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# Delayed access to essential surgical care in Uganda: A tertiary multi-center study

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ABSTRACT

*Background:* Surgery has been largely neglected within global public health despite growing evidence that the overall burden of disease requiring surgical intervention is rapidly growing and affordable access to surgical care can avert many deaths and disabilities. This study assessed the factors influencing delayed access to essential surgical care in Uganda.

*Methods:* A descriptive multi-center cross-sectional survey was carried out in three hospitals designated for major surgeries in Uganda from December 2019 to December 2021 across three regions of the country in a prospective manner. Patients admitted to the hospitals that required surgical intervention were included. Bivariate analysis using the chi-square test or Fischers' exact test and multivariable logistic regression models to adjust for confounders were carried out.

*Findings:* A total of 635 patients participated in the study of which the majority were males ($n = 399$, 63%) from the Northern region ($n = 347$, 54.7%.). Most patients and sought surgical help immediately ($n = 406$, 63.9%) and were operated on time ($n = 402$, 63.3%), however only 23.3% ($n = 148$) were able to reach the hospital for care on time. Caretakers' hesitancy on the surgical procedure (aOR: 2.41 95% CI: 1.07 – 5.43; $p = 0.035$), hospital inaccessibility (aOR: 5.35 95% CI: 1.82 – 5.75; $p = 0.002$), and delayed surgical procedure performance (aOR: 6.37 95% CI: 2.64 – 5.34; $p<0.001$) contributed to surgical delays among other factors.

*Interpretation:* All three factors contribute to surgical delay but most significantly access to hospital. Several socioeconomic factors like education, long distances, and poverty interplay in a complex web to hamper access to essential surgical care.

## Research in context

**Evidence before this study:** Surgical diseases contribute to a quarter of the global disease burden but little efforts and investments have been geared towards this global health docket. The Lancet Commission on Global Surgery (LCoGS) lists a target of at least 80% access to timely essential surgical care per country by 2030 among priority indicators towards progress to universal access to the surgical care we need. Low- and middle-income countries (LMICs) face enormous unrecognized health and economic consequences due to untreated surgical conditions which could be averted by the provision of safe and affordable surgical care. A confluence of factors at multi-levels contributes to

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the minimal surgical care access in LMICs that should be well elucidated for tenable precise actions.

**Added value of this study:** The biggest magnitude of inaccessibility to timely, safe, and affordable surgical care lies within LMICs with multiple barriers across a spectrum of sectors from individuals to government policies which vary in context and are largely influenced by social and cultural values. This makes country-specific data on surgical access very vital for tailored strategies towards a common goal of access to essential surgical care by at least 80% of people per country by 2030. We, therefore, evaluated the factors that hinder easy access to surgical care in Uganda utilizing the three-delays model at multiple tertiary regional and national specialized hospitals distributed all over the regions of the country to provide baseline data for prompt solutions. We note that accessibility to hospitals stands out as a major factor in delayed access to essential surgical care mainly attributable to economic aspects such as lack of transport. Economic factors as well hindered access to surgeries among those that accessed hospitals on time underscoring the need to prioritize poverty eradication as a major determinant of health. Noteworthy large lists of patients to undergo surgery versus the limited number of surgeons came through as a major factor drawing back to the inadequate specialist workforce. LCoGS stresses that by 2030 all countries should have at least 20 surgical, anesthetic, and obstetric physicians per 100,000 population, thus specialist training should be on the priority agenda by the responsible government arms.

**Implications of all the available evidence:** This comprehensive study reveals that delays in access to essential surgical care in Uganda as much likely to other LMICs with similar settings are largely influenced by socioeconomic factors like poverty and limited number of specialists versus large numbers of patients. There is a glaring need to uplift the socioeconomic status of people for better health coverage. We also highlight the need to increase the surgical workforce to address the healthcare needs of the population.

