Original Research Article

Assessment of a Tertiary Hospital's Systems Thinking Approach using the World Health Organization Health System Framework in Response to the COVID-19 Pandemic in Nigeria.

ABSTRACT

Background – The coronavirus disease 2019, (COVID-19) pandemic dealt a catastrophic blow to health systems globally, especially those of middle and low-income-countries, whose health systems were already frail, pre-pandemic. The World Health Organization (WHO) recognizes six building blocks (BBs) for a sturdy health system, whose synergistic interaction, through a systems thinking approach, guarantees optimal and equitable health outcomes for the populace, while shielding them from financial risk.

Objectives – To showcase a Nigerian tertiary hospital's response to the COVID-19 pandemic, through the application of systems thinking, to the WHO health systems BBs.

Methods – A questionnaire-based survey (utilizing a Likert scale of 1=very poor; 2=poor; 3=fair; 4=good and 5=excellent) of the hospital-wide efforts, employed by the leadership of the University of Nigeria Teaching Hospital (UNTH) Enugu, utilizing the WHO BBs, during the COVID-19 pandemic, assessed the perceived impact of the individual BBs on the hospital system. Eighty key stakeholders (Females=55%), heads of departments and supervisors, comprising various categories of medical personnel, overseeing twenty critical service areas of the hospital undertook the survey.

Results – Leadership/Governance ranked highest in impact among the BBs (68.6%), with the availability of Medical products/Technology (65.9%), and Service delivery (64.4%) trailing closely at second and third, respectively. Perceived robustness and overall motivation of the Health Workforce was least ranked at 57.1%, closely followed by Healthcare Financing (58.2%) and Health Information Systems (61.9%).

Conclusion – At an average cumulative score of 62.7% for all the BBs, the UNTH leadership may be adjudged to have performed creditably in their efforts at COVID-19 containment. Staff welfare should be enhanced, to ensure a well-motivated staff which will likely translate to improved service delivery.

Keywords – Health Systems, WHO Building Blocks, Systems thinking, COVID-19 Pandemic,

1.0 INRODUCTION

The SARS-CoV-2, the causative virus of COVID-19 is an enveloped single-stranded RNA virus, belonging to the *Coronavirinae* sub-family of the *Coronaviridae* family of viruses [1], whose primary mode of transmission is via direct or indirect contact of mucosal surfaces with infected respiratory droplets. The median incubation period of the SARS-CoV-2 is about 5.1 days, and 97.5% of infected individuals develop symptoms within 11.5 days [2]. Common clinical symptoms of the COVID-19 include: fever, cough, dyspnea, malaise, fatigue, sputum secretion, headache, sore throat, chest pain, loss of smell and or taste and diarrhea**.** [3,4] The virus first originated from China in 2019 and quickly spread throughout the world that the WHO declared it a pandemic in March 2020 [5].

The COVID-19 pandemic rattled health systems of countries globally, but more so, those of low and middle-income-countries such as Nigeria, whose health systems were already fragile, pre-pandemic [6]. The relative novelty of the highly transmissible COVID-19 disease, in addition to the wide-spread fear and panic which the illness elicited in populations due to its perceived high mortality at the time, resulted in unprecedented surge of patients to hospitals. This, expectedly, stretched health systems and health facilities to their limits, especially with regards to health care

personnel, material and financial resources [7,8]. In view of this, health facilities had to deploy creative, systematic and effective solutions to counteract these daunting challenges, in the face of whole country lockdowns with attendant dire economic consequences, in several regions of the world.

The WHO health systems framework, which was designed to promote resilience within health systems relies on six elementary components, widely referred to as the health systems building blocks (BBs) to function optimally so as to achieve the expected outcomes, chief of which is improved health of the populace. These BB include – 1. Leadership/Governance; 2. Service delivery; 3. Healthcare workforce; 4. Health Information System; 5. Vaccines, Medical products and Technology; 6. Healthcare Financing [9,10,11].

Leadership and Governance sets the vision and policy direction of the health system and guides effective coalitions between groups, while ensuring the right regulatory practices and overall system accountability through efficient and effective use of resources. Excellent *service delivery* involves availability of safe and accessible quality health care services delivered promptly to all, without discrimination, by qualified health care personnel. A well-qualified, responsive and motivated *health workforce*, deliver optimal and timely health care services, while employing efficient use of resources. An efficient *health information system* gathers, stores, analyses and disseminates vital and accurate health-related and health system information in a timely manner, while illuminating important indices of health system performance and health determinants. Availability and access to high quality *essential medical products, vaccines and technologies* vital for optimal and efficient health care delivery contributes to a resilient health system. A robust, transparent and accountable *health care financing* system guarantees availability of pooled funds at all times, to enable prompt access to health care services, whenever needed, thereby protecting individuals and families from financial hardship [9,10,11].

A typical system may be viewed as a perceived whole, consisting of several, relatively independent parts, with each part obligatorily working in synergy with other parts, to produce a common desired outcome or goal. The health system thus, checks all the characteristics of a typical system, including being complex; self-organizing, History dependent, counter-intuitive, constantly changing but resistant to external change, non-linear and governed by feedback [12,13]. Systems thinking therefore, represents a problem-solving approach, where problems are

viewed in the context of a holistic system and how deficiency in a single part of the system affects the efficiency and productivity of the whole system [12,13]

Hence, for any category of health facility in a health system, the careful, intentional and synergistic application of these BBs through a systems-thinking approach, will ensure that the goals of the health system, which includes optimal health outcomes for the populace are achieved.

This study hence, intends to evaluate a Nigerian tertiary hospital's leadership response to the COVID-19 pandemic, through the application of systems thinking, to the WHO health systems BBs. This is with a view to prioritizing the concept of systems thinking as a simple but powerful tool which can and should be utilized towards achieving the noble goals set out in the WHO health systems framework.

2.0 MATERIALS AND METHODS

2.1 Study setting and design

The study is a descriptive, cross-sectional, observational study among heads of departments and supervisors of units, carried out in twenty critical service departments/units of the UNTH Enugu viz – Accident & Emergency; Children Emergency; Intensive care unit; Isolation center; General out-patient department; Oncology unit; Clinical laboratories (Chemical Pathology, Hematology, Microbiology and pathological anatomy); Radiology; Medical, Surgical and Children out-patient clinics; Eye clinic; Dental clinic; Physiotherapy unit; Theatre units; Labour ward; Pharmacy & compounding unit; General Administration & Accounts department; Procurement & Stores department. Four key stakeholders were drawn from each of the twenty critical service areas giving a total of eighty respondents.

A structured questionnaire previously adapted from the core monitoring indicators of the WHO BBs, pre-tested and applied to a similar population as published by Manyazewal T et. al. [14], was adopted for the study. It assessed the hospital-wide efforts using a Likert scale of 1=very poor; 2=poor; 3=fair; 4=good and 5=excellent [15], employed by the leadership of the UNTH Enugu, utilizing the WHO BBs, during the COVID-19 pandemic and evaluated perceived impact of the individual BBs on the hospital system.

2.2 Study criteria

Eighty consenting key stakeholders, comprising various categories of medical and health personnel, overseeing all the twenty critical service areas of the hospital which were all the areas where services were fully maintained during the period of the COVID-19 pandemic (average of four staff from each service area) undertook the survey which was conducted between May and June 2022 Staff involved in the study included Physicians, Dentists, Nurses, Pharmacists, Laboratory Scientists, Administrative officers, Accountants, Environmental health officers and hygienists. All the participants were required to have been employed at the hospital for a minimum of five years so as to ensure they were already working in the hospital a few years prior to the onset of the COVID-19 pandemic, to ensure an evidence-based assessment.

2.4 Data analysis

Descriptive statistics was employed to analyze the data, using IBM SPSS version 20. Each of the elements/indicators assessing a BB was scored, utilizing a Likert scale ranging from 1 to 5, with 1=very poor; 2=poor; 3=fair; 4=good and 5=excellent [15]. Individual scores (ranging from 1 to 5) for each of the monitoring indicators for the BBs were collated from the participants and the average score computed and converted to percentages. Subsequently, the percentage scores of all the monitoring indicators of each BB was added together and the average score computed to give the final score for each of the BBs.

3.0 RESULTS

3.1 Socio-demographic characteristics of respondents.

A total of eighty strategic, key stakeholders were involved in the survey and all returned complete data.

The female gender made up 55% (44) of the 80 participants while males constituted 45% (36).

Fifty-one respondents (63.7%) were middle-aged (≥ 45 years), while 29 (36.3%) were < 45 years.

Seventy-three stakeholders (91.2%) had tertiary level education while 8.8% of the respondents had either elementary or secondary level education.

Seventy-one respondents (88.7%) had been employed in the hospital for more than ten years, while 9 (11.3%) had been employed for at least 5 years.

3.2 Synergistic interactions between the building blocks in a health system.

To bring about optimal health outcomes for the populace, individual components of the health system BBs need to function in synergy with other BBs, typically relying on complex feedbacks to achieve this as shown in figure 1.

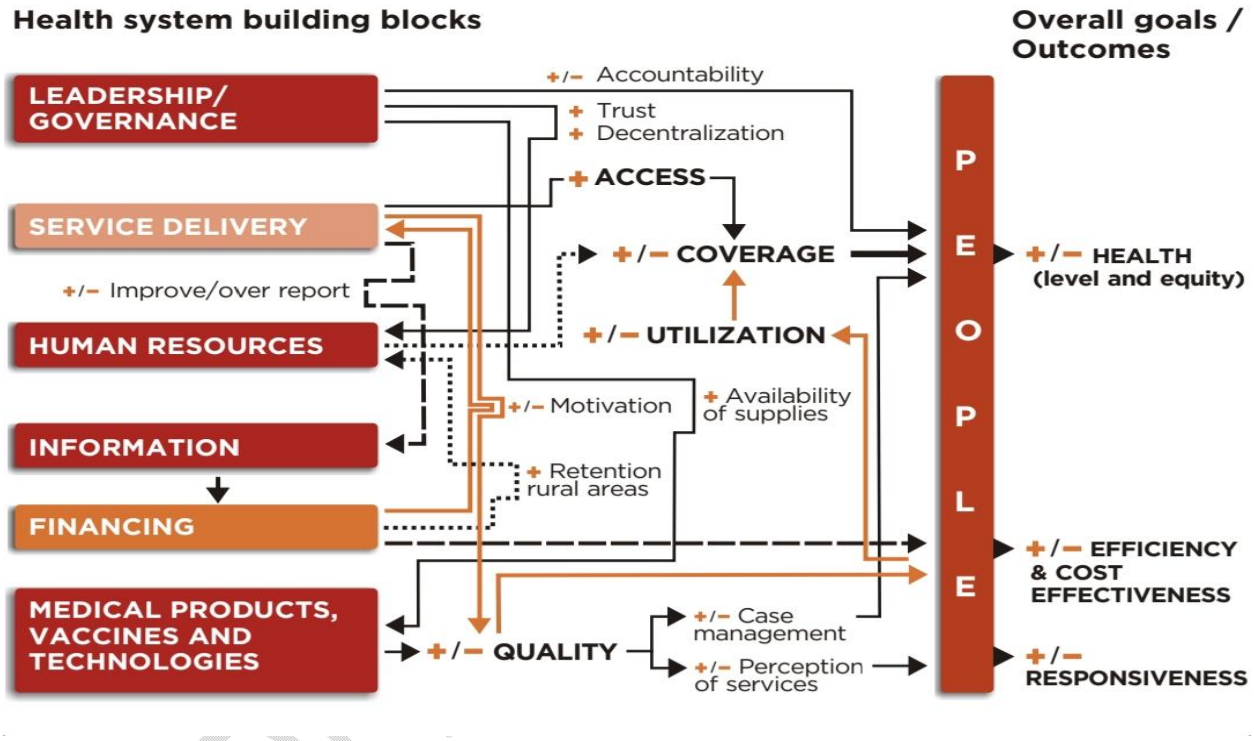

Fig. 1. Flow diagram illustrating the synergistic interaction of health systems building blocks through a systems-thinking approach [3].

