scarring effects such as loss of businesses and unemployment. The United Nations Conference Trade and Development Agency (UNCTAD) affirmed these predictions when it estimated the cost of the outbreak to be approximately US$2 trillion in 2020 (Akanni & Samuel, 2020).

The foregoing therefore implies that the pandemic would potentially result in a global economic crisis. The logic of the prediction can be ascertained by looking at the effects of unplanned lockdowns by countries resulting in chains of flight cancellations, events postponements and businesses closures occasioned by COVID-19 infection. Indeed, it should not be surprising that, the various economic shocks emanating from different countries are the aftermaths of the sudden deviation from the economic, administrative and political norms. The COVID-19 cost implication put out by UNCTAD represents the fallout arising from the losses incurred from shutting down economies; transactions were grounded but unplanned medicare were to be provided even though economic production was static. To cope with this crisis, the government in many countries had to to live up to the constitutional responsibilities of mediating for their citizens by providing palliatives which were not only expensive but unavoidable.

There is no doubt that COVID 19 caused a broad spectrum of economic devastation caused to world economy. However, its impact on the healthcare sector cannot be compared to any other sector because healtcare suffered the heat directly. Indeed, the effect of COVID 19 on healthcare cannot be expressed in absolute economic terms; an approximate estimate can only be speculated. More importantly, can any premium be placed on the human lives lost to the pandemic? To put this in perspective is to take a cursory look at the global statistics of the devastation attributed to the virus. Statistics shows that the global infected population is 97,403,475, the infected but recovered population is 69,965,314 while the mortality rate to date is 2,085,744 (Worldometer, 2021). This statistic implies that the brunt of the COVID-19 infection rests on the lean shoulders of the healthcare sector globally while also emphasizing that the world has suffered one of the most devastating infections in this century. It is therefore understandable that there has been a real concern about the capacity of many underdeveloped countries, particularly in Africa whose healthcare systems of the various countries are weak (WHO, 2020). This is a situation that applies Nigeria in particular, which forms the crux of this research.

It is against the backdrop of the inestimable damages accruing from the COVID 19 pandemic worldwide that this research assesses the health security capacity of Lagos State to manage the pandemic effectively. Similarly, the research identifies the challenges encountered by healthcare practitioners in managing the pandemic as well as pinpoint the lessons learnt from the management of the COVID-19 pandemic. The emphasis on the lessons from COVID-19 in this research is borne out of the likelihood of a future medical emergency of a larger magnitude than COVID-19. To this end, an assessment of the status of the preparedness-capacity of the health-system of the state is aimed to reveal the reality about the component units of the system and possibly serve as a guide in the development of the appropriate baseline preparedness infrastructures.

Literature Review

African Healthcare-Systems

Healthcare challenges vary across countries (Oleribe *et al.*, 2019). However, the issues that pervade the enviromnet of African health-system are largely man-made and traverse institutional, human-resources, technical, financial and political developments (Oleribe *et al.*, 2019). This suggests that the primary issues challenging the continent's health-system are traceable to components of the same system which include human resources, data system, infrastructure and financial system (Mavalankar *et al*., 2015). Crucially, healthcare services are fundamental services that should be available in every society. Unfortunately, most African countries lack basic standard care, which explains why millions of the populace still struggle against diseases that could easily be prevented or treated (Bryan, *et al.*, 2010).

It could be implied also that, the fragility of the African healthcare-system emanates from weak infrastructural base of countries on the continent. Health infrastructure largely depends on the availability of qualitative physical, technological and human-resources within the healthcare delivery environment at a point in time (Ademiluyi and Aluko-Arowolo, 2009). Notably, infrastructural deficits imply non-availability of good roads in rural areas, lack of basic amenities like electricity, poor access to affordable and clean water supply, shortage and uneven distribution of healthcare-workers such as nurses, midwives, doctors within the premises of health facilities (Filmer *et al.*, 1997; Adam *et al.*, 2005; WHO, 2005; Palmer, 2006; Ukachukwu *et al.*, 2009). Furthermore, healthcare infrastructure is also dependent on health policy, budgetary allocation, health-system implementation and monitoring (Adebayo and Oladeji, 2006).

The advent of COVID-19 in Africa has further exposed the severe infrastructural gaps and the poor preparedness status of the health-system of many African countries as they have failed in their responsibilities to provde medical and economic succour for the populace. Most African countries have testing issues (testing kits shortage), insufficiency of testing centres and laboratories, inadequate bed-spaces

and isolation centres, shortage and non-availability of specialized equipment such as ventilators, protective gears and other basic supplies (Kibira, 2020). In summary, the COVID-19 pandemic should be a clarion call for African countries to revitalize their health-system because a future pandemic may be more devastating.

The Nigerian Healthcare-System

Nigeria is the most populous country in Africa and also one of the continent's largest economies; the country alongside 13 other African countries have a very high level of commuting with China, hence these countries have been listed as a high risk for Coronavirus importation (Onyedinefu, 2020). Furthermore, WHO reported that the Federal-Capital-Territory, Abuja, Lagos, Kano, Cross-River, Akwa-Ibom, Port Harcourt, Enugu, Delta and Bayelsa States were at high risk following the population strength and mobility of these states (Onyedinefu, 2020). It was therefore apparent that Nigeria was expected to take immediate steps to strengthen her level of preparedness as the window of opportunity for containing the outbreak was narrowing down. In spite of the call, the cases in Nigeria eventually escalated and currently stand at 114,691; 1,478 death, 92,336 recoveries and 20,877 active cases (Worldometer, 2021).

Containing the spread of the Coronavirus-pandemic is the responsibility of everyone but the primary caregivers remain the healthcare practitioners, which make their task a herculean one. In reality, the Lagos State healthcare practitioners work within a system that is already plagued by flaws due to several factors. Some of these factors are those related to manpower shortage, inadequacy of healthcare facilities, insufficiency of drugs and supplies. In addition, these problems put the practitioners in a dilemma of not being able to carry out their occupational-code appropriately and or to compromise standard medical ethics.

A healthcare-system can be described as an organization of people, institutions, and resources that deliver healthcare-services to meet the health needs of target populations (Oyibocha *et al.*, 2014). Healthcare is the right of every-man and every well-meaning government must make it available by fulfilling their respective role in ensuring the functionality and workability of the healthcare-system at all levels. An ideal healthcare-system is expected to provide non-discriminatory service; thus, it should be based on fairness and equity. However, even though the Nigerian situation may not be the worst in terms of provison of basic health care system it is certainly far from the ideal.

Also, Nigeria operates a pluralistic healthcare-system that could either be orthodox or traditional (Oyibocha *et al.* 2014). An orthodox healthcare system focuses on the treatment of symptoms of diseases by medical professionals such as medical doctors, nurses, pharmacists, dentists, radiologists using drugs, radiation, or surgery (National-Cancer-Institute, *no date*.; Adefolaju, 2014; Adekannbi, 2018). On the other hand, traditional-medicine is "the sum of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness (WHO, 2008). Orthodox healthcare is provided by private and public sectors while traditional is mainly private. In addition, the orthodox system is organized into primary, secondary and tertiary healthcare levels. These levels are anchored by the local, state and federal governments respectively. Primary healthcare is supposedly the baseline of the Nigerian health-system, but poor funding from the local government makes the country's healthcare system sit on a weak base (Pharm Access Foundation, 2015).

To state that the status of the health-system has a bearing on its ability to contain health emergencies is to state the obvious. It is therefore disturbing that the Nigerian healthcare system is still struggling with containing pandemics despite the country's long history with it. Lagos State, which is the study area for this work, suffered from the Bubonic plague twice in two decades while it was a colony; it also suffered a double outbreak of influenza in 1918 and around the 1930s (NAI, 1950). In the more recent years, there

had been Ebola and Lassa fever which were also dreaded epidemics that the country managed to contain through the heroic performance of the healthcare practitioners.

Olushola *et al*. (2020) in their study on the early geography of coronavirus identified three phases in the progression of the pandemic. The first phase, according to them, include the outbreak of the nC_OV strain and $MERS - nC_OV$ in China and the Kingdom of Saudi Arabia on 2nd and 4th of December, 2019 respectively (WHO, 2020a). The second phase was the post-China transmissions which cover the outbreak of the pandemic in Europe and North America from 21st January, 2020 (Olushola *et al.*, 2020). The final phase is the African phase when the first cases were recorded across different African countries; this covers the time after the 30th of January, 2020. The thrird phase emphasizes the local responses and measures deployed in surmounting the difficulties posed by a further increase in infection across the Africa continent. The success of these measures is largely dependent on the status of the healthcare facilities in the country which as shown by the pandemic is inadequate. According to Welcome (2011), Abdulraheem *et al.* (2012), Oyekale (2017), Adeloye, *et al*. (2017) & Olushola *et al*. (2020), the state of the healthcare-system and the healthcare practitioners in Nigeria is an indication of the abandonment of the healthcare sector by the government. Furthermore, the description of the Nigerian healthcare facilities and medical infrastructures as weak and neglected by Ogunbekun *et al*. (1999) has been proved correct by the challenges posed by COVID-19.

Healthcare systems around the world are built to fulfil certain functions which according to WHO (2000) include: good health, fair financial contribution and responsiveness of the healthcare providers. In addition, the achievement of these goals is said to be dependent on how the healthcare-systems carry out the following functions: rendering of efficient health-services, resources generation such as healthcare financing (raising, pooling and allocating), health investment such as material resources, and stewardship such as human resources (Oyibocha *et al*. 2014).

Achieving the goals cited by WHO above in Nigeria is critically dependent on finance. This is not to say there are no funds, but that the situation has been crippled by corruption which has made the functionality of the Nigerian health system almost impossible. The issues of equity, accessibility, affordability, quality, effectiveness and efficiency which are the overall policy objectives of the revised national health policy remain elusive. The failure of the primary healthcare on which the Nigerian healthcare system is based is too glaring for anyone to deny. This is due to certain obvious realities such as the restrictive use of cost-effective interventions for priority public health issues suc as non-communicable diseases, injuries, maternal and child health etcetera as well as the issue of poor cooperation and collaboration between different health ministries (Muhammad *et al.*, 2017). A contributory factor to the sorry state of the sector is what Cohen (2013) tagged as "the health seeking behavior of most Nigerian elites and public servants". This is very unfortunate especially as elite behavior is an outright declaration of no confidence in the health sector; patronage of Nigerian health institutions instead of foreign facilities will help in redeeming its lost glory.

Other issues besetting the health sector in Nigeria include infrastructural stock and human resources distribution. The Nigerian healthcare infrastructural stock was estimated to be about 34,423 health facilities out of which 88.15% are primary healthcare facilities, 11.6% secondary and 0.25% tertiary (Makinde *et al*., 2014). This shows a huge distribution disparity of healthcare facilities between rural and urban areas which also affects human resource distribution. Hence, over 70% of doctors are in urban areas where only 48% of the population live, leaving the remaining 52% rural dwellers in the hands of 30% health personnel (Muhammad *et al.*, 2017). Although the Human Resources for Health (HRH) stated that Nigeria has one of the largest numbers of human resources in Africa, however, these resources are insufficient to deliver crucial health services owing to the low densities of health-workers (doctors, nurses, and others) to population (1.95 per 1,000) (Global-Health-Workforce-Alliance (GHWA), Report on Nigeria, 2020).

In summary, Obansa & Orimisan (2013) identified the challenges confronting the Nigerian healthcare system, which include inadequate health facilities/structure, shortage of essential drugs and supplies, inadequate supervision of the healthcare system, poor human resources, management, remuneration and motivation; lack of fair and sustainable health care financing with very low per capita health spending; unequal economic and political relations and the neoliberal economic policies of the Nigerian state and corruption. Other challenges identified by them are high out-of-pocket expenditure in health by citizens, and the absence of a community-based integrated system for disease prevention, surveillance and treatment.

The next section discusses the methods deployed in the appraisal of health security capacity required by Lagos State to manage the pandemic. Similarly, tools and processes used in gathering information on the challenges limiting efficiency in the management of the pandemic are also discussed and finally, the lessons learnt from COVID-19 are analysed.

Materials and Methods

Description of the Study Area

Lagos lies approximately on longitude 2° 42'E and 3° 22'E, and between latitude 6° 22' N and 6° 42'N (Figure 1). It shares boundaries with Ogun State in the East and North, Benin Republic in the West, and the Atlantic-Ocean in the South. The State's coastline stretches over 180-kilometres along the Guinea Coast of the Bight of Benin on the Atlantic-Ocean. Lagos was the political capital of Nigeria before the capital was relocated to Abuja on 12th December 1991. Nevertheless, Lagos remains the nation's economic and commercial capital. Its territorial extent and political jurisdiction encompass the city of Lagos and the five administrative divisions of Ikeja, Badagry, Ikorodu, Eko and Epe which are divided into 20 Local Governments Areas by Nigeria's federal structure. The state covers an area of 358,862 hectares or 3,577 sq. km. which represents 0.4% of Nigeria's territorial landmass (Oteri & Ayeni. 2016).

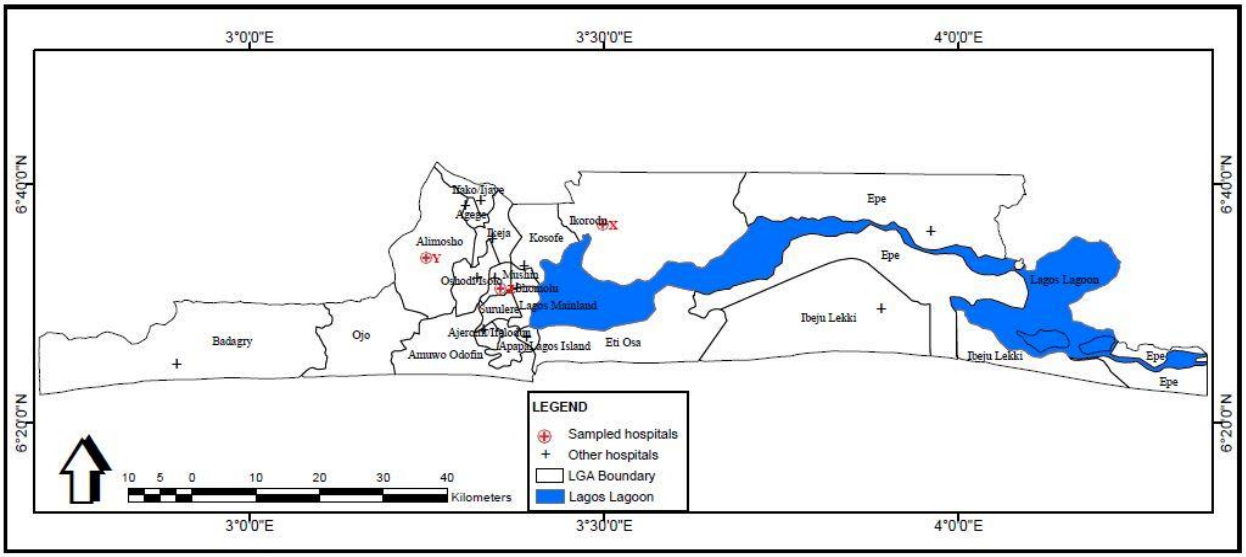

Figure 1: Lagos State Local Government Areas showing sampled health faci**lities**

Lagos is a commercially viable State with a GDP that is 26.7% of the national-GDP and half of non-oil GDP (Oteri & Ayeni. 2016). Furthermore, the State hosts over 50% of Nigeria's non-oil industrial capacity and hosts the Nigerian Stock Exchange which caters for over 80% of Nigeria's foreign trade flow. Lagos

State ports revenue represents 50% of Nigeria's total port revenue and its economy is bigger than that of other countries in the ECOWAS sub-region. Despite these strengths, the State is plagued by many health challenges as ealier highlighted in this study.