## Introduction

Surgery is an essential component of health care systems that has been largely neglected within global public health despite growing evidence that the overall burden of disease that needs surgical intervention is rapidly growing [1,2]. Surgical conditions (disease states requiring the expertise of a surgically trained provider) [3] claim more lives each year (16.9 million) than HIV/AIDS, tuberculosis, and malaria combined (3.83 million) [1,4,5]. Overall disease burden associated with surgical conditions in Sub-Saharan Africa is estimated at 38 disability-adjusted life years lost per 1000 populations. Furthermore, World Health Organization (WHO) estimated that 11% of the global disease burden can be treated with surgery comprising of injuries (38%), malignancies (19%), congenital anoma-lies (9%), complications of pregnancy (6%), cataracts (5%) and perinatal con-ditions (4%) [2]. Even then this burden could be underestimated because it is hard to quantify the true global burden of surgical disease as there may be many undiagnosed and untreated disorders in the community that remain unreported, especially in the setting of low- and middle-income countries (LMICs) [4].

Looking at four dimensions—access-timeliness, surgical capacity, safety, and affordability—it was realized that about 5 billion people do not receive timely, safe, and affordable access to surgical care, with the highest estimated need in sub-Saharan Africa [5,6]. Most premature deaths from untreated surgical conditions occur in LMICs, where access to surgical care is poor [1]. This greatly affects the economy due to reduced productivity and increased dependency burden if not managed [7]. The poorest of the world's population receives only 3.5% of the estimated 234 million major surgical operations undertaken worldwide [4] and with only 6.3% of the world's surgical procedures being performed in the poorest countries, where over one-third of the world's population lives [1].

Additionally, greater than 95% of the population in South Asia and central, eastern, and western Sub-Saharan Africa don't have access to surgical care whereas only 5% in North America and Europe lack access [8]. By incorporating essential surgical care into LMICs, approximately 1.5 million deaths a year could be avoided, which equates to 6–7% of all avertable deaths in LMICs [6]. The perception of surgery as an expensive intervention compared with other public health measures for LMICs [9] has been dislodged by recent data showing that investment in surgical and anesthesia services is affordable as well as cost effective [10]. Though, despite this knowledge, multiple barriers continue to prevent the provision of safe, affordable, and timely surgery to those who need it. Delay in the provision of emergency surgery is caused mostly by system factors and leads to adverse surgical outcomes [11] with mortality rates higher in those who experience delay [12].

The near absence of access in many LMICs represents a crisis and as the global health community continues to support the advancement of universal health coverage, increasing access to surgical services will play a central role in ensuring health care for all. This study, therefore, seeks to evaluate the factors that hinder easy access to surgical care in Uganda. By gathering more data, solutions, and recommendations can be established to improve access to surgical care.

## Methodology

### *Study design*

This was a descriptive cross-sectional multicenter survey carried out in hospitals designated for major surgery in Uganda employing quantitative methods.

### *Study area*

The study was conducted at two national referral hospitals and one private-not-for-profit hospital which have maximum surgical capacities distributed across three of the four regions of the country i.e., Mulago national referral hospital in Central, Mbale regional referral hospital in the Eastern and Lacor referral hospital in the Northern part of Uganda. All the above-mentioned hospitals have a surgery department divided into emergency, surgical inpatient, outpatient surgical clinics, and theater.

### *Study population*

All patients admitted to the different above-mentioned hospitals within the study period through either the emergency surgical department or outpatient department require lifesaving surgical intervention and essential surgeries (surgical procedures that are fundamental and necessary for addressing critical health conditions, preventing severe disability, and saving lives).

### *Inclusion criteria*

Patients admitted to the above-mentioned hospitals and require a surgical intervention either as an elective or emergency surgery, above 18 years of age, that provided informed consent.

### *Exclusion criteria*

Patients admitted to the surgical department with surgical conditions that can be managed conservatively.

### *Sampling and recruitment method*

A consecutive sampling method was used. Any patient that suited the inclusion criteria and provided consent was recruited into the study. Recruitment was done either in the emergency or inpatient surgical ward after surgery had taken place. The patients were only recruited after they had recovered from the effect of anesthesia and could fully

consent by themselves (above 18 years). The patient file was also used as a reference to verify the patient information, time of admission, time of decision-making, time of surgery as well as outcomes of the surgery. Data was collected by trained research assistants using Google Forms loaded on their phones.

*Sample size*

Considering a study that was done in Malawi in evaluating various delays reporting prevalence at 36.8% in a tertiary hospital, the sample population was calculated from the formula $n_o = Z^2Pq/e^2$ where q is 1-P. We used a $P = 0.37$, margin of error of 5% giving $e = 0.05$, and a confidence level of 95% which gives a Z value of $Z = 1.96$. The population sample was thus, $n = (1.96)2\ (0.37 \times 0.63)\ /\ (0.05)^2 = 358.22 \approx 358$.