3.3 Evaluation of the hospital-wide systems thinking approach using the performance of the BBs.

A hospital-wide evaluation of the systems thinking approach using the performance of the BBs was undertaken. Table 1 below summarizes the evaluation of the different BBs by the key stakeholders.

Table 1. Perceived performance of the various BBs by the key stakeholders*.

LEADERSHIP/GOVERNANCE	**68.6%**
New organizational policies and practices	72%
Capacity to assemble & manage resources (human & material)	71.7%
Optimal use of resources	66.3%
Appropriate use of staff working hours	63.5%
Networking with external organizations	69.8%
Level of trust & confidence in leadership capacity	73%
Satisfaction of patients & providers	64%
HEALTH CARE FINANCING	**58.2%**
Efficient & effective health financing system	56.5%
Linkage of financial mobilization with evidence-based plan/need	57.8%
Effective budget consumption	60.3%
Innovative financial mobilization window	60.3%
Transparency & accountability	61%
The required financial resources for sustainability	50.8%
Reduced wastage & enhanced cost-effectiveness	60.8%
HEALTH WORKFORCE	**57.1%**
The required no. qualified staff	67%
Job satisfaction	61.3%
Well motivated staff	53.8%

Appropriate and timely feedback	60.3%
Conducive staffrooms	46.5%
Conducive hospital structures	56%
Innovative staff recruitment strategies	55%
MEDICAL PRODUCTS, VACCINES & TECHNOLOGY	**65.9%**
Availability of essential drugs & medical supplies	59.5%
Medical apparatus, equipment & devices	60%
Up-to-date technologies for patient diagnosis	62%
New organizational policies & practices	68%
Local & innovative medical products & devices	64%
COVID-19 vaccine availability	78.8%
Networking with external organizations	69%
HEALTH INFORMATION SYSTEMS	**61.9%**
Monitoring and evaluation system	60.8%
Availability & dissemination of updated guidelines & protocols	64%
Easy & prompt reporting system	60.5%
Availability of electronic medical records system	63.5%
Networking with external organizations	66.3%

Data generation for strategic planning	61.3%
Ease of access to data for research	57%
SERVICE DELIVERY	**64.4%**
Satisfied patients	61%
Prompt services	58.8%
Courtesy & resect to patients	64%
No patient discrimination	68.8%
Comprehensiveness of service	68%
Quality of healthcare	69.5%
Adequate mode of communication suitable to patients	69.5%
Patients' ease of access to healthcare services	62%
Staff satisfaction	58%

***Cumulative average score for all the BBs = 62.7%.**

4.0 DISCUSSION.

Systems thinking encompasses a problem-solving approach, where issues are viewed, not as stand-alone problems, but rather, in the context of a holistic system, and how deficiency in a single component of the system affects the efficiency and productivity of the whole system. It encourages a deeper interrogation of the prevailing state of affairs, and views problems from different angles, bearing in mind the interconnectedness of different, apparently independent, parts of a system [16]. Access to efficient and quality health care delivery in Nigeria remains a huge challenge [17], made worse by the demands of the COVID-19 pandemic on the health system. In other to make available, optimal healthcare service delivery to the populace, in addition to ensuring efficient utilization of extremely scarce resources during the COVID-19 pandemic, the leadership of the UNTH Enugu, a tertiary hospital in Nigeria, employed a systems-thinking approach utilizing the health systems BBs as a strategy, to help them contain the COVID-19 pandemic while offering the best care possible for their patients. A similar health

system assessment had been undertaken at a larger scale in East Africa as reported by Manyazewal et. al. [14], and their findings indicated that the WHO health systems BBs were useful in assessing health systems with a view towards strengthening them. The perceived impact of this hospital-wide systems-thinking approach which was employed by the leadership of the hospital, was assessed by the authors through a feed-back survey involving eighty key system stakeholders from critical clinical, non-clinical and administrative departments of the hospital.

Females were slightly more in number than males at a ratio of 1.2:1, with majority of the respondents expectedly, belonging to the middle-aged category, as the stakeholders were mainly supervisors and heads of various units who would typically have worked in the hospital for a significant number of years.

Nine out of every ten of the key stakeholders had tertiary-level education. This is in keeping with the expected educational attainment demographic of supervisors and heads of units/departments in a tertiary hospital, being a prime referral center for the region. A significant proportion of the stakeholders had worked at the hospital for more than 10 years and as such, could give a good account of the perceived impact which the systems-thinking approach had made, having been aware of how the hospital had been running, pre-pandemic.

Leadership/Governance was adjudged to have had the most positive impact on the system, at a cumulative score of 68.6%, as staff had a high level of trust and confidence in the leadership of the hospital. In addition, new organizational policies and practices put in place by the leadership were well appreciated by the staff. This is a welcome development as a recent review by Adeloye et. al., suggests a health system governance crisis in Nigeria [18]. However, staff felt that their skills and experience could still be more optimally utilized by the hospital leadership. The above score, though marginally higher, aligns with the findings as reported by Manyazewal et al in Ethiopia [14], although their study involved a wider scope.

The stakeholders were unanimous in their belief that there was inefficient and ineffective healthcare financing mechanism as most of the patients pay out-of-pocket to access healthcare services, a situation which leads to financial hardships and impoverishment [19,20]. In addition, poor budgetary allocations to the health sector by the central government was adjudged to impactnegatively on health care service delivery as the country has consistently fallen short of

the 15% minimum recommendation of the total federal budget, as allocation to the health sector [21]. However, the respondents believed that the leadership of the hospital, to a reasonable extent, employed transparency and accountability in the management of the hospital's finances.

Regarding availability of medical products, vaccines and technologies, the stakeholders appreciated the efforts of the leadership of the hospital as a wide-array of external collaborations and partnerships were actively sought for the provision of scarce, life-saving medical services, consumables, equipment and devices as the pandemic raged. This was also echoed by Karreinen S, et al. in their recent study among a cross-section of health facility leaders in Finland [22]. Additionally, the hospital leadership envisioned and supported various local initiatives that impacted on the hospital service delivery greatly. For instance, the compounding unit of the Pharmacy department, through support from the hospital management, commenced the production of hand-sanitizers, hypochlorite solutions and liquid soaps and these were extremely vital in allaying fears and boosting staff morale which were at an all-time low during the pandemic. The Biomedical Engineering department also commenced the production of mobile hand-wash stations which were stationed at strategic points in the hospital, while the clinical services department designed and produced medical face-masks which were systematically distributed to all staff at the peak of the pandemic, in the backdrop of severe world-wide scarcity of these life-saving medical consumables. Once the COVID-19 vaccines became available in the country, the hospital leadership collaborated with external partners to make the vaccines available in the hospital for staff, patients and members of the local community, at no cost. However, the stakeholders believed that more could be done regarding the availability of essential medications and medical supplies.

Quality of healthcare services offered and comprehensiveness of healthcare services, though could be improved upon, were adjudged to be above average by the respondents. The leadership of the hospital were deemed to have been proactive in constructing a 20-bedded temporary COVID-19 isolation facility in record time, as well as evacuating and preparing another hospital ward on stand-by, as soon as the COVID-19 disease was declared a pandemic by the World Health Organization in March 2020 [23].

This particular move by the leadership would later prove to be the master-stroke in the battle to contain the pandemic as the center would go ahead to become the main regional COVID-19

treatment hub, south-east of the country. However, the stakeholders believed that the leadership needed to do much more, so as to improve on staff-related welfare issues and staff motivation as these trailed other BBs. Indeed, healthcare workforce has been singled out as a critical resource for achieving a resilient health system [22].

5.0 CONLUSION

Overall, at a cumulative average score of 62.7% for all the six BBs, the UNTH leadership may be adjudged to have performed creditably in their efforts at COVID-19 containment, given the limited human and material resources available to them. The application of systems thinking by the leadership of the hospital, to their response to the COVID-19 pandemic may have contributed in no small measure to the successes recorded.

However, staff welfare should be enhanced and prioritized, so as to ensure a well-motivated staff which will most likely translate to improved service delivery.

6.0 LIMITATIONS

The study involved only key stakeholders who were either heads or supervisors in all the various critical units and departments of the hospital. Ideally, sampling all the staff of these departments may have provided a better perspective.

Consent – verbal informed consent was obtained from all the participants.

Ethical approval – Not applicable

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