The COVID-19 pandemic was imported into Nigeria through Lagos State on February 27th, 2020 and to date, the state represents the epicentre of the cases in the country. The spread of the pandemic in the state can be attributed to its high population, the huge economic presence characterized by the daily hustling and bustling of the many inhabitants. Currently, the situation is far from being contained as the daily cases continue to increase; hence, the continuous emphasis on COVID-19 protocols set out by the WHO.

Sources of Data

Research data were sourced from primary and secondary data sources. The secondary sources of data collection include journals, textbooks, WHO dashboards, news dailies, etc. These sources were consulted for relevant literature on pandemics, IHR-preparedness, healthcare information and facilities, and others. In addition, a questionnaire was designed and sampled on healthcare practitioners to elicit first-hand information on the status of Lagos State preparedness.

Sampling frame and Sample Size

The questionnaire administration for this research was carried out online via the WhatsApp. The choice of WhatsApp was based on the need to avert the risk attached to field survey in the domain of healthcare treatment facilities assigned for COVID-19 patients. The questionnaire has two-sections which are: health practitioner's information and IHR-SPAR tool related questions. The population-size (467) from which the sample-size (210) was selected was estimated by excluding the primary healthcare facilities (1785) from facilities count because only secondary and tertiary facilities were used for COVID-19 treatment in Lagos State. Furthermore, the Krejcie & Morgan (1970) probabilistic table was used in the sample size selection to reduce sampling error. The table is designed with columns for population ranges and matching sample size, thus, sample size selection is achieved by just looking up the sample that corresponds with the population figure. The summary of the sampling distribution plan is shown in Table 1.

Table-1: Sampling Distribution Plan

State	Secondary Health-Facilities	Tertiary Health-Facilities	Sample-Size
Lagos	460	7	210

In addition, questionnaire administration was purposively limited to state-owned secondary and tertiary healthcare facilities because these facilities have specialists in diverse areas of medicine, thus crucial information on COVID-19 and the capacity of existing healthcare facilities would accrue from multiple areas of specializations.

Lagos State has twenty-six secondary and three tertiary healthcare facilities (total of twenty-nine) within its domain (Federal Ministry of Health, 2019). These facilities are distributed across the three Senatorial-Districts of the State, with Lagos East having eight facilities, Lagos Central with eleven and Lagos West, ten facilities. Consequently, the stratified-sampling technique was deployed in the selection of the sample from each district. All the healthcare facilities in each of the Senatorial districts were contacted between April 8th and 23rd, 2020 on the possibility of conducting an online survey on their medical staff. On the first try, none of the contacted administrative departments gave a positive response. They claimed the staff were overburdened while others said their facilities did not have unified staff online-platform where such

questionnaire administration could be done. After multiple trials, the researchers succeeded in getting one random facility from each of the three Senatorial districts among which the initially determined sample size (210) was administered.

Online-Survey

As stated in the preceding section, only three healthcare facilities (X, Y, and Z) granted access to the request for an online survey on their medical staff. The process began with the administrative department of the respective facility. The department contacted the leadership of the health workers who in turn requested for a sample of the questionnaire to be used in the survey to gauge the content for appropriateness and medical relatedness. Some of the critical questions embedded in the online questionnaire regarding IHR preparedness include availability/access to laboratories with standard-testing-capacity, surveillance, human-resources, access to essential healthcare services, planning for emergency preparedness, healthcare legislation and finance amongst others. The administrative department informed the team that the response for the approval of the request will take a minimum of 14-processing days.

The last approval for access which was for the Z facility was granted about 22 days after request was made (15th May 2020). Approvals for facilities X and Y were granted on 7th-May, 2020 and 12th May, 2020 respectively. After that, a mobile telephone number provided by the research team was added to the platform of the respective hospitals for a time limit of 6 weeks after which the number was deleted. The access provided was to the workers' WhatsApp group with strict instruction against direct contact of staff outside the use of the platform. Contact e-mails were also exchanged for ease of communication between the Administrative department and the team. The questionnaire was uploaded twice daily along with a reminder to engender prompt responses from the health workers.

The submitted questionnaires were downloaded from the Google-form database (download.csv) and analyzed accordingly. The expectation was to get 70 responses per selected centre, which will give 210 responses as estimated by the sampling distribution table. However, only 157 responses were obtained from the health workers. Cumulatively, it took about 80 days from the first day of contact to the last expiration. Table 2 provides more information on the facilities selected for online sampling.

Table-2: Selected Healthcare Facilities for Online-Sampling

Selected COVID-19 Treatment Centres	Status of Facility	Required Number of Questionnaires	Returned Questionnaires	Completed & Submitted %
X	Secondary	70	67	93.06
Y	Tertiary	70	51	70.83
Z	Secondary	70	39	54.17
Total		210	157	74.76

Table-2 reveals that only 157 (74.76%) of the targeted 210 questionnaires were completed, returned, and analyzed. The adequacy of this returned percentage was subjected to checks. The overall response rate to a survey is a guide to the representativeness of the sampled respondents (Babbie, 2008); This suggests that the preference is for higher responses than for lower responses. This is because low responses can bring

about bias in sampling; while, higher responses eliminate/lessen the possibility of significant response bias and vice-versa (Mundy, 2002). It was concluded that "there is no magic figure on response rates but higher is better: thus, 60% would be marginal, 70% is reasonable, 80% would be good, and 90% would be excellent" (Mundy, 2002). Therefore it was concluded that the returned questionnaire percentage is usable.

Data Analytical Technique

The IHR-SPAR tool was used as the capacity assessment tool for gauging the preparedness of the Lagos-State healthcare system. The tool consists of 24 indicators spread across 13 IHR capacities that were set up to ensure public health safety by prompt detection of health risks and acute events of domestic and international concern, as well as its assessment, response, and reporting, to every necessary quarter. Measurement of the status of each capacity involves the use of one to three indicators. Indicators are further divided into a few elements called attributes, which further define the indicator at each level (WHO - SPAR, 2019).

The approach of Kandel *et al.* (2020) was adopted in the analysis of the preparedness capacity of the Lagos healthcare system. They analyzed and reviewed the 2018-SPAR submissions of IHR member countries to establish the health security status of the respective member state. They also used the five capacity indices which include: prevent, detect, respond, enabling function, and operational readiness. Subsequently, the countries were placed in one of five categories based on the estimated capacity indices with level 1 as the least level and level 5 as the highest (Kandel *et al.* 2020).

For the purpose of this research, seventeen indicators selected from the IHR-SPAR tool were grouped under five (5) indices. However, the "Prevent-index" was replaced with the "Report-index". This is due to the porous nature of Nigeria's entry points, thus emphasizing that prevention as a result of the prevailing conditions at these points, is tantamount to deception. However, this is not to suggest that prevention is not important. Rather it is to suggest that the emphasis on it would be best when conditions at those points improve. Consequent upon this, the choice indices are:

- Detect,
- Report,
- Respond,
- Enabling Action,
- Operational Readiness

Capacities were assessed for the five indices above using the indicators that best suit them. Unlike the works of Kandel *et al* (2020), however, where the national report submitted by member countries was analyzed, the SPAR-tool (Figure-2) was adapted into a questionnaire and sampled online to the healthcare professionals, and the data collected were subsequently analyzed and interpreted accordingly.

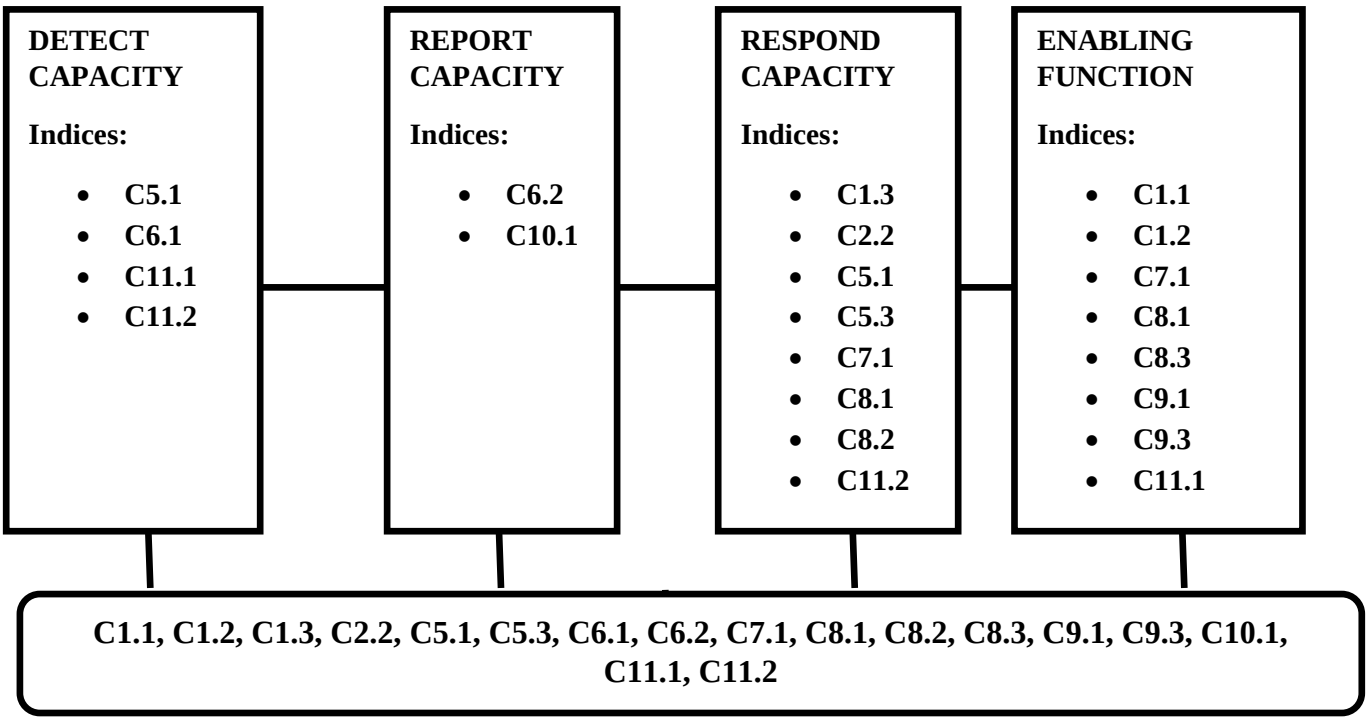

Figure-2: Schema of the IHR-SPAR tool (i.e. selected indicators).

Details and definitions of each index and indicator given in the IHR-SPAR schema (figure 2) are provided in Table 3.

Table-3: Indices-and-Indicators Selected for Lagos-State Healthcare Capacity Estimation

Indices	Indicator's Code	Indicators
Detect	C5.3	Availability of laboratory with provisions for testing priority diseases
	C6.1	Early warning function: indicator-and event-based surveillance
	C11.1	Constant core capacity at border points: airports, ports & ground crossings
	C11.2	Effective public health response at points of entry
Report	C6.2	Mechanism for event management
	C10.1	Capacity for emergency risk communications
Respond	C1.3	Financing mechanism and funds for timely response to public health emergencies
	C2.2	Multisectoral IHR coordination mechanisms
	C5.1	Specimen referral and transport system
	C5.3	Availability of laboratory with provisions for testing priority diseases
	C7.1	Human resources for the implementation of IHR capacities
	C8.1	Emergency-preparedness planning & mechanism for response
	C8.2	Management of health-emergency response operations
	C11.2	Effective public health response at points of entry
Enabling Function	C1.1	Legislation, laws, regulations, policy, administrative requirements, or other government instruments to implement the IHR
	C1.2	Financing for the implementation of IHR capacities
	C7.1	Human resources for the implementation of IHR capacities
	C8.1	Planning for emergency-preparedness and response mechanism
	C8.3	Emergency resource mobilization
	C9.1	Case management capacity for IHR relevant hazards
	C9.3	Access to essential health-services
	C11.1	Core capacity requirements at all times for designated airports, ports, and ground crossings
Operation Readiness	All the selected indicators	C1.1, C1.2, C1.3, C2.2, C5.1, C5.3, C6.1, C6.2, C7.1, C8.1, C8.2, C8.3, C9.1, C9.3, C10.1, C11.1, C11.2

Source: IHR-SPAR Tool, (2005).

Copies of the submitted responses to the questionnaire were retrieved and collated, and the capacity indexes were estimated using the basic Arithmetic mean ($\bar{x}$). Details on the estimation procedure are given in Table-4.

Table-4: Categories of Capacities that were estimated in the Research

Capacity Indexes	Estimation Formulae
$Detect\ Capacity\ (x_{Detect})$	$\frac{\sum(C5.3, C6.1, C11.1, C11.2)}{N}$
$Report\ Capacity\ (x_{Report})$	$\frac{\sum(C6.2, 10.1)}{N}$
$Respond\ Capacity(x_{Respond})$	$\frac{\sum(C1.3, C2.2, C5.1, C5.3, C7.1,\ C8.1, C8.2, C11.2)}{N}$
$Enabling\ Function\ Capacit(x_{Enabling\ Function})$	$\frac{\sum(C1.1, C1.2, C7.1, C8.1, C8.3,\ C9.1, C9.3, C11.1)}{N}$
$Operation\ Readiness\ Capac(x_{Operation\ Readiness})$	$\sum(\frac{x_{Detect}, x_{Report}, x_{Respond}, x_{Enabling\ Function})}{4}$

Source: Adaptation of Kandel *et al*, (2020)

The estimated values for the respective and collective capacities as defined by the IHR were subsequently used to draw inferences on the preparedness status of the Lagos State healthcare system. Definitions and interpretation of categories (levels) is provided in Table 5.

Table-5: Definitions and Interpretations of Levels in the Study

Levels	Mean Estimate Percentage	Interpretation
1	≤ 20%	Capacity functionality is minimal, risk preventive & controlling ability is very little
2	≤ 40%	Impromptu availability of Capacity functionality with the support of external resources
3	≤ 60%	Capability functionality is available at the central level but effectiveness is minimal at the local government and LCDA levels.
4	≤ 80%	Capacity functionality for handling various events is available at the state centre, local government, and LCDA levels.
5	> 80%	Capacity functionality is well advanced and sustainable at all levels of health-systems.

Source: Adaptation of Kandel *et al*. (2020)

Results and Discussion

Healthcare Practitioners Distribution and *safety from COVID-19 Infection*

Findings revealed that varieties of healthcare practitioners were interviewed during the questionnaire survey. This includes doctors (21.66%), pharmacists (21.66%), nurses (19.75%), laboratory scientists (16.56%) and others. Furthermore, Table 6 shows that majority of the respondents 131 (83.5%) (Not safe & not very safe) are convinced that healthcare workers are not adequately protected from COVID-19.

Table 6: Healthcare Practitioners on Safety from COVID-19 Infection

Options	Responses	Per cent (%)
Very Safe	0	0
Safe	6	3.8
Indecisive	20	12.7
Not Safe	83	52.9
Not Very Safe	48	30.6
Total	157	100

Estimated Capacity and Categorization

Five levels (1-5) as given in Table 5 are available for estimated capacity categorization with level1 as the lowest and level 5 as the highest. Based on this background, the collected online-data were analyzed, and the capacity for the respective indexes was estimated. *The estimated coefficient for the capacities examined in this research, i.e., detect, report, respond, enabling-function, and operational-readiness were all level-3.*

Level 3 capacity ranges between 40 to 60% and implies that Lagos State is functionally efficient at the centre. However, efficiency is low at the local government and LCDA levels. This connotes that capacities are strong at the state administrative hub and political centre; which represent the highbrow areas where the elites reside, while it diminishes at locations that are farther from the centre, i.e., remote areas, areas on the outskirt of town where development is minimal. Therefore, level 3 capacity category is not optimum; rather, it is constrained and limited. A summary of the computed estimate for all the capacities is given in Table 7.

Table-7: Summary of Capacity Findings

Capacity	Number of Indicators	Capacity Average	Capacity Percentage	Level Interpretations
Detect	4	2.1	41.94	Level 3
Report	2	2.27	45.41	Level 3
Respond	8	2.29	45.77	Level 3
Enabling-Function	8	2.3	45.99	Level 3
Operational-Readiness	17	2.24	44.78	Level 3

Detect-Capacity and Selected Indicators

The detect-capacity is concerned with the availability of capacity that would enhance detection and early warnings on health emergencies like COVID-19. The indicators for this capacity are C5.3, C6.1, C11.1, and C11.2. The computed detect index was 41.94% (level-3 capacity). Figure 4 reveals that three indicators for Lagos State detect capacity are on level 3 capacity while the last one is on level 2.

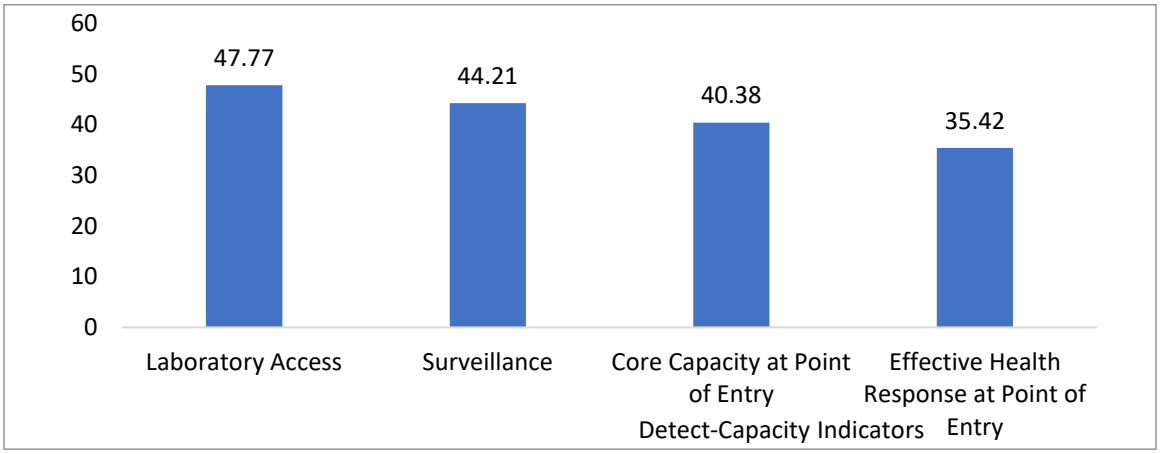

Figure 4: Indicators of Detect-Capacity.

The implication of this is that the efficiency of these indicators is below par and needs to be improved upon. As shown above, access to laboratories stand at 47.77% which tallies with the IHR estimated average (48%) for Nigeria (WHO-electronic-SPAR, 2019). The estimated average for Lagos State on surveillance system (44.21%) in comparison with that of IHR (70%) for Nigeria signifies that the Lagos surveillance system is lower, which means it is weak. This is unacceptable because surveillance and monitoring represent one of the major fulcra of the IHR (IHR, 2005) but many countries around the world like Nigeria are deficient in the required surveillance infrastructures and other such enabling capabilities that can make detection timely (Katz & Dowell, 2015). Healthcare authorities in Lagos State must therefore install facilities that would ease detection, verification, and make event tracking faster while also ensuring seamless health data flow amongst varieties of stakeholders including the WHO.

The point of entry indicators (C11.1) and (C11.2) are tied to the country's access points which include the airports, the waterways, and the land borders. The indicators had level 3 (40.58%) and level 2 (35.42%) estimated capacity respectively. The logic here is that the efficacy of the surveillance infrastructures at these points is a pointer to the level of success or failure that could be recorded. Therefore, these estimated capacities suggest that the operations at these points are below par. The International Organization of Migration (IOM) (2016) expressing the relevance of the Point of Entry stated that "the attempt to reduce the importation of communicable diseases is at the foundation of some of the most well established public health measures in border management". However, the traditional operations at these locations such as travellers' medical records verification, history of risk exposure and detection of symptoms are becoming inadequate. This is because of the high volume of movements linked to formal and informal cross border trade, transnational communities, and porous borders". It was concluded therefore that activities on these corridors need to be tidied up to checkmate the importation of health risks.

Report Capacity and Selected Indicators

The report capacity is concerned with giving real time notification to all stakeholders once a health anomaly is detected. The computed report capacity index was 45.41% (level-3 capacity) which means that the reporting capacity of Lagos State is limited; hence, effective circulation of important emergency information to every necessary department, agency, and unit in the state especially those that are remotely located is constrained.

Reporting is extremely important; hence the process deployed must be efficient. The IHR gave four important criteria that member-states are expected to use in assessing an event that constitutes a health risk;

these include "the seriousness of the event's public health impact; the unexpected nature of the event; the risk of international disease spread; and the risk that travel or trade restrictions will be imposed by other countries" (IHR, 2005). Therefore, any event that meet one or more of these yardsticks must be promptly reported.

The crux of the above decision criteria is the need for reporting when these thresholds are surpassed. However, proper reporting is capacity dependent. The ratings of the performance indicators for reporting are shown in figure 5 with both indicators on level 3 capacity. The mechanism for events management (C6.2) had an index of 44.46% which means the report capacity of events is deficient and constitutes a handicap for the process of prompt reporting.

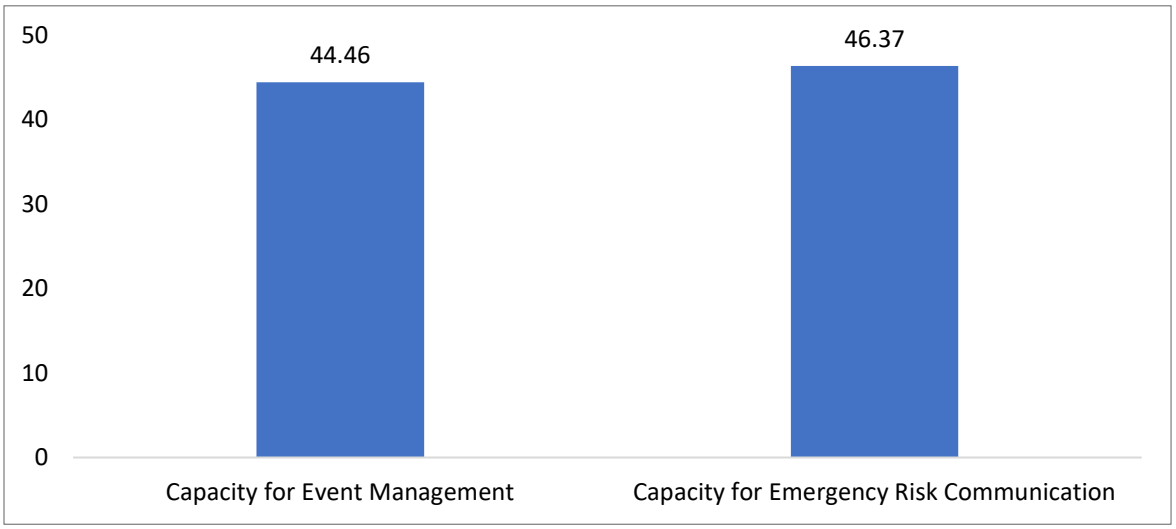

Figure 5: Indicators of Report Capacity.

According to Dagina *et al*. (2005) and Kool *et al*. (2012), reporting should be handled in real time systems integrated into settings with good electronic and telecommunications infrastructure.
This implies that reporting capacity aside from being able to deliver reports on emergencies should have technological infrastructures capable of real time reporting while also mitigating other factors that may cause delays in remote settings where healthcare practitioners may face logistic challenges and may be oblivious of the usefulness of reporting events. Consequently, the Lagos State health authorities should ensure the easy flow of healthcare information among a variety of stakeholders.

The case of capacity for emergency risk communication (C10.1) with an average estimate of 46.37% is rather critical. This estimated index aligns with the 2018 IHR-index for Nigeria (40%) but is in discordant with the 2019 index (20%). The situation with the IHR-capacity index for 2019 is such that the estimated average for Nigeria is lower than both the regional (43%) and the global averages (60%) (WHO-electronic-SPAR, 2019). A probable reason for this gulf in index coefficient is the use of newer methods in the estimation of capacity index other than the traditional self-evaluation data submitted by State Parties. Self-evaluation involves the use of data collected through self-evaluating processes organized by the State which gives room for manipulation and bias reporting (Oppenheim *et al*., 2019). To eliminate doubt on emerging data, researchers like Kluge *et al.* (2018) emphasized the need for newer procedures which they claim will boost event reporting quality owing to the adoption of modern strategies of combined self-evaluation, peer review, and voluntary external evaluation using different classes of experts which though will take longer

time, require more money but will yield better and more dependable results. Therefore, Lagos State needs to conform to these new ways to have access to genuine data that aid the reporting capacity of the state.

Respond-Capacity and Selected Indicators

This index is concerned with the availability of capacity for managing detected and reported emergency cases. It is a very important capacity hence multiple indicators (8) were selected in its estimation. The computed index-coefficient for this capacity was 2.29 (average) which translates to 45.77% . Hence, like the other capacities (detect and report), it also falls within the level 3 capacity bracket. Seven of the eight indicators assigned for the respond capacity of Lagos State were on level 3 capacity while the last indicator is on level 2. The gross implication of this is that the capacity of the health system is constrained. Figure 6 shows details of the capacity and its indicators.

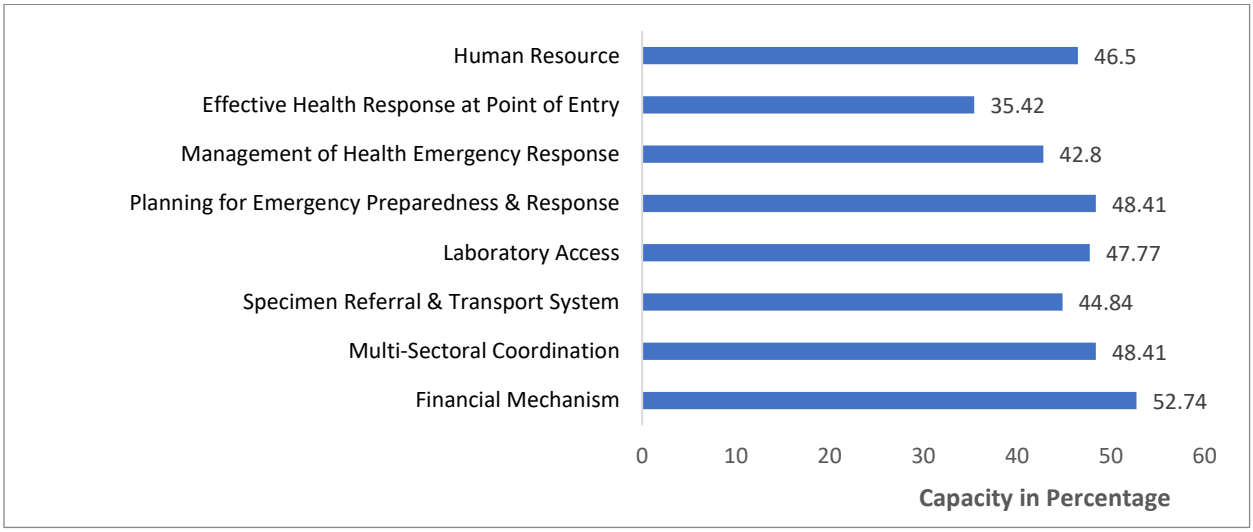

Figure 6: Indicators of Respond-Capacity.

The estimated average for the financing-mechanism (C1.3) was 52.74%, this is in tandem with the IHR-Nigeria's estimated quota for 2019 even though it falls below the global estimate (66%) (WHO-electronic-SPAR, 2019). This therefore suggests a need to redesign the mechanism to ensure timeliness of funds and continuous availability. This is also because finance is critical to the efficacy of other indicators; hence its importance cannot be overemphasized. Multi-sectoral coordination (C2.2) and transportation of specimens from health-facilities to reference laboratories (C5.1) as indicators for the respond-capacity follow the same trend as the others. The services are available but not enough. Findings suggest that the available specimen infrastructure for the human-animal interphase is 44.84% which is below the regional and global averages (50% and 68%), meaning the indicator is constrained. According to the WHO (2021), humans and animals coexist and share an interdependent relationship which is notable in man's livelihood, food production and general wellbeing. However, the interface which represents the environments (water, land, forests etc.) connecting them pre-disposes man to diseases as people interact with animals. Several infectious diseases that are newly identified as well as known ones are transmitted through this interaction. Therefore, a lot has to be done make to make the indicator active.

Human-resource (C7.1) in healthcare is a major issue globally. The Lagos State estimated average for this indicator standing at 46.5% is a sharp contrast to the 2019 Nigeria's IHR-average (60%); notwithstanding the sizable 13.5% difference, the averages are still within the level-3 capacity bracket but lower than the global estimate. This difference could be attributed to many factors but a probable one that has dominated

the academic literature is healthcare workers migration, often called medical brain drain. Imafidon (2018) described it as the migration of medical doctors which oftentimes lead to a further deterioration of an already weak healthcare system and widens the health inequalities gap worldwide. This situation involves the entire stretch of the medical spectrum. Hence, Uneke *et al*. (2008) highlighted that Nigeria represents a major hub of health workers exports on the African continent. Notably, "432 nurses legally emigrated to work in Britain between April-2001 to March-2002, compared with 347 between April 2000 & March-2001". The status quo needs to change in Lagos especially because there are reported cases of such migration during this pandemic siege.

Another salient dimension of human resources is the dearth of specialists. Gheorghita & Caterincuic (2013) emphasized the importance of having specialists such as epidemiologists, immunologists, microbiologists, anesthesiologists, hygienists, critical-care medicine specialists, environmental health professionals & laboratory-technicians across various medical disciplines in an emergency response team. Kluge *et al.* (2018) re-echoed the essentiality of human resources for emergency preparedness "in terms of numbers and availability, specialization, training, and deployment". This adds depth and improves human resource dynamism, which is especially helpful during emergencies like COVID-19 pandemics.

The planning for emergency response (C8.1) and management of health emergency response operation are both level 3 capacities with averages of 48.41% and 42.8% respectively. While planning entails laying out procedural plans for responding to emergencies, response operation involves plan execution. Oladele *et al.* (2012) captured the very essence of emergency response as a critical requirement in any healthcare system especially in controlling epidemics. However, the situation in developing countries is that most of the health workers in charge of such cases are either poorly trained or not trained at all. This strongly suggests that there is an urgent need for the authorities to take prompt actions to improve response.

Enabling-Function

Enabling function can be likened to the existence of suitable conditions that increase the success rate of an event. It is a skeletal framework that provides basic support required to promote healthcare services. As the estimated via multiple indicators (8) shown in figure 7, seven out of which are on level 3 capacity and one on level 2. The estimated coefficients for Legislation and finance stand at 51.85% and 54.9% respectively for Lagos State In comparison with Nigeria's IHR-index of 52%, the averages are at par, but below the 66% global average.

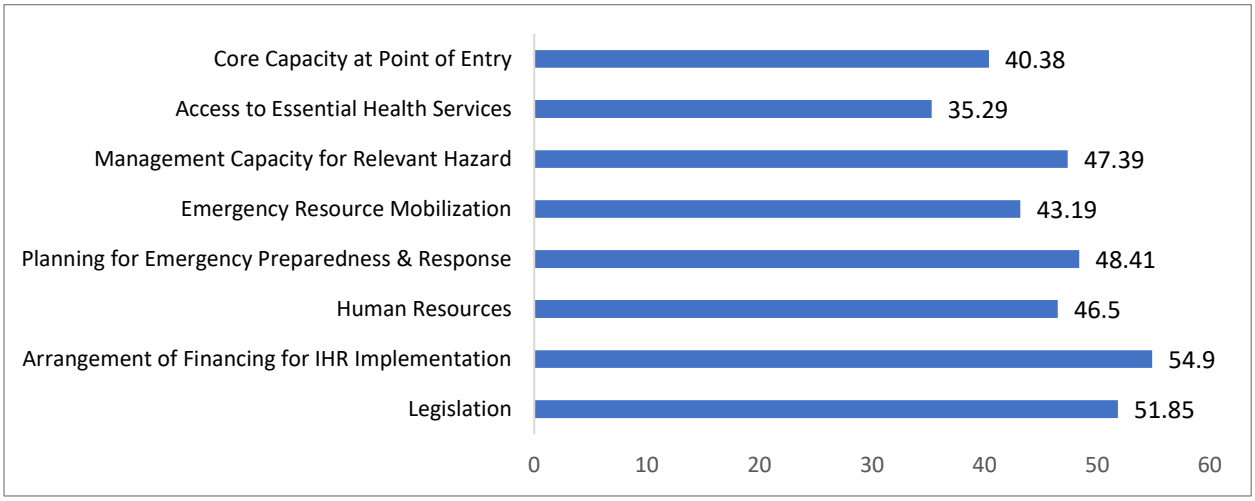

Figure 7: Indicators of Enabling-Function.

The findings on legislation are understandable; Nigeria like most member-states under the UN are signatories to the IHR-arrangements hence legislations are in place but this is not enough for the implementation of terms. Finance remains an indispensable aspect of healthcare as its availability is cogent for the implementation of most IHR-capacities. However, the computed index suggests the need for improved financial investments in the health sector.

Planning for emergency preparedness (C8.1) and mobilization of emergency resources (C8.2) with estimated averages of 48.41% and 43.19% implies that a facelift is urgently required. The computed average (47.39%) for Case management capacity for IHR relevant hazards (C9.1) connotes that preparedness is strong around administrative strongholds but weak elsewhere. Access to essential services connotes accessibility at all times and everywhere. This is important because it would help to curtail health-emergencies at the earliest stage (Kandel *et al.*, 2020). Furthermore, they emphasized that access is important to ensure the continuous availability of core healthcare-services like childhood immunization and maternal health-services. Therefore, the estimated average of this indicator at 35.42% (level 2) is a pointer that access is abysmal and require urgent attention.

Operational-Readiness

Operational readiness is simply readiness for operations. It is a measure of the readiness for operation of a healthcare system based on the availability of prerequisite indicators. Kandel *et al*. (2020) considered it as an index that can be used by WHO, governments and other international agencies to determine where to deploy immediate support during emergencies like the COVID-19 outbreak. Operational-readiness-index is a merger of all the indicators used in the estimation of other indexes as shown in figure-8. It thus implies that this index gives the cumulative report of all the capacities.

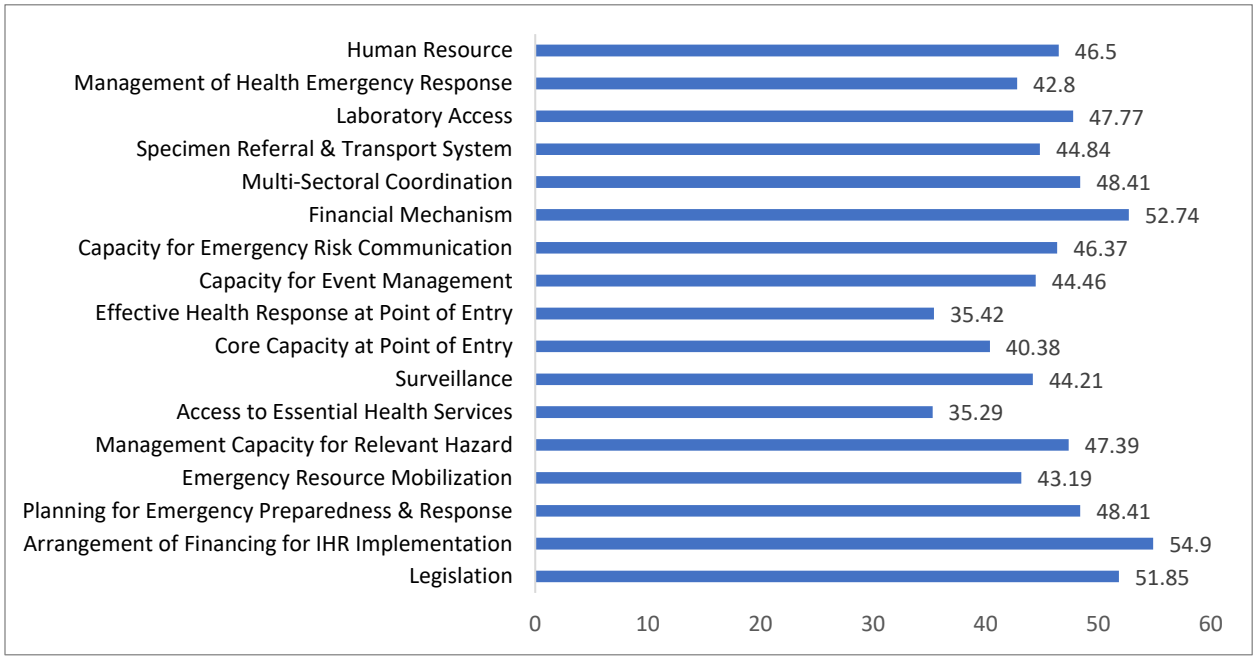

Figure 8: Operational Readiness Index.

The target of any healthcare-system should be "to achieve operational-readiness through a continuous process of building, strengthening, and maintaining a multi-sectoral response infrastructure-base that is

applicable at all levels, effective on all hazards and focuses on the highest priority risks" (Kandel *et al.*, 2020). Operational readiness is key as it represents the very epitome of preparedness such that health risks are easily detected, reported and response is guaranteed even in the most critical times. This should be the focus of the Lagos-State healthcare-system.

Challenges Encountered by healthcare Practitioners in COVID-19 Management

Peculiar Factors

Findings revealed that the following factors induce COVID-19 increase: economic factors, insufficient testing, illiteracy, poor enforcement of lockdown, corruption & insincerity & public distrust, shortage/lack of infectious disease specialists, insufficient isolation centres, poor/insufficient medical-researches, and lack of political will, etc.

Perennial Factors

Figure-9 shows a list of factors that make the management of COVID-19 cases difficult for healthcare professionals. These factors, at a closer look, are perennial because they predate the pandemic and had been bedevilling healthcare services in Nigeria for decades.

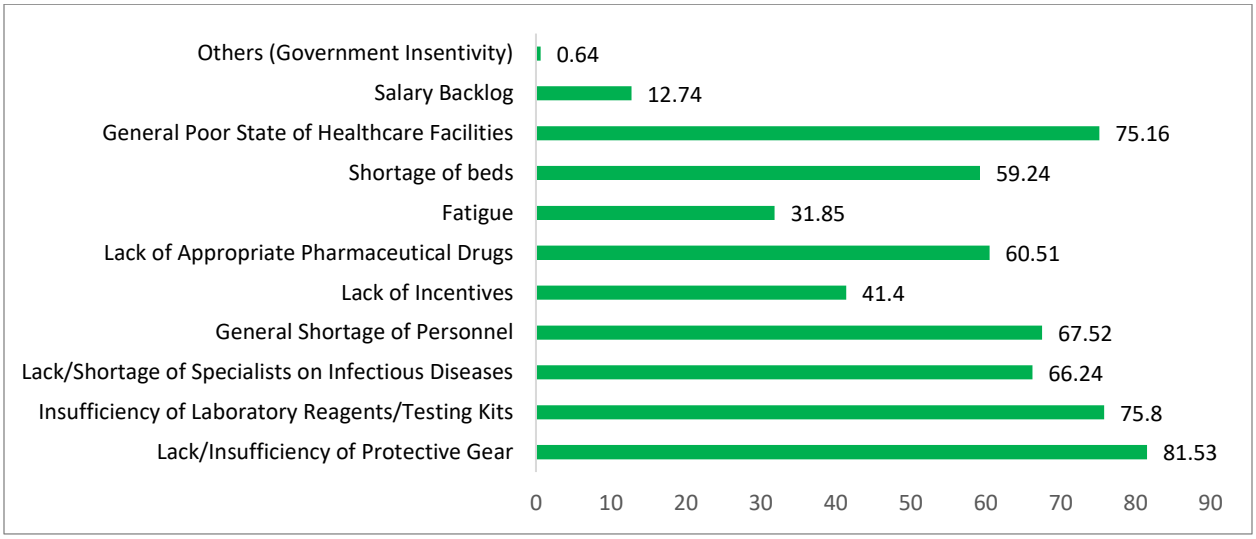

Figure-9: Challenges of Healthcare Practitioners in COVID-19 Management.

Socio-economic and cultural challenges such as illiteracy, lack of political will, poor enforcement of lockdown, corruption, etc. were also cited by the respondents as challenges. This is because the healthcare-system exist in tandem and interactions with other systems and is continually affected by them thus their effects on healthcare cannot be downplayed. Furthermore, the demographic diversity of Lagos-state can be better understood with data hence the need for a database to aid decision-making cannot be overemphasized.

Lessons from COVID-19 and Conclusion

The lesson from COVID-19 is that the health-sector in Lagos State need a total restructuring. This is because the respondents opined that key areas of the sector like surveillance infrastructures, healthcare accessibility, training of the human resources, health insurance scheme, healthcare monitoring, diverse areas of

specialization, budgetary allocation and funding for healthcare, etc. require a facelift to improve the status of Lagos State's healthcare services and boost the preparedness capacity in situations of health emergencies.

One other critical lesson from the pandemic as put out by the respondents is that COVID-19 is a timely reminder of the weak state of the country's health-sector. Therefore, the health-preparedness status of the State needs to be reinforced for it to be efficient and capable of delivering on healthy living and the promotion of people's wellbeing as set in the Sustainable Development Goals for all nations by 2030. Hence, every corridor through which this laudable agenda could be achieved must be explored.

Among the key areas needing critical facelift, the financial mechanism should be a starting point. Budgetary allocation must improve while the process of financial allocation to respective areas of healthcare must also be transparent. This is possible if government at all levels heed the Abuja declaration of 2001 where it was agreed that a minimum of 15% of the national budget must be allocated to healthcare. Nigeria's health budgets since the declaration (2001 to 2021) have fluctuated between 3.7% and 7.5% which is a clear fallout from the agreed benchmark (WHO, 2011; Adebisi et al., 2020). Similarly, Lagos State with a budgetary allocation of 9.11% (Lagos-State-Citizens-Budget Document, 2021) needs to increase their health allocation. Relative to the African continent, only Botswana, Rwanda, Zambia, Togo and Madagascar have met the Abuja Declaration target of a minimum of 15%, 20 countries have allocations that fall between 10-15% bracket while the remaining countries have budgets of less than 10% (Uzochukwu *et al.*, 2015; WHO (2016; Adebisi *et al.*, 2020). Therefore, African countries need to take deliberate action to achieve the desired changes in their respective health-systems.

Achieving this budget allocation milestone will be difficult for many countries amid several competing sectors, however, the benefits of investing in salient areas of the health-system preparedness cannot be overemphasized.

Notably, it would impact the procurement of surveillance apparatus and addendum facilities, enhance the effective management of the human resource, aid access to essential healthcare, improve the planning and management of emergency preparedness, and make the upgrade of the healthcare infrastructures a possibility, and other benefits. In more explicit terms, the availability of more funding will promote the setting up of new laboratories (required for testing specimens), procurement of testing kits, protective gears, and other medical accessories. It will also facilitate human resources capacity building by making funds available for their training and retraining, thereby updating their knowledge to newer and best practices in their profession. Furthermore, it would enhance infrastructural development, which is important for specimen referral and transportation, access to essential health services, capacity for managing emergencies and others. The need for strict adherence to health-preparedness legislation at critical entry points is also very important. Health emergencies that portend a larger risk should be handled professionally as dictated by legislation, compromise at such point could lead to a national disaster.

Additionally, the recommendations of the respondents could be deployed as invaluable guides for health policy formulation as the recommendations provided specific action points that require consideration. Such action points include the need for an elaborate health insurance scheme with modalities that would improve coverage and access. For instance, the National Health Insurance Scheme (NHIS) and the Health Maintenance Organization (HMO) need to be well articulated and properly implemented to reduce out-of-pocket spending and improve the coverage of the health-system and accessibility. The need for a functional and robust national database can also not be overemphasized as its availability will provide data on varieties of subject matters (including healthcare) and thus help the government to plan better.

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