*Data collection tool*

A semi-structured questionnaire developed from a previous similar study in Malawi and literature was administered to collect data on delays in getting essential surgical care. The questionnaire was sub-divided into sections: socio-demographic characteristics (age, gender, tribe, religion, education level, employment status, level of income, residence), delay in seeking care, hospital inaccessibility, delay to be operated on, and the reasons as to why for all instances.

*Study variables*

Independent variables were the demographic details which included sex, age, religion, residence, distance from the hospital, level of education, and level of income, and dependent variables were delay in seeking surgical care, inaccessibility to hospital, and delay to be operated on time.

*Data management and analysis*

Fully completed questionnaires were extracted from Google Forms and exported to Microsoft Excel 2016 for cleaning and coding. The cleaned data was exported to STATA 16 (StataCorp LLC, College Station, Texas, USA) for analysis. Numerical data were then summarized as means and standard deviations or median and interquartile range (IQR) as appropriate. Categorical variables were summarized as frequencies and relative percentages. To assess the association between independent variables with various delays, the chi-square test or Fischers' exact test (for categorical variables) and the Man-Whitney U test (for continuous variables) were used for bivariate analysis. All independent variables with $p<0.2$ at bivariate analysis were included in the multivariable logistic regression models to adjust for confounders. A $p<0.05$ was considered statistically significant.

*Ethical considerations*

The study was performed according to the *Declaration of Helsinki*, after obtaining approval from Lacor Hospital Institutional Review Board (IRB), approval number 0161/02/2020. Administrative clearances were also obtained from IRBs of Mulago National Referral Hospital and Mbale Regional Referral Hospital. Informed consent to participate in the study was obtained from the research subjects before the study commencement.

## Results

*Sociodemographic characteristics of participants*

We enrolled a total of 635 participants with a median age of 35 (20 – 51) years, majority being male ($n = 399$, 62.8%), from Northern region ($n = 347$, 54.7%), earning less than 200,000 Ugandan shillings ($50), unemployed ($n = 338$, 53.2%), having primary level of education ($n = 323$, 50.9%) and within the general surgery category ($n = 481$, 75.8%) Table 1.

*Delays to surgical care among participants*

The majority of participants ($n = 406$, 63.9%) immediately sought medical attention while only 148 (23.3%) accessed the hospital on time. Fig. 1 The most cited reason for delayed accessibility to hospitals was lack of transport ($n = 247$, 50.7%). About 53 (10.9%) first sought alternative medical care. Most participants ($n = 542$, 85.3%) accepted to undergo surgery, and those who were hesitant identified costs involved with the procedure ($n = 59$, 63.4%) as the main reason. More than half ($n = 402$, 63.3%) were operated on time upon reaching the hospital. The delays in operation while in the hospital were mostly attributed to many patients on the lists ($n = 64$, 27.5%) and lack of blood ($n = 59$, 25.3%). Most caretakers ($n = 593$, 93.4%), accepted their patients to undergo

**Table 1**
Socio-demographic characteristics of participants ($N = 635$).

| Variable | Frequency | Percentage |
|---|---|---|
| Age (Median; IQR) | 35 (20 – 51) years | |
| **Age Category (years)** | | |
| < 1 | 2 | 0.3 |
| 1 – 5 | 50 | 7.9 |
| 6 – 12 | 50 | 7.9 |
| 13 – 19 | 50 | 7.9 |
| 20 – 35 | 170 | 26.8 |
| 36 – 59 | 217 | 34.2 |
| 60 Above | 96 | 15.1 |
| **Sex** | | |
| Male | 399 | 62.8 |
| Female | 236 | 37.2 |
| **Region** | | |
| Northern | 347 | 54.7 |
| Eastern | 133 | 20.9 |
| Central | 125 | 19.7 |
| Western | 30 | 4.7 |
| **Employment status** | | |
| Unemployed | 338 | 53.2 |
| Informal | 192 | 30.2 |
| Formal | 105 | 16.5 |
| **Religion** | | |
| Catholic | 361 | 56.9 |
| Anglican | 140 | 22.1 |
| Born Again | 68 | 10.7 |
| Muslim | 53 | 8.3 |
| Seventh-Day Adventist | 9 | 1.4 |
| Others | 4 | 0.6 |
| **Education Level** | | |
| Primary | 323 | 50.9 |
| Secondary | 207 | 32.6 |
| Tertiary | 76 | 11.9 |
| None | 29 | 4.6 |
| **Marital Status** | | |
| Married | 336 | 53.0 |
| Single | 235 | 37.0 |
| Widowed | 42 | 6.6 |
| Divorced | 22 | 3.4 |
| **Income Level** | | |
| <200,000 | 449 | 70.7 |
| 200,000 – 500,000 | 138 | 21.7 |
| 501,000 – 1000,000 | 38 | 6.0 |
| >1000,000 | 10 | 1.6 |
| **Home to Hospital Distance (kilometers)** | | |
| <10 | 184 | 28.9 |
| 11 – 30 | 190 | 29.9 |
| 31 – 50 | 46 | 7.2 |
| >50 | 198 | 31.2 |
| **Type of surgery** | | |
| General Surgery | 481 | 75.8 |
| Orthopedic surgery | 104 | 16.4 |
| Urology | 48 | 7.6 |
| Neurosurgery | 2 | 0.3 |

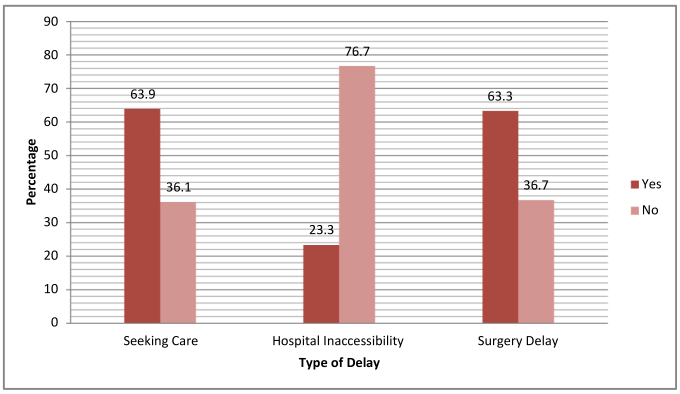


**Fig. 1.** Contribution of different types of delay models.

surgery without hesitancy. Table 2

*Factors associated with delays in accessing essential surgical care*

1) **Delay in seeking surgical care**

On bivariate analysis, delayed seeking of surgical care was associated with age ($p<0.001$), region ($p = 0.006$), religion ($p = 0.014$), marital status ($p<0.001$), caretakers' acceptance ($p<0.001$), type of surgery ($p = 0.001$), number of surgeons ($p = 0.040$) and anesthetists ($p = 0.001$) Table 3. On multivariate analysis, participants with no education level at all were nine times more likely to delay seeking surgical care (aOR: 9.47 95% CI: 3.14 – 28.60; $p<0.001$), those staying within a distance of 31 – 50 kms from the hospital were twice (aOR: 2.28 95% CI: 1.02 – 5.07; $p = 0.045$), while those earning between 200,000 – 500,000 Uganda shillings were seven times likely to delay (aOR: 7.96 95% CI: 1.21 – 5.38; $p = 0.031$). Other factors contributing to delayed seeking of surgical care included caretakers' refusal (aOR: 2.41 95% CI: 1.07 – 5.43; $p = 0.035$), patients who are divorced (aOR: 4.29 95% CI: 1.35 – 13.63; $p = 0.014$), being a Muslim (aOR: 16.36 95% CI: 1.05 – 25.78; $p = 0.046$), and age between 1 – 5 years (aOR: 0.03 95% CI: 0.01 – 0.11; $p<0.001$). Table 4

**Table 2**
Participants' delays and reasons for accessing surgical care.

| Variable | Frequency | Percentage |
|---|---|---|
| **Immediately sought medical Attention** | | |
| Yes | 406 | 63.9 |
| No | 229 | 36.1 |
| **Reached hospital in time** | | |
| Yes | 148 | 23.3 |
| No | 487 | 76.7 |
| **Reasons why not.** | | |
| Lack of transport | 247 | 50.7 |
| Long distance | 185 | 38.0 |
| Tried alternative medications | 53 | 10.9 |
| Insecurity | 2 | 0.4 |
| **Accepted to take up the surgery** | | |
| Yes | 542 | 85.3 |
| No | 93 | 14.7 |
| **Reason for hesitancy to surgery** | | |
| Cost of procedure | 59 | 63.4 |
| Fear of surgery | 24 | 25.8 |
| Spiritual beliefs | 6 | 6.5 |
| Fear of anesthetics | 4 | 4.3 |
| **Operated on time** | | |
| Yes | 402 | 63.3 |
| No | 233 | 36.7 |
| **If not, why?** | | |
| Lack of blood | 59 | 25.3 |
| The cost involved with the procedure | 48 | 20.6 |
| Many patients on the list | 64 | 27.5 |
| Delay of laboratory results | 25 | 10.7 |
| The doctor wasn't available | 16 | 6.9 |
| Lack of supplies in the theater | 14 | 6.0 |
| Don't know why | 7 | 3.0 |
| **Caretakers' acceptance of surgery** | | |
| Yes | 593 | 93.4 |
| No | 42 | 6.6 |

2) **Delay due to inaccessibility to hospital**

On bivariate analysis, inaccessibility to hospital was associated with age ($p = 0.015$), region ($p<0.001$), employment status ($p<0.001$), religion ($p = 0.014$), education level ($p<0.001$), income level ($p<0.001$), distance from hospital ($p<0.001$), type of surgery ($p<0.001$), number of surgeons ($p<0.001$), and anesthetists ($p<0.001$) in the hospital, Table 3. On multivariate analysis, participants staying more than 50 kms from the hospital were twice likely to not access the hospital on time (aOR: 2.12 95% CI: 1.06 – 4.26; $p = 0.034$), and those earning less than 200,000 (aOR: 2.38 95% CI: 1.38 – 3.14; $p = 0.029$), and 200,000 – 500,000 Uganda shillings (aOR: 2.57 95% CI: 1.81 – 4.31; $p = 0.017$), were twice also likely not to reach hospital on time respectively. Other factors associated with hospital inaccessibility included caretakers' refusal of the surgery (aOR: 5.35 95% CI: 1.82 – 5.75; $p = 0.002$), being male (aOR: 2.09 95% CI: 1.21 – 3.62; $p = 0.008$), age ranges 1–5 years (aOR: 0.19 95% CI: 0.03 – 0.98; $p = 0.047$), 13–19 years (aOR: 0.22 95% CI: 0.05 – 0.99; $p = 0.048$), and 20–35 years (aOR: 0.29 95% CI: 0.11 – 0.77; $p = 0.013$). Table 5

3) **Delay of performing the surgical procedure**

On bivariate analysis factors associated with delayed performance of surgical procedures included age ($p = 0.003$), region ($p<0.001$), employment status ($p = 0.001$), religion ($p = 0.030$), marital status ($p<0.001$), home to hospital distance ($p = 0.030$), care takers' decision ($p<0.001$), type of surgery ($P = 0.021$), number of surgeons ($p<0.001$) and anesthetists ($p<0.001$), Table 3. On multivariate analysis, patients whose caretakers refused surgery were six times more likely to delay surgical procedures (aOR: 6.37 95% CI: 2.64 – 5.34; $p<0.001$). Other factors included home-to-hospital distance between 31 – 50 kms (aOR: 1.84 95% CI: 1.12 – 3.01; $p = 0.015$), and age between 6 and 12 years (aOR: 0.32 95% CI: 0.11 – 0.94; $p = 0.038$). Table 6

## Discussion

The burden of surgical conditions in LMICs especially in sub-Saharan Africa is enormous but access is not well documented and unmet needs are underestimated due to lack of surveillance systems. In certain instances, where surgeries are recorded in the hospital operative logbooks, this data isn't analyzed. Even then, the available little information shows that access to surgery is limited in SSA and unmet needs could be underestimated [2]. It is estimated that only less than 5% of people in

**Table 3**
Bivariate analysis for factors associated with surgical delays among participants.

| Variable | Delayed Seeking for Care | | P-value | Hospital Inaccessibility | | p-value | Surgical procedure Delay | | p-value |
|---|---|---|---|---|---|---|---|---|---|
| | Yes Freq (%) | No Freