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The double burden of Ebola and COVID-19 viral infections and the readiness for safe surgical care provision in Uganda and the Eastern Democratic Republic of the Congo: An online cross-sectional survey

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Abstract

Objective: This study aimed at highlighting the extent to which Uganda and the Eastern DR Congo are ready for safe surgical care provision during the double burden of Ebola and COVID-19.

Methods: An online cross-sectional study was conducted in selected National, Regional Referral and General Hospital facilities of Uganda and in the Eastern part of D.R. Congo from 1st August 2020 to 30 October 2020. Data was analysed using Stata version 14.2.

Results: A participation rate of 37.5% for both countries (72/192). The mean bed capacity of participating health facilities (HF) was 184 in Eastern DR. Congo and 274 in Uganda with an average surgical ward bed capacity of 22.3% (41/184) of the beds in the DR. Congo and 20.4% (56/274) in Uganda. The mean number of operating rooms was 2 and 3 in Eastern DR. Congo and Uganda respectively. Nine hospitals (12.5%) reported being able to test for Ebola and 25 (34.7%) being able to test for COVID-19. Only 7 (9.7%) hospitals reported having a specific operating room for suspect or confirmed cases of Ebola or COVID-19. Provision of appropriate Personal Protection Equipment to personnel were reported to be available in 60 (83.3%) hospitals. The mean of readiness score for provision of surgical care was 7.8/16 (SD: 2.3) or 60% in both countries with no statistical significance in multiple linear regression analysis (p>0.05).

Conclusion: The majority of participating hospitals in both countries had a low level of readiness to provide safe surgical care due to lack of supplies to limit the exposure of Healthcare workers (HCW) to Ebola and Covid-19 viral infections, and poor funding. Governments and non-governmental organizations should work together to enhance health facility supplies and readiness for safe surgical provision in resource-limited settings.

Key-words: Double burden, Ebola, COVID-19, surgical care readiness, Uganda, Eastern DR. Congo
Introduction

As the COVID-19 continues to evolve and spread worldwide, health facilities are intensifying measures for protecting patients and health workers from this highly infectious disease [1]. The incubation period of the COVID-19 varies from 2 to 14 days [2]. Infected patients, both asymptomatic and symptomatic, can transmit the disease to a non-infected person and this accounts for the significant ongoing community transmission [2]. The spread of the COVID-19 virus in health facilities is largely from patients and healthcare providers with mild or nonspecific respiratory syndromes, or asymptomatic, leading to a cluster of nosocomial infections [3]. With a total of 148,999,876 cases confirmed worldwide (3,290,637 confirmed in Africa) as of 28th April 2021, COVID-19 compounded an already complicated situation in the Eastern Democratic Republic of Congo (DRC), with both armed conflict and the highly contagious Ebola virus disease (EVD) outbreak (from August 1, 2018 to of June 21, 2020 in the Kivu). A total of 3,317 confirmed cases and a death toll of 2,287 patients including healthcare workers (HCWs) and two fatalities registered in the neighboring Uganda was reported [4,5]. The 11th EVD outbreak was declared in the Equator Province in the western DRC last year registering 130 cases including 55 deaths [6]. On 7th February 2021, the 12th EVD outbreak has been declared in Butembo in the eastern DRC by the DRC Ministry of Health with 12 confirmed cases including 2 health care workers and has claimed so far 6 lives as of 28th April 2021 [6].

Several facility-based measures have been put in place to mitigate the spread of COVID-19 and Ebola and their impact on the health systems. The measures include the use of personal protective equipment (PPE) when handling patients, testing, isolation and treatment of symptomatic patients, and contact tracing, in addition to quarantine of the suspected cases [1,7]. However, since not all patients in need of surgery are being routinely tested for COVID-19 or EVD and asymptomatic patients could spread both diseases to the non-infected staff in the surgical operating rooms, it was suggested that all surgical patients should be considered as possibly positive in order to limit the contamination of healthcare workers [8]. Following the declaration of the COVID-19 pandemic in March 2020, elective surgeries were cancelled in most countries and several additional measures such as use of PPE, psychological support to all surgical teams, COVID-19 test for all patients who need an emergency surgery and others have been proposed to limit the risk of contamination among surgical patients and staff [9,10].
It is worth noting that during the West African Ebola outbreak in 2014, one of the measures put in place was that, for surgery to be done, the caregiving team was requested to undertake a documented utility risk analysis, which included not only the perspective of the patient, but also the surrounding surgical team [11]. A similar practice would be beneficial even in the current situation especially where there is a double threat from Ebola and COVID-19. Shortages of PPEs and operating rooms have changed the way surgical diseases are managed during the COVID-19 [12], with the American College of Surgeons proposing a triage algorithm with the purpose of preserving staff, PPE, and patient care supplies; ensuring staff and patient safety; and expanding available hospital capacity during the COVID-19 pandemic [8,13-14].

In Africa, the College of Surgeons of East, Central and Southern Africa (COSECSA) proposed a checklist for surgical readiness during the COVID-19 period that includes factors such as isolation of confirmed COVID-19 patients, use and application of PPE, hand hygiene, limitation of movement through the hospital and wearing of surgical masks for all confirmed cases when being transported through hospital space or in rooms [14]. Similar measures have been applied by surgical teams in different countries with varying success [15] as was also indicated during the Ebola outbreak in Western Africa [11]. However, despite these measures, health workers are reportedly being infected by the virus while providing health care during this pandemic. In China, more than 3300 health care workers have been infected with SARS-CoV-2 with notified 23 deaths, while in Italy 20% of responding health care workers have been infected as they cared for COVID-19 patients [16-18]. In Spain, 37 deaths have been reported among 35,000 health care workers (HCW) infected by COVID-19 [19]. African countries are registering deaths among confirmed COVID-19 healthcare workers. As of 14th March 2021, a total of 104,103 HCWs had been confirmed COVID-19 positive in Africa with 1,903 in Uganda and 256 in DR Congo (Verde et al., 2021) [6].

Worldwide, surgical care delivery to the general population has been affected by the staggering increase in the demand for medical supplies, reduced in-person medical visits, and shortages of medical protective gear [20] which has led to the delay in surgical care and follow-up of surgical patients in China, Germany and in Dubai [21].

In Africa, preparedness is challenged by the general weakness of health structures such as poor quality of healthcare, shortage of human resources, lack of equipment and facilities and vulnerable supply chains [22]. While most governments across Africa already rely heavily on assistance from
donors in the health area, the fragmented and insufficient responses have led to the creation of national public health institutes that have obliged these countries to look for ways to collaborate and work together to fight this weakness of health structures [22].

Furthermore, the COVID-19 pandemic has come at a time when low- and middle-income countries are already facing a critical shortage of human resources for health and more especially the surgical care human resources (Surgeons, anesthesiologists, theatre nurses) at 0.7 providers per 100,000 population [23]. This could have an impact on access to surgical care given that 4.8 billion people worldwide do not have access to surgery, with the greater strain being experienced in low- and middle-income countries [24-25]. To be able to respond appropriately to the situation and to avoid the negative impact on provision of surgical care, there is need to know the reality on the ground in terms of facilities, the necessary equipment and supplies, and the strengths and weaknesses in terms of availability of suitably qualified human resource for health for surgical care. Nevertheless, the extent to which the African countries, particularly Uganda and the DRC, are prepared to face the Ebola and COVID-19 burden to provision of safe surgical care is not known and hence the need to undertake this study.
Methods

Study design and setting

This was an online cross-sectional study conducted in selected National, Regional Referral and General Hospital facilities of Uganda and in the Tertiary health facilities and General hospitals of the Eastern part of DRC where surgeries are being done during the double burden of Ebola outbreaks and COVID-19 viral infection pandemic. These two countries were chosen as they have recently been affected by Ebola and the ongoing COVID-19 pandemic. Currently the Eastern DRC is affected by both Ebola and COVID-19 and Uganda is facing COVID-19 and had Ebola outbreaks in 2000, 2014, 2017 and 2018; and remains on alert given the outbreak in the Eastern DRC. With the experience of viral disease outbreaks, it would be assumed that the countries could have been prepared.

Study participants and recruitment

This study involved medical doctors and surgeons working in the selected health facilities and consented to participate in the study and responded to the questionnaire. The participants doctors (medical director or head of surgical department) were contacted by call phone in personal of the behalf of the hospital and were encouraged to participate on the study.

Data collection and instrument

The study was conducted for a period of three months from 1st August 2020 to 30 October 2020 and the participants were asked and always encouraged to respond to an online structured questionnaire, pre-validated by two independent hospitals and piloted in Uganda and in Eastern DRC whose responses were not included in this study.

Judgement sampling technique was used to identify the hospitals and the participants per selected hospital in both countries based on the fact that both countries have experienced multiple outbreaks Ebola and share the borders. Data collection in each country was coordinated by one trained researcher who was in charge of identifying and distributing the online structured questionnaire via e-mail and/or WhatsApp to the heads of surgical departments of the selected hospitals in the study setting. A total of 192 hospitals were selected out of which 158 were in Uganda and 34 hospitals in Eastern DRC.

After reading the preamble part of the questionnaire and consenting to participate, participants were automatically directed to fill in an online questionnaire which was then automatically sent to the principal investigator.
The questionnaire was composed of 23 items developed based on the elements from the study on COVID-19 preparedness [14] and focused on several key concepts. Section A had six questions related to characteristics of the health facility (country, name of hospital, hospital sector, hospital bed capacity, surgical bed capacity and number of active operating rooms). Section B had sixteen questions related to the readiness and Section C had one question related to the influencing factor to provision of surgical care during the double burden Ebola and COVID-19 era (Table 1). In section B each of the 16 readiness-related questions contained 2 options “Yes” and “No” and a score of one point was given for answer (Yes), and zero point was awarded for answer (No). The total score in this section ranged from 0 to 16, with the higher score indicating a higher level of readiness among participant hospitals.

Data processing and analysis
The raw data was cleaned and entered into Microsoft Excel and exported into STATA version 14.2 used for statistical analysis (StataCorp, College Station, Texas, USA).

The categorical data (characteristics of the health facility) are described by frequencies and figure. The sixteen questions on readiness were compared by country (Uganda and DRC) using the Chi-square statistics and presented with their frequencies and percentages.

The analysis of variance (ANOVA) and simple linear regression were used to study the association between readiness score (outcome) and independent variables (country, sector and having resource shortages) and presented with f-value, t-value at a 95% confidence interval with significant variables (p<0.05). Furthermore, readiness score was subjected to multiple logistic regression and presented with their coefficients and t-value at a 95% confidence interval with significant variables (p<0.05).

Ethical consideration
Ethical clearance for the survey was obtained from the Institutional Research Ethical Committee of Kampala International University (KIU-REC-023/202019) in Uganda and the Comite d’Ethique du Nord Kivu (004/TEN/CENK/2020) in the Democratic Republic of Congo. Permission to access health facilities was obtained from all relevant local health authorities. The participation in this survey was voluntary. Participants were allowed to withdraw from the study at any time by not submitting their form online or sending an email to the PI and there was no penalty for withdrawing from the study. The participants’ identities remained concealed as the form did not require any
identification. Names were not required from the participants. Informed consent was obtained from all the participants in the current study. All methods were carried out in accordance with relevant guidelines and regulations.
Result

Out of 192 preselected hospitals in Uganda (158) and Eastern DRC (34), 72 hospitals responded to the questionnaire during data collection period with a response rate of 37.5% for both countries. From the 72 hospitals, 47 (65.3%) were from Uganda and 25 (34.7%) from Eastern DRC. The mean bed capacity health facility (HF) was 184 (min: 60 and max: 500) in Eastern DRC and 274 (min: 80 and max: 1000) in Uganda. The average of bed capacity on surgical ward (SW) represented 22.3% (41/184) of the beds in the DRC and 20.4% (56/274) in Uganda. The mean operating rooms was 2 (Standard deviation of 1.7, minimum of 1 and Maximum of 9) and 3 (Standard deviation of 1.6, minimum of 1 and Maximum of 10) in Eastern DRC and Uganda respectively (Figure 1).

HF: Heath facility
SW: Surgical ward

Figure 1. Average of hospital bed capacity, surgical ward bed capacity and operating rooms per responding hospital
Readiness and Influencing factors

Out of 72 respondent hospitals, 9 (12.5%) reported being able to test for Ebola and 25 (34.7%) being able to test for COVID-19. Only 7 (9.7%) hospitals reported to have an operating room specific for suspect or confirmed cases of Ebola or COVID-19. Team response for Ebola and COVID-19 were reported to be present for 61 (84.7%) hospitals and provision of appropriate PPEs to personnel were reported to be available for 60 (83.3%) hospitals. Overall, the rate of correct answer on readiness reported by the hospitals ranged from 9.7 to 84.7% (Table 1).
<table>
<thead>
<tr>
<th>Variable group</th>
<th>Elements related to readiness and Influencing factor (Total size:72)</th>
<th>Total (n=72)</th>
<th>Eastern DRC (% n=25)</th>
<th>Uganda (%) n=47</th>
</tr>
</thead>
<tbody>
<tr>
<td>Readiness</td>
<td>Hospital able to test for Ebola (Yes)</td>
<td>9 (12.5)</td>
<td>5 (20.0)</td>
<td>4 (8.5)</td>
</tr>
<tr>
<td></td>
<td>Hospital able to test for COVID-19 (Yes)</td>
<td>25 (34.7)</td>
<td>5 (20.0)</td>
<td>20 (42.6)</td>
</tr>
<tr>
<td></td>
<td>Postponing elective surgeries during outbreaks period (Yes)</td>
<td>10 (13.9)</td>
<td>5 (20.0)</td>
<td>5 (10.6)</td>
</tr>
<tr>
<td></td>
<td>Having one operating room specific for suspect or confirmed cases (Yes)</td>
<td>7 (9.7)</td>
<td>1 (4.0)</td>
<td>6 (12.8)</td>
</tr>
<tr>
<td></td>
<td>Training of staff on appropriate donning and doffing of PPE (Yes)</td>
<td>40 (55.6)</td>
<td>9 (36.0)</td>
<td>31 (66.0)</td>
</tr>
<tr>
<td></td>
<td>Having teams specifically for Ebola and COVID-19 response (Yes)</td>
<td>61 (84.7)</td>
<td>21 (84.0)</td>
<td>40 (85.1)</td>
</tr>
<tr>
<td></td>
<td>Having protocols specifically for Ebola and COVID-19 response (Yes)</td>
<td>56 (77.8)</td>
<td>20 (80.0)</td>
<td>36 (76.6)</td>
</tr>
<tr>
<td></td>
<td>Use of COVID checklist for suspected/known patients undergoing surgery (Yes)</td>
<td>46 (63.9)</td>
<td>17 (68.0)</td>
<td>29 (61.7)</td>
</tr>
<tr>
<td></td>
<td>Avoid involving students/Residents in patient care of infected patients (Yes)</td>
<td>14 (19.4)</td>
<td>5 (20.0)</td>
<td>9 (19.1)</td>
</tr>
<tr>
<td></td>
<td>Reduction of the staff number required in the hospital to preserve human resource (Yes)</td>
<td>24 (33.3)</td>
<td>7 (28.0)</td>
<td>17 (36.2)</td>
</tr>
<tr>
<td></td>
<td>Providing appropriate PPEs to personnel (Yes)</td>
<td>60 (83.3)</td>
<td>25 (100.0)</td>
<td>35 (74.5)</td>
</tr>
<tr>
<td></td>
<td>Having containers (disposable bag) for any used PPE (Yes)</td>
<td>54 (75.0)</td>
<td>12 (48.0)</td>
<td>42 (89.4)</td>
</tr>
<tr>
<td></td>
<td>Disinfection of all hard surface areas regularly with 0.5% chlorine or 70% alcohol (Yes)</td>
<td>30 (41.7)</td>
<td>16 (64.0)</td>
<td>14 (29.8)</td>
</tr>
<tr>
<td></td>
<td>Provide psychological support to staff during this time of crisis (Yes)</td>
<td>29 (40.3)</td>
<td>2 (8.0)</td>
<td>27 (57.4)</td>
</tr>
<tr>
<td></td>
<td>Similarity or increase on HCW’s remuneration (Yes)</td>
<td>52 (72.2)</td>
<td>17 (68.0)</td>
<td>35 (74.5)</td>
</tr>
<tr>
<td></td>
<td>Timely remuneration of HCW’s (Yes)</td>
<td>46 (63.9)</td>
<td>14 (56.0)</td>
<td>32 (68.1)</td>
</tr>
</tbody>
</table>

| Influencing Factor | Resource shortages during the double burden Ebola and COVID-19 (Yes) | 63 (87.5)  | 18 (72.0)    | 45 (95.7)      |

HCW’s: Healthcare workers
Simple linear and multiple linear regression analyses of readiness score

As shown in Table 2, the mean of readiness score to provision surgical care during the double burden of Ebola and COVID-19 in Uganda and Eastern DRC was 7.8 (SD: 2.3) suggesting an overall of 60% rate on readiness. Multiple linear regression analysis showed that there is no statistical significance of readiness score across country, sectors and resource shortages (p>0.05) (Table 3).

**Table 2. Simple linear regression of readiness score to provision surgical care by country, hospital’s sector and influencing factor**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency (%)</th>
<th>Mean (SD)</th>
<th>t/F</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td></td>
<td></td>
<td>2.54</td>
<td>0.115</td>
</tr>
<tr>
<td>Eastern DRC</td>
<td>25 (34.7)</td>
<td>7.2 (2.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>47 (65.3)</td>
<td>8.1 (2.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital’s sector</td>
<td></td>
<td></td>
<td>0.9</td>
<td>0.345</td>
</tr>
<tr>
<td>Private</td>
<td>27 (37.5)</td>
<td>8.1 (2.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>45 (62.5)</td>
<td>7.6 (2.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource shortages</td>
<td></td>
<td></td>
<td>0.47</td>
<td>0.497</td>
</tr>
<tr>
<td>No</td>
<td>9 (12.5)</td>
<td>7.3 (2.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>63 (87.5)</td>
<td>7.9 (2.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>72 (100.0)</td>
<td>7.8 (2.3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: Standard deviation

**Table 3. Multiple linear regression of country, hospital’s sector and influencing factor associated with readiness score to provision surgical care**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t</th>
<th>95% CI</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DRC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>0.8</td>
<td>1.23</td>
<td>(-0.47 - 1.99)</td>
<td>0.223</td>
</tr>
<tr>
<td>Hospital’s Sector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>-0.4</td>
<td>-0.67</td>
<td>(-1.52 - 0.76)</td>
<td>0.505</td>
</tr>
<tr>
<td>Public</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource shortages</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.2</td>
<td>0.24</td>
<td>(-1.52 - 1.95)</td>
<td>0.807</td>
</tr>
</tbody>
</table>

CI: Confident Interval
Discussion

The availability of human resources, drugs, equipment and basic infrastructural amenities is crucial for providing quality services that meet minimum standards [26]. In high- and middle-income countries, suitable facilities and equipment, human resources, and infrastructure are available even in the district hospitals [27]. The situation is quite different in low-income countries, especially in Africa. For a health facility to be considered ready, it has to: (a) develop a clear plan for providing essential operations during the pandemic; (b) develop strategies to decrease exposure of health care staff and (c) develop capacity to conserve PPE and consumables [14].

Across the two countries, the hospitals that reported to be offering surgical services did not have all of the elements of readiness for offering the safe surgical care during the double burden of Ebola and COVID-19 viral infections. This study reported that 60% of hospitals were ready to provide surgical care during the Ebola and COVID-19 era at the time of data collection period. In Uganda, the mean of readiness was higher than in Eastern DRC, though not statistically significant. This result is similar to findings in a study done by Spiegel et al [28] on surgical availability and readiness in 8 African countries in which Uganda was reported to have a higher readiness score for basic surgery compared to other countries. In our study, the average bed capacity varied across the two countries. Hospitals in Uganda reported having a lower average of bed capacity on surgical ward than those in the Eastern DRC. However studies assessing public hospital surgical capacity in the DRC [29] and Uganda [30] have shown the average number of hospital beds to be 150 (2.5 operating rooms) and 257.1 (2.63 operating rooms) respectively. With such an average of operating rooms available in the participating hospitals in both countries, the study found that 90.3% of hospitals reported not having a separate theatre room specific for suspect or confirmed cases of Ebola and COVID-19. This increases the potential risk for infectious disease dissemination among patients and HCWs, and is compounded by the lack of testing for Ebola and COVID-19 in most respondent hospitals. However, it has been proposed for each hospital providing surgical care to have a separate operating room specific for confirmed or suspected COVID-19 [14] or Ebola cases [31].

According to the International Monetary Fund (IMF), LIC’s reported financial shortage in most of the hospitals [32] and this survey has found that both countries, Uganda and Eastern DRC hospitals are facing financial shortages to provision of safe surgery. However, teams, protocols and appropriate PPE’s to HCWs were reported to be available in most hospitals of Uganda and Eastern
DRC. This can be due to the fact that both countries have participated in infectious disease control related campaigns in response to repeated outbreaks of Ebola and Marburg Outbreaks [33]. However, the level of training of staff on appropriate donning and doffing of PPE was found to be inadequate in both countries despite the recommendation that guidance and training should be provided immediately to HCWs so as to make the best use of their technical and clinical skills [14,34].

Our study found a lack in provision of psychological support to staff during Ebola and COVID-19 in Eastern DRC and Uganda yet it was reported that HCWs during periods of outbreaks need psychological support as they have been reported to have significant anxieties while providing care outside of their normal scope of practice or working beyond their area of competence [35] and this anxiety must be acknowledged and managed to allow them to have reassurance that the system will protect them and support them and their family.

**Study limitations**

Participation of all pre-selected hospitals in Uganda and Eastern DRC was not possible despite the effort made to get responses from the participants to whom we sent the link, thus the findings from this survey will not be generalized for all the hospitals. This study is not to illustrate the effectiveness or ineffectiveness of management of hospitals. It could be more useful to carry out a qualitative research in the selected hospitals to have in-depth insights of what is ongoing in the hospitals but due to restrictions measures to move during data collection period, it was not possible and we converted questions to an online form to allow the researchers to have an idea of surgical readiness of hospitals in Uganda and Eastern DRC.

**Conclusion**

This study was highlighting the level of readiness of hospitals to provision of surgical care during the double burden of Ebola and COVID-19 in Eastern DRC and Uganda. The findings suggest lack of readiness among hospitals in both countries in terms of supplies to limit the exposure of HCWs, remuneration and support of the HCWs, and in terms of financing. There is urgent need for intervention by the concerned governments and non-governmental organizations to work together in improving health facility supplies and funding to enhance the readiness for safe surgical
provision in the two countries. The readiness process must be constantly monitored, the surgical societies should champion the advocacy for adequate supplies and better remuneration of HCWs.

List of abbreviations

CENK: Comite d’Ethique du Nord Kivu
COSECSA: College of Surgeons of East, Central and Southern Africa
DRC: Democratic Republic of Congo
EVD: Ebola virus disease
HCW: Health Care Workers
IMF: International Monetary Fund
IREC: Institutional Research Ethical Committee
KIU: Kampala International University
LIC: Low Income Country
PPE: personal protective equipment

Data availability

The data used to obtain the findings is available from the corresponding author FKS and the author YM on a reasonable request.

Ethical approval and consent to participate

Ethical clearance for the survey was obtained from the Institutional Research Ethical Committee of Kampala International University in Uganda (KIU-IREC-023/202019) and the Comite d’Ethique du Nord Kivu (004/TEN/CENK/2020). Informed consent was obtained from all the participants in the current study. All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Informed consent was obtained from all the participants in the current study.

Competing interest

Authors declare no competing interest.
**Author’s contributions**

FKS was the principal investigator, conceived and designed the survey, supervised data collection and critically reviewed the manuscript. YM analyzed data; RS, FNBP and SBM reviewed the manuscript development, revised the data tool and revised the methodology. AAOL, FO, MK, MMV, BMV, MMM, FDS, JS and JOF participated in data collection; BJS and PK critically reviewed the manuscript. All authors read and approved the final manuscript.

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**Funding**

Not applicable
References


**Figure 1**

Average of hospital bed capacity, surgical ward bed capacity and operating rooms per responding hospital. HF: Heath facility SW: Surgical ward