Risk Management and Healthcare Policy

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ORIGINAL RESEARCH

Impact of Hospital Closure on Patients with Communicable and Non-Communicable Diseases During the COVID-19 Pandemic in Uganda: A Cross-Sectional and Mixed-Methods Study

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Background: The COVID-19 pandemic and its measures have had a profound impact on universal access to health services. We investigated the impact of the closure of the Entebbe Regional Referral Hospital (ERRH) for two years on the accessibility to necessary healthcare among non-COVID-19 patients.

Methods: This mixed-methods study focused on ERRH patients with tuberculosis (TB), human immunodeficiency virus (HIV), diabetes/hypertension, and mental illness. A quantitative study used a structured-questionnaire with a primary outcome measure to assess the discontinuation of healthcare accessibility. A qualitative study with a focus group discussion (FGD) was conducted on eight patients.

Results: Of the 202 quantitative survey participants, 17.8% discontinued necessary healthcare due to the ERRH closure, and the discontinuation rates differed by disease: 48.1% of TB patients, 16.0% of HIV patients, 7.8% of diabetes/hypertension patients, and 4.0% of mental health patients ($P < 0.001$). Almost 90% of the patients reported a worsened health condition, regardless of the disease. Multivariable logistic regression analysis showed that patients with diabetes/hypertension (adjusted odds ratio [AOR], 12.69; 95% confidence interval [CI], 2.57–62.52) and HIV (AOR, 7.52; 95% CI, 1.37–41.27) were more likely to discontinue healthcare than those with mental illness. The factors associated with discontinued healthcare included age ≥50 years vs ≤30 years (AOR, 4.88; 95% CI, 1.07–22.34), and high transportation cost vs low cost (AOR, 3.15; 95% CI, 1.13–8.75). The FGD also identified difficulties in obtaining medication, especially for TB, even though ERRH provided the outreach services.

Conclusion: Our study revealed that the ERRH closure and lockdowns had an overall profound negative impact on access to healthcare and health conditions. Younger patients and those with TB were the most affected patients. This study provides practical suggestions from the field for policy makers to strengthen universal health access during health crises in Uganda and other sub-Saharan countries.

Plain Language Summary: This study investigated the impact of service disruption in a tertiary hospital (ERRH) that was converted to a COVID-19-dedicated hospital for two years in Uganda. This mixed-methods study focused on the ERRH patients with tuberculosis (TB), human immunodeficiency virus (HIV), diabetes, hypertension, and mental illness. A quantitative study used a structured questionnaire with the primary outcome measure being the discontinuation of healthcare provision. A qualitative study with a focus group discussion (FGD) was conducted on eight patients. Of the 202 quantitative survey participants, 17.8% discontinued necessary healthcare due to ERRH closure, and the discontinuation rates differed by disease: 48.1% of tuberculosis patients, 16.0% of HIV patients, 7.8% of diabetes/hypertension patients, and 4.0% of mental health patients ($P < 0.001$). Almost 90% of the patients

Received: 19 May 2023
Accepted: 28 September 2023
Published: 27 November 2023

reported worsening health conditions. The factors associated with discontinued healthcare included age ≥50 years vs ≤30 years (AOR, 4.88; 95% CI, 1.07-22.34), and high transportation costs vs low cost (AOR, 3.15; 95% CI, 1.13-8.75). The FGD also identified difficulties in obtaining medication, especially for TB, even though the ERRH provided outreach services. Our study revealed that ERRH closures and lockdowns had profound negative impacts on access to health care and health conditions. Younger patients and those with TB were the most affected patients. This study provides suggestions from the field for policy makers to strengthen universal health access during health crises in Uganda and other sub-Saharan countries.

Keywords: lockdown, public health and social measures, health service disruption, tuberculosis, HIV, mental illness

Introduction

The coronavirus disease (COVID-19) is an infectious disease caused by a novel coronavirus called SARS-CoV-2, which emanated from Wuhan, People's Republic of China with an outbreak of pneumonia of unknown cause and reported on December 31, 2019, leading to a global pandemic.[1] The COVID-19 pandemic has negatively impacted health services provision in major health areas in not only low-income countries but also middle- and high-income countries.[2] Health systems in developing countries remain a heavy debt towards recovery to the pre-pandemic level.[3–8] Intensive public health and social measures (PHSMs) that were taken to control the COVID-19 transmission, resulted in decreased access to the essential health services, especially in low- and middle-income countries.[4,9–12] Many African countries have faced enormous burdens from PHSMs[13–15] despite successful containment of COVID-19 compared with high-income countries. A survey conducted in 19 African Union member states reported that 42% of respondents answered that some household members who needed healthcare gave up trying to access services at the beginning of the pandemic.[9]

The Sustainable Development Goals have set the goal of reducing mortality in non-communicable diseases (NCDs), Africa is no exception. Over the last 20 years, the African continent has faced an epidemiological transition from communicable to NCDs.[16,17] Even the Africa Centers for Disease Control and Prevention (Africa CDC) declared that their priority had shifted to NCDs and mental health disorders in September 2020.[18,19] The COVID-19 pandemic hit African countries in the midst of this transition phase, when economic capacities were weak and healthcare systems were fragile.[16,20,21] A review study identified that the COVID-19 pandemic had severely impacted the control programs and adherence to treatment of major diseases, such as human immunodeficiency virus (HIV), tuberculosis (TB), malaria, NCDs, as well as mental illness in Africa.[16] Other researchers also stressed that persons living with HIV (PLWHs) were vulnerable to COVID-19-related mortality.[4,22]

The first case of COVID-19 was identified in Uganda on March 21, 2020. The government embarked on two strict nationwide lockdowns in 2020 and 2021, including bans on public transportation, night curfews, school closures, and bans on public gatherings to prevent the spread of the pandemic.[23,24] The restriction of mobility affected vulnerable populations, limited access to health services, and resulted in negative impacts on health conditions, especially for patients with malaria, TB, and hypertension, which are among the leading causes of death in Uganda.[25,26] PLWHs with TB have experienced a high burden in Uganda, as the country ranks among the top 30 in terms of cases of PLWHs with TB.[27] In addition, mental health is an underlying national public health concern.[28]

Converting hospitals to COVID-19 treatment centers is a common measure to ensure that a health system is in place to provide COVID-19 treatment in low-resource countries.[9,29] A few studies have examined the impact of hospital conversion or closure in high-income countries.[30,31] In Uganda, one of the tertiary hospitals, the Entebbe Regional Referral Hospital (ERRH), was designated as the only COVID-19-specialized hospital and disrupted its regular services from March 2020 to March 2022. We suspected that its closure would have had an enormous impact on patients with TB, HIV, and mental health issues as well as those with other NCDs who had been receiving continuous care at the ERRH.

Given this background, the aim of this study was to explore the impact of hospital closure, especially the degree of alternative health care and health conditions, on patients with diabetes/hypertension, TB, HIV, and mental illness under the COVID-19 response measures in Uganda and to examine the factors associated with the discontinuation of healthcare access among these populations.

Materials and Methods

Study Design and Setting

This was a cross-sectional, mixed-methods study. A quantitative study of patients at the ERRH using a structured questionnaire and a qualitative study using focus group discussion (FGD) were conducted simultaneously, and the results were merged and interpreted equally. The combination of both methods enabled us to explore broader and richer findings regarding unknown, complex events, such as COVID-19 and associated factors. In addition, the FGD enabled researchers to directly gather patients' recommendations for health delivery system reform for future health crises.

The health service delivery in Uganda is structured along a three-tire system; tertiary (top referral, national referral hospitals and regional referral hospitals), secondary (general hospital at district level) and primary levels (health centers IV, III, and II).[32] The ERRH is one of 14 regional referral hospitals at tertiary level located in the Entebbe municipality of the Wakiso district. The Entebbe municipality has a population of approximately 70,219 as of the last census in 2014.[26] It is located approximately 36 km southwest of Kampala, the Ugandan capital city, and its southern end borders Lake Victoria. Entebbe has the only international airport and is the gateway to Uganda. The ERRH serves the population of Entebbe and surrounding areas in Wakiso district. The hospital includes obstetrics and gynecology, pediatrics, internal medicine, general surgery, and orthopedics departments, as well as special clinics for diabetes/hypertension, TB, antiretroviral therapy (ART) for HIV, and mental health. As of September 2022, it had 200 beds and approximately 180 staff. The monthly average numbers of outpatients before the closure of The ERRH from January 2018 to March 2020 were: 382.1 for diabetes/hypertension; 26.0 for TB; 512.0 for HIV; and 153.1 for mental health (See Supplementary File 1).

Participants

This study focused on four clinics serving five high-burden diseases in Uganda, namely diabetes/hypertension, TB, HIV, and mental illness. Although comorbidities are often found among patients with these five diseases, this study focused on their primary disease. We omitted malaria because patients with malaria can receive care at lower health facilities and trends in malaria change seasonally and yearly. Participants in both the patient survey and the FGD were purposely selected from the hospital registration list of patients who had visited the ERRH before the hospital closure and who were ≥18 years of age. From this list, the patients who had visited most recently were prioritized and asked at the exit of the clinics. Owing to time constraints, we failed to recruit patients with hypertension and diabetes mellitus for the FGD.

The sample size for the quantitative study was calculated by using the following formula, with the assumption that 15% reduction of numbers of NCD outpatients at the hospital during the target period based on the results of our previous survey at other regional referral hospitals in Uganda (See Supplementary File 2) with a 95% confidence interval (CI), a 5% margin of error, and a detection power of 80%. By adding 2% potential missing data, the estimated sample size was 200, which was divided equally into four clinics.

$$N = Z_a^2 \text{ x } P(1 - P) \ / \ d^2$$

N: required minimum sample size
Z_a: confidence level at 95% (1.96)
P: estimated prevalence of indicator in the research area
d: desired accuracy (0.01)

Data Collection

The quantitative study was conducted using a structured questionnaire. The questionnaire was developed by a research team and modified through a pre-test carried out with seven respondents. The questionnaire contained the basic characteristics of the participants, usage of the ERRH, difficulties faced during the pandemic, and perceptions and impact of the closure of ERRH. The heads of the clinics and one experienced senior-researcher were trained prior to the survey, and interviewed in person at the exit of each clinic using a digital data collection device.

The FGD was carried out at Kigungu Health Center III, which is located approximately 2 km (5 min by car) from the ERRH, on September 23, 2022. The semi-structured interview guide (see Supplementary File 3) was created by the research team, including three major topics: impact of the closure of the ERRH, impact of the COVID-19 pandemic, and suggestions for future pandemics. The FGD was carried out by two experienced researchers. The discussion continued until saturation was reached. The field data were collected from September to October 2022.

Prior to the start of the survey, we obtained approval from the Ethical committee at JICA Ogata Sadako Research Institute for Peace and Development (approval reference JICADI202002070001), the Research Ethics Committee at the School of Biomedical Sciences, Makerere University (approval reference SBS-2022-201), the Review Committee at the Uganda National Council for Science and Technology (approval reference SS1425ES). All participants provided informed written consent to be part of the study and consent for the publication of individual patient details (eg, age, gender, occupation) as long as it is published anonymously.

Data Analysis

For the quantitative study, first a descriptive analysis was performed with comparisons between diseases using a chi-square test or Fisher's exact test. Second, univariate analysis was conducted to identify factors associated with "discontinuation of healthcare". Potential confounding factors with a *P*-value of < 0.05 in the univariate analyses included: disease, age, transportation cost, and fear of catching COVID-19 at health facilities. These factors were entered into the multiple logistic regression model. The results of the regression analysis were shown the adjusted odds ratio (AOR) with the 95% CI. Statistical significance was set at 0.05. STATA version 17 was used for all quantitative analyses.

For the qualitative data, we performed a thematic analysis followed by the six phases in the analysis process described by Braun.[33] We targeted three topics: impact of the closure of the ERRH, impact of the COVID-19 pandemic, and suggestions for future pandemics. Additionally, the relative frequencies of statements by the participants were determined by following the previous studies.[34–36] Data were audio-recorded and transcribed. The transcripts were read repeatedly by two researchers (MK, SC) until they were fully familiarized with the contents, and codes and themes were extracted independently by two researchers (MK, SC) using NVivo version 1.6.1. (QSR International). A team of field researchers, the ERRH research members, and authors discussed the abstracted themes and finalized them. Finally, the findings from the quantitative and qualitative analyses were interpreted in an integrated manner.

Results

Quantitative Findings

Table 1 shows the basic characteristics of the 202 participants according the disease. The mean age of the respondents was 39.2 years (SD: 13.9, range: 18–85 years). Over half of the diabetes/hypertension patients were aged ≥50 years, whereas nearly half of the mental health and TB patients were aged <30 years. Approximately 30% of the respondents were jobless at the time of the survey. Close to 90% of respondents experienced a decrease in income due to COVID-19. Food security was a significant issue for most of the participants during the pandemic.

Table 2 shows the physical accessibility of the ERRH. Approximately one-third of the respondents could reach the ERRH within 30 min, and the most common means of travel to the ERRH was mini-bus (public transportation carrying about 14 passengers). A supplementary analysis proved that physical accessibility to the ERRH was not significantly related to healthcare discontinuation (see Supplementary File 4).

Table 3 presents the perception and impact of the ERRH closure by disease. Nearly all the participants (95.5%) were aware of hospital closures during the pandemic. Patients with Diabetes/hypertension showed the least awareness of its closure. Only 10.4% did not accept the closure during the pandemic while 13.9% accepted it as a necessary COVID-19 measure. Remarkably, 75.7% of participants argued that the government should have assigned them to an alternative health facility. This rate was highest among mental health patients (90.0%), followed by TB patients (82.4%). During the COVID-19 pandemic, all participants faced some difficulties (data not shown in Table 3). The difficulties in accessing healthcare services that people reported included unavailability of transportation (73.3%), transportation cost (51.0%), and fear of catching COVID-19 at health facilities (53.0%). Regarding healthcare expenditure, nearly 80% of the

Table 1 Socioeconomic Characteristics of the Respondents by Disease

	Diabetes/ Hypertension (n= 51) n (%)	TB (n= 51) n (%)	HIV (n= 50) n (%)	Mental Health (n= 50) n (%)	Total	
					(n= 202) n (%)	*P-value*
Age (years)						
≤30	6 (11.8)	22 (43.1)	12 (24.0)	23 (46.0)	63 (31.2)	<0.001
31–49	18 (35.3)	25 (49.0)	31 (62.0)	19 (38.0)	93 (46.0)	
≥50	27 (52.9)	4 (7.8)	7 (14.0)	8 (16.0)	46 (22.8)	
Sex						
Male	18 (35.3)	17 (33.3)	15 (30.0)	21 (42.0)	71 (35.2)	0.640
Female	33 (64.7)	34 (66.7)	35 (70.0)	29 (58.0)	131 (64.9)	
Education						
None/Primary	15 (29.4)	28 (54.9)	19 (38.0)	20 (40.0)	82 (40.6)	0.022
Secondary	21 (41.2)	16 (31.4)	27 (54.0)	22 (44.0)	86 (42.6)	
Tertiary and above	15 (29.4)	7 (13.7)	4 (8.0)	8 (16.0)	34 (16.8)	
Marital status						
Single/others	22 (43.1)	30 (58.8)	24 (48.0)	35 (70.0)	111 (55.0)	0.033
Married/cohabit	29 (56.9)	21 (41.2)	26 (52.0)	15 (30.0)	91 (45.0)	
Employment						
With job	39 (76.5)	39 (76.5)	37 (74.0)	24 (48.0)	139 (68.8)	0.004
Without job	12 (23.5)	12 (23.5)	13 (26.0)	26 (52.0)	63 (31.2)	
Decreased income due to COVID-19						
Yes	50 (98.0)	42 (82.4)	43 (86.0)	41 (82.0)	176 (87.1)	0.053
No	1 (2.0)	9 (17.6)	7 (14.0)	9 (18.0)	26 (12.9)	
Food security						
Yes	10 (19.6)	2 (3.9)	9 (18.0)	8 (16.0)	29 (14.4)	0.097
No	41 (80.4)	49 (96.1)	41 (82.0)	42 (84.0)	173 (85.6)	

Abbreviations: TB, tuberculosis; HIV, human immunodeficiency virus.

Table 2 Access to ERRH by Disease

	Diabetes/ Hypertension (n= 51) n (%)	TB (n= 51) n (%)	HIV (n= 50) n (%)	Mental Health (n= 50) n (%)	Total	
					(n= 202) n (%)	*P-value*
Time to reach ERRH						
≤30 min	18 (35.3)	16 (31.4)	15 (30.0)	21 (42.0)	70 (34.7)	0.436
31–60 min	20 (39.2)	26 (51.0)	27 (54.0)	17 (34.0)	90 (44.6)	
≥61 min	13 (25.5)	9 (17.6)	8 (16.0)	12 (24.0)	42 (20.8)	
Means to travel to ERRH						
Private car	1 (2.0)	0 (0.0)	0 (0.0)	1 (0.0)	2 (1.0)	0.105
Mini-bus	36 (70.6)	36 (70.6)	41 (82.0)	29 (58.0)	142 (70.3)	
Bike taxi	7 (13.7)	13 (25.5)	6 (12.0)	9 (18.0)	35 (17.3)	
Walking	4 (7.8)	0 (0.0)	1 (2.0)	7 (14.0)	12 (5.9)	
Others	3 (5.9)	2 (3.9)	2 (4.0)	4 (8.0)	11 (5.5)	

Abbreviations: TB, tuberculosis; HIV, human immunodeficiency virus; ERRH, Entebbe Regional Referral Hospital.

participants reported that their expenditure had more than doubled. These percentages were higher among patients with diabetes or hypertension.

Alternative healthcare services during the closure of ERRH varied: buying drugs at a store (27.2%) was the most frequent, followed by discontinuation of healthcare (17.8%), and private clinic (16.8%). The frequency at which health centers were used ranged from 4.0% to 12.4%, and differed by disease. Regarding the association between the disease and discontinuation of healthcare, 48.1% of participants with TB discontinued healthcare; in contrast, only 4.0% of

Table 3 Perception and Impacts of the ERRH Closure by Disease

	Diabetes/ Hypertension (n= 51) n *(%)*	TB (n= 51) n *(%)*	HIV (n= 50) n *(%)*	Mental Health (n= 50) n *(%)*	Total	
					(n= 202) n *(%)*	*P-value*
Aware of the ERRH service disruption						
No	5 (9.8)	1 (2.0)	0 (0.0)	3 (6.0)	9 (4.5)	0.079
Yes	46 (90.2)	50 (98.0)	50 (100.0)	47 (94.0)	193 (95.5)	
Acceptance of ERRH service disruption						
Cannot accept	10 (19.6)	7 (13.7)	2 (4.0)	2 (4.0)	21 (10.4)	<0.001
Should accept as COVID19 measures	7 (13.7)	2 (3.9)	16 (32.0)	3 (6.0)	28 (13.9)	
Assign alternative health facility	34 (66.7)	42 (82.4)	32 (64.0)	45 (90.0)	153 (75.7)	
Difficulty in accessing health services						
Transportation unavailable	36 (70.6)	36 (70.6)	40 (80.0)	36 (72.0)	148 (73.3)	0.666
Transportation cost	21 (41.2)	9 (17.6)	39 (78.0)	34 (68.0)	103 (51.0)	<0.001
Fear of catching COVID-19 at health facility	38 (74.5)	18 (35.3)	26 (52.0)	25 (50.0)	107 (53.0)	0.001
Health care expenditure						
Not increased	1 (2.0)	3 (5.9)	3 (6.0)	0 (0.0)	7 (3.5)	<0.001
Somehow increased	1 (2.0)	13 (25.5)	17 (34.0)	4 (8.0)	35 (17.3)	
More than doubled	49 (96.1)	35 (68.6)	30 (60.0)	46 (92.0)	160 (79.2)	
Alternative health care						
Health center IV	2 (3.9)	5 (9.8)	6 (12.0)	8 (16.0)	21 (10.4)	0.247
Health center III	0 (0.0)	9 (17.7)	4 (8.0)	12 (24.0)	25 (12.4)	0.001
Health center II	1 (2.0)	0 (0.0)	1 (2.0)	6 (12.0)	8 (4.0)	0.009
ERRH outreach services	8 (15.7)	0 (0.0)	9 (18.0)	0 (0.0)	17 (8.4)	<0.001
Private hospital in Entebbe	3 (5.9)	2 (3.9)	1 (2.0)	9 (18.0)	15 (7.4)	0.010
Hospital in Kampala	1 (2.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)	0.395
Private clinic	21 (41.2)	0 (0.0)	2 (4.0)	11 (22.0)	34 (16.8)	<0.001
Visiting healthcare worker	2 (3.9)	4 (7.8)	15 (30.0)	9 (18.0)	30 (14.8)	0.001
Buying drug at store	19 (37.2)	0 (0.0)	0 (0.0)	36 (72.0)	55 (27.2)	<0.001
Discontinued health care	4 (7.8)	22 (48.1)	8 (16.0)	2 (4.0)	36 (17.8)	<0.001
Health condition						
No change/getting better	7 (13.7)	1 (2.0)	6 (12.0)	7 (14.0)	21 (10.4)	0.535
Worse	27 (52.9)	30 (58.8)	25 (50.0)	23 (46.0)	105 (52.0)	
Extremely worse	17 (33.3)	19 (37.3)	19 (38.0)	20 (40.0)	75 (37.1)	
Do not know	0 (0.0)	1 (2.0)	0 (0.0)	0 (0.0)	1 (0.5)	

Abbreviations: TB, tuberculosis; HIV, human immunodeficiency virus; ERRH, Entebbe Regional Referral Hospital.

participants with mental illness discontinued healthcare. The supplemental analysis showed no marked differences among the subgroups of sex, education and income reduction (see Supplementary File 5). In contrast, a high percentage of participants with mental illness reported buying drugs at a store (72.0%); in contrast, none of the participants (0.0%) with TB or HIV reported buying drugs at a store. Regarding the frequency of using the ERRH outreach services, HIV outreach services were used most frequently (18.0%), while none of the patients (0.0%) used outreach services for TB or mental health. Consequently, 52.0% of all participants evaluated their health condition as "getting worse" and 37.1% evaluated their health condition as "getting extremely worse", indicating that nearly 90% of the participants felt that their health condition had worsened.

Table 4 shows the factors associated with discontinuation of healthcare (discontinuation of healthcare as an outcome group, and continuation of health care as a control group). In the univariate analysis, disease, age, transportation cost, and fear of catching COVID-19 at health facilities were associated with discontinuation of healthcare. These variables were used to develop the multivariate logistic regression model. A multivariate logistic regression model was produced with the following statistically significant variables: mental health vs diabetes/hypertension (AOR, 12.69; 95% CI, 2.57–62.52), mental health vs HIV (AOR, 7.52; 95% CI, 1.37–41.27), age ≥50 years vs age ≤30 years (AOR, 4.88; 95% CI, 1.07–22.34), and expensive transportation cost vs inexpensive transportation cost (AOR, 3.15; 95% CI, 1.13–8.75).

Table 4 Factors Associated with Discontinuation of Healthcare During the Closure of ERRH

	Univariate Analysis		Multivariate Analysis[a]	
	Odds Ratio (95% CI)	***P-value***	**Adjusted Odds Ratio (95% CI)**	***P-value***
Diseases				
Mental health	1		1	
Diabetes/hypertension	8.91 (2.79–28.48)	<0.001	3.68 (0.54–25.05)	0.184
TB	2.24 (0.63–7.97)	0.214	12.66 (2.57–62.52)	0.002
HIV	0.49 (0.09–2.80)	0.422	7.52 (1.37–41.27)	0.020
Age (years)				
≤30	5.73 (1.57–20.86)	0.008	4.88 (1.07–22.34)	0.036
31–49	2.76 (0.76–10.06)	0.125	1.80 (0.42–7.73)	0.430
≤50	1		1	
Health expenditure				
Not increased	1			
Somehow increased	2.75 (0.29–25.68)	0.375		
More than doubled	1.06 (0.12–9.19)	0.959		
Acceptance of ERRH service disruption				
Cannot accept	1			
Should accept as COVID-19 measure	0.69 (0.17–2.80)	0.610		
Assign alternative health facility	0.65 (0.22–1.94)	0.447		
Transportation cost				
Expensive	1		1	
Inexpensive	4.68 (2.01–10.89)	<0.001	3.15 (1.13–8.75)	<0.028
Fear of catching COVID-19 at health facilities				
No	1		1	
Yes	0.32 (0.15–0.70)	0.004	0.44 (0.18–1.08)	0.075

Note: [a] Logistic regression model (n=202).
Abbreviations: TB, tuberculosis; HIV, human immunodeficiency virus; ERRH, Entebbe Regional Referral Hospital.

Qualitative Findings

The sociodemographic characteristics of the participants in the FGD are shown in Table 5.

Table 6 summarizes the themes that emerged from the analysis of the three preselected topics. In addition to the preselected topics, one additional topic emerged: the fear of stigma. The relative frequencies were presented at three levels.

Difficulties Due to the Lockdown

All participants emphasized that they faced difficulties in banning movement. Some participants stated that they suffered from the sudden shutdown of public transportation, which left them with no chance to return to their place or access regular free treatment.

Table 5 Characteristics of the Focus Group Discussion (FGD) Participants

Age	Sex	Primary Disease	Occupation
22	Female	Mental health	Business
50	Female	HIV/AIDS, COVID-19	Business
50	Female	HIV/AIDS	Business
27	Female	Mental health	Business
48	Male	HIV/AIDS, TB	Business
35	Female	HIV/AIDS	Bar attendant
49	Male	HIV/AIDS, TB	Fish monger
50	Male	HIV/AIDS	Fish monger

Abbreviations: TB, tuberculosis; HIV/AIDS, human immunodeficiency virus/acquired immunodeficiency syndrome.

Table 6 Summary of Emergent Themes and Relative Frequency (n=8)

Topic	Theme	Relative Frequency[a]
Difficulties due to the lockdown	• Ban of movement	***
	• Downturned economic situations	***
	• No food security	***
Impacts by the ERRH closure	• Negative: Increased mortality in community	*
	• Negative: Shortage of medicine at ERRH	***
	• Positive: Functioned outreach services	*
	• Positive: Changing health facility usage behavior	**
Fear of stigma	• Hesitate to access to health services	*
Opinions toward the ERRH closure and suggestions for future pandemics	• Not full closure and setting isolation centers	***
	• Early announcement and assignment to other facilities	**

Note: [a]Relative frequency of responses is denoted by: *Mentioned only by a few participants, **Mentioned by around half of the participants, and ***Mentioned by all of the participants.
Abbreviation: ERRH, Entebbe Regional Referral Hospital.

> The challenge was banning public transportation….I was at my sister's place in Entebbe when covid came…. I would go back to my place where most of them know about my [health] condition but I could not, so I ended up missing out on the treatment. I could not access the treatment because they had banned public transportation. (Female, 23 years, Mental health)

> President Yoweri Kaguta Museveni didn't first warn us before putting a lockdown during covid so everyone remained where he/she was and that was a big challenge in accessing some drugs. (Female, 50 years, HIV/AIDS and COVID-19)

> I was very much affected by covid. I used to get my drugs from Soroti district but the lockdown found me this side when I visited here and there is no way I could move back to Soroti. My mother got sick, I lost my job and the money I had at hand finished. (Female, 50 years, HIV/AIDS)

A few participants mentioned the underlying issue of the economic situation of the stay-home policy during the lockdown.

> For the job issues, we were no longer moving on smoothly. But I had nothing to do. I had to bear with the situation. (Female, 35 years, HIV/AIDS)

> We didn't even have the money to buy the medicine because we were not working during that time by 7:00 pm. We were supposed to be inside our houses. (Male, 50 years, HIV/AIDS)

Additionally, when asked if they had difficulty securing food during the shutdown period of public transportation, they all answered without hesitation, "We failed to get what we needed to eat". Although one man said that the government delivered maize flour during the peak of the lockdown instead of putting it in shops, the amount received was insufficient.

Negative Impact of the ERRH Closure

The most significant and overall adverse impact was described by a female participant, and was related to the situation of the patients during the ERRH closure.

> When the hospital [ERRH] was closed people died a lot those days. (Female, 50 years, HIV/AIDS)

Many participants reported frequent shortages of medicines at the ERRH and interruptions in continuous care. All participants argued that when medicines were depleted at the ERRH, the hospital staff wrote prescriptions on paper and asked them to procure them from elsewhere at their own expense.

> We couldn't buy it from any hospital because the type of drug that you really wanted wasn't there. Health workers themselves could not direct us where to buy medicine. So, we could miss out those days and you later go back. (Male, 50 years, HIV/AIDS)

The leader of a peer patient group complained that when the ERRH ran out of medicines, the medicines were not delivered, even if they had been covered under an outreach program (See the next section in detail). Some medications are expensive, especially for people who are jobless during the lock down, or difficult to obtain anywhere else. He said that he also accessed a local organization that supported PLWHs in obtaining his medicine. Sometimes he gave up taking medicines and used herbs as substitutes.

Positive Changes

Several participants benefited from the ERRH outreach services even before the pandemic. A young female patient described the situation.

> When they closed the hospital the health workers used to call me asking how I was doing. Then, they could bring the medicine to me. (Female, 22 years, Mental health)

The leader of the patient group explained the mechanism of the outreach service from the ERRH. The group was organized in his area and he was the leader of the group (called "expert client"). The ERRH staff regularly delivered the members' medicines to him at a convenient location and he distributed them to the members. However, he added that he lost contact with some of his members because many of them had reallocated due to job loss or because the phone network had shut down.

These voices imply that outreach services for TB, HIV and mental health patients were in place at the ERRH and played an important role during the closure of the ERRH, even though some deficiencies existed.

At the time of the interview, two previous ERRH patients reported that they used the ERRH services in the same way after the ERRH reopened. Some sought services from hospitals in Kampala. Among them, three patients are still receiving outreach services from either the ERRH or a hospital in Kampala. Accordingly, it seemed that participants' behavior regarding the usage of health services became diverse after the period of ERRH closure.

Fear of Stigma

Due to the closure of the ERRH, various kinds of stigma have prevented people from seeking alternative health services. A former female COVID-19 participant was mentioned.

> I didn't want people around me to know I have covid. Since I feared being stigmatized. I gave up on taking medicine. We even reached a point of accepting death than being stigmatized. (Female, 50 years, HIV/AIDS and COVID-19)

A female patient with mental illness who stayed at her sister's house during the lockdown said that she did not want to tell her sister about her illness. She did not know how to take medication in her neighborhood and ended up missing treatment. Similarly, a female HIV patient reported that when she visited the ERRH and forced her to undergo PCR testing at the same unit as suspected COVID-19 infected persons, she was hesitant to stay with the COVID-19 suspected people, and stopped visiting the ERRH.

Opinions and Suggestions for Future Pandemics

To respond to the question on the opinion about the closure of ERRH, all participants spoke in unison, saying that hospital closure was not the right decision.

> Even if there is disease outbreak like Ebola, we would always want the drugs to be available in the ERRH because it is where we get our drugs from. They should fight Ebola as they serve other patients. (Male, 50 years, HIV/AIDS)

One woman suggested as:

> They should get isolation centers for covid patients other than closing the hospital. The patients should be directed to where they can access their drugs from. (Female, 50 years, HIV/AIDS and COVID-19)

The male participant suggested that the prisons should be used as an isolation facility for infected patients, and that they should be left out of hospitals; all other participants agreed on his idea. Half of the participants also stressed that the government should officially announce any closures or changes in service provision at existing health facilities and

assign their patients to appropriate and accessible health services. The reason behind this is that they used special medicines that were not available everywhere, so they needed to have access to the right medicines with the right information through designated health workers.

Discussion

This study illustrated the impact of the disruption of regular service provision at the ERRH and the lockdowns during the COVID-19 pandemic among non-COVID-19 patients. Both quantitative and qualitative studies revealed that the most severe difficulties were the lockdowns and bans on public transportation. This resulted in economic downturns and food insecurity, which consequently limited the accessibility of the necessary healthcare. The ERRH closure also affected access to healthcare, especially to medicines. The degree of inaccessibility to healthcare varies by disease. TB patients were the most affected, whereas mental health patients tended to seek various options. In contrast, the qualitative study identified positive impacts, including the functioning of the ERRH outreach services and people's awareness of the use of community-based, lower-level health facilities through the referral system, as intended. The qualitative study highlighted that the ultimate issue was lack of medicines. Consequently, nearly one-fifth of the respondents discontinued their necessary healthcare, and many felt that their health condition worsened during the pandemic. The factors associated with discontinuation of healthcare were disease and age. Furthermore, travel expenses pose a burden on accessing healthcare services during the period of restricted mobility.

General Issues During the COVID-19 Pandemic

Our results implied that the difficulties faced by citizen were not from the pandemic but from the lockdown in urban Uganda. The shutting down of the movement caused a suspension of economic activities, leading to reduced income or job loss. The restriction of mobility cause uncertainty in access to healthcare.[5,23] Food security was also a critical issue, not only for the economically vulnerable but also for all residents of Entebbe, due to the strict ban on movement and closure of shops.[25,34] Even though the government distributed food to households, the amount was insufficient or food was not fairly distributed.[25,37]

The quantitative study demonstrated that 18% of the patients with primary illnesses discontinued routine healthcare. Younger people and TB patients were more likely to miss healthcare access than individuals in the other groups. Transportation costs also have a negative impact on access to health services. Socioeconomic factors, such as gender, education, and income reduction were not significantly associated with missing healthcare in our study. Drug shortages were also a major challenge in providing the necessary medications, as in the pre-pandemic period. As the FGD showed, once a drug shortage occurred at the ERRH, patients needed to purchase medicine at their own expense. Medicines for TB and HIV cannot be easily found outside designated health facilities (eg, the ERRH). Moreover, they were unaffordable for most people who had lost their jobs. Discontinued healthcare not only occurred with economically vulnerable people, but also with those lacking means of transportation or sources of medicines.

Concerning the fear of contracting COVID-19 or stigma related to COVID-19, the results of both the quantitative study and the FGD demonstrated that the fear of catching COVID-19 prevented people from visiting health facilities to seek healthcare. This was in line with the report from 19 African countries, which showed that fear of catching COVID-19 at health facilities was the most common reason for missing healthcare.[38,39] Risk communication efforts to address health crises should be strengthened for future pandemics.

It is worth mentioning that nearly 90% of the quantitative study respondents felt that their health conditions worsened during the pandemic. This may have resulted from a lack of access to proper healthcare, lack of medication, food insecurity, or depression and anxiety from the underlying fear of the pandemic. However, further studies with disease analyses are required to identify the factors that are significantly associated with adverse health conditions.

Tuberculosis (TB)

Our study found that TB patients faced the greatest challenges in obtaining necessary health services during the closure of ERRH; nearly half of TB patients discontinued necessary care. A previous review of Asian countries reported that the provision of various TB services was reduced by 25–50%.[4,40] One of the significant reasons for this negative impact in

our study was that the current Ugandan TB strategy directed only public health facilities to provide TB programs; thus, no private facility could support TB patients who were abandoned by the ERRH. An other reason might be that the TB treatment program set a 6-month period for the first round, with patients moving to a higher-level referral facility if the first round was ineffective. Some of our respondents may have successfully completed the first round or moved to higher-level facilities. Additionally, our quantitative analysis showed a low usage of health centers. This may reflect either a service provision mechanism that is not functioning well or that patients are unaware of the availability of services. Alene et al[40] recommended possible strategies to mitigate the impact of COVID-19 on TB control, including the use of e-health technologies, community-based TB programs, integration of COVID-19 and TB programs, and mobilization of the private health sector. As Uganda has among the highest rates of HIV and TB comorbidity worldwide,[27] further study are needed to strengthen community-based TB and HIV control strategies with the full utilization of lower-level health centers and the private sector.

Human Immunodeficiency Virus (HIV)

In our quantitative study, 16.0% of PLWHs suspended or halted ART treatment after service disruption at the ERRH. Contrarily, at study conducted by the US President's Emergency Plan for AIDS Relief (PEPFAR) covering 19 African countries showed that only 2–3% of PLWHs missed treatment.[41] Although Uganda is one of the countries supported by the PEPFAR program, this results indicated that our study area did not sufficiently benefit from the program. The PEPFAR program included several interventions, including multi-month ART dispensing (MMD), client-centered services at primary health facilities, and supply chain monitoring. Although our qualitative results implied that outreach programs were carried out or tele-communication by the ERRH, they could not provide secure access to all needy citizens. The qualitative data implied that some registered patients tended to move from the residence to search for jobs, or losing/changing phone numbers due to economic burden without notifying during the pandemic period. One study pointed out that telemedicine was expected to be a useful tool to maintain retention-in-care in the period of reducing physical accessibility to health facilities, however, it remains a challenge in sub-Saharan Africa due to a lack of network coverage and an insufficient technological infrastructure,[16] as well as financial insufficiency of users. Currently lower-level facilities, especially health centers, were not well utilized by PLWHs. Several reasons were observed, including a lack of knowledgeable health personnel at health centers, a lack of medicines at lower-level health facilities, and a lack of awareness of their availability among the patients. The ART program should be strengthened by integrating community-based service provision and securing necessary supplies.

Diabetes/Hypertension

The data showed that patients with diabetes/hypertension were relatively able to continue their necessary care by using private clinics or pharmacies as alternative services. They tended to be middle-aged or older, highly educated, and married compared with individuals with other diseases. Even so, almost all of them faced difficulties in association with the financial burden, spending more than twice as much on medical expenditure in comparison to the pre-pandemic period. This situation may be related to their claims concerning the government's designation of alternative health facilities when the hospital was closed. A Mexico study reported that one-third of diabetes and hypertension patients lost health facility access, as a result of which the number of controlled cases declined by 22% for diabetes and 17% for hypertension.[41] Additionally, it is widely warned that uncontrolled diabetes and hypertension are important predictors of COVID-19 severity and mortality.[3,42–45] As our study did not explore such prolonged risk; further studies are needed in the Uganda setting.

Mental Illness

The World Health Organization (WHO) cautioned that COVID-19 has imposed a significant mental health burden on people worldwide and impeded access to mental health care.[46] Our quantitative study showed that mental health patients were younger and that the group included a higher percentage of jobless individuals in comparison to other diseases, and faced the issue of increased medical expenses. Meanwhile, these patients had more access to various health services, such as purchasing medicine at pharmacies and visiting health centers or private clinics. Fewer mental health patients missed

healthcare compared with patients with other diseases. The FGD results supported that patients with mental illness tended to receive the same person-centered services from the ERRH as in the pre-COVID period. Close communication between the ERRH and registered patients may have been associated with a lower frequency of discontinuation of healthcare in this group.

The Uganda government noted an increase in the number of mental health patients, reaching almost one-third of the population in 2022.[28,47] Additionally, mental health units in 14 regional referral hospitals converted to COVID-19 isolation units and many inpatients had to leave the hospitals under the direction of the Ministry of Health for about two years.[28] The current study found the co-occurrence of mental health problems with the COVID-19 pandemic, as a consequence of increased depression, anxiety disorder, and elevated stress levels due to forced lifestyle changes.[48] These mental health issues could be seen and recognized as one of the prominent challenges among vulnerable people living in urban slums in Uganda.[25] The Uganda government spends less than 10% of its gross domestic product in the health sector, and just 1% of this goes into mental health care.[26,47] To address this situation, Kaggwa et al[28] suggested three strategies: fast-track training for practitioners, monetary incentives based on the volume of services offered, and advocacy to promote awareness of mental illness. Our study also identified that stigma about mental illness as well as HIV were factors of prejudice among citizens. In addition to risk communication for emergencies, the Ugandan government should enhance sensitization strategies to dispel these prejudices among the whole population. The development of novel programs in these fields requires robust evidence for policy makers.

Limitations

The present study had several limitations. First, the generalizability of this study's findings to identify impacts on the general population is limited because this was a single site observational study. Second, purposely sampling both quantitative and qualitative studies may have contributed to a selection bias. In addition, we included only registered patients who received care before the COVID-19 and excluded new patients or healthy people according to the nature of this cross-sectional collection and lack of follow-up period, which may have caused prevalence-incidence bias. Third, the sample size of the quantitative study had limited statistical power for comparisons among the four diseases. This may cause the 95% CI to be very wide in diseases such as TB and HIV. This association should be carefully interpreted by readers. Increased numbers of FGDs would also provide more precise and deeper insights from various patients' perspectives in the general population. Fourth, various factors are generally involved in hospital closure, access to health services, and negative health conditions; however, the current study did not fully examine the causal relationship between them. Fifth, changes in the health status of the patients were self-evaluated, which is a common but limiting approach. To overcome these limitations, we plan to conduct additional larger-scale study. Despite these limitations, to the best of our knowledge, no studies have been conducted in Uganda to explore the impact of tertiary hospital closure during the lockdown period from the viewpoint of patients with communicable diseases and NCDs.

Conclusions

The present study illustrates the impact of the closure of a regional referral hospital in urban setting and lockdown during the COVID-19 pandemic among non-COVID-19 patients. Both quantitative and qualitative studies revealed that the most severe difficulties were the lockdown and ban on public transportation. These burdens led to the discontinuation of adherence to treatment for major infectious diseases (HIV and TB) and mental illnesses. Younger patients and patients with TB tended to discontinue necessary care. Although the ERRH made efforts to maintain continuous care for their clients through outreach services, coverage was limited. This study extracted practical suggestions from the field that can be used by policy makers or health service providers to strengthen health system resilience in Uganda and other sub-Saharan countries during both normal and emergency times.

Abbreviations

COVID-19, coronavirus disease 2019; PHSMs, public health and social measures; NCDs, non-communicable disease; HIV, human immunodeficiency virus; TB, tuberculosis; PLWHs, persons living with HIVs; ERRH, Entebbe Regional Referral Hospital; WHO, World Health Organization; FGD, focus group discussion; ART, antiretroviral therapy; OR;

odds ratio; AOR, adjusted odds ratio; AIDS, acquired immunodeficiency syndrome; PEPFAR, president' emergency plan for AIDS relief.

Data Sharing Statement

All data generated and analyzed during this study are available from the corresponding author upon reasonable request.

Ethical Approval

This study was approved by the Ethical committee at JICA Ogata Sadako Research Institute for Peace and Development (approval reference JICADI202002070001), the Research Ethics Committee at the School of Biomedical Sciences, Makerere University (approval reference SBS-2022-201), the Review Committee at the National Council for Science and Technology in Uganda (approval reference SS1425ES). After obtaining permission from the Ministry of Health and the ERRH, informed voluntary, and written consent, was signed by study participants. Confidentiality was maintained by using codes instead of the participant's name. Participants were also informed that they have full right to refuse participation or withdraw any time from the research and the participants informed consent included publication of anonymized responses before taking part in the survey.

Acknowledgment

We would like to thank the study participants who took time to respond to this survey, despite the ongoing difficult circumstances. We acknowledge all the institutional review committees for providing helpful suggestions on this study protocol, and for the expedited review of this study. We thank all study collaborators at Entebbe Regional Referral Hospital and researchers who dedicated to this field work. We also appreciated the Ministry of Health Uganda and JICA Uganda office for their continuous supports to accomplish our study. Our special thanks go to Dr. Michael Hibbard, Professor Emeritus, University of Oregon, for his refining English.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

No external fund was obtained.

Disclosure

The authors report no conflicts of interest in this work.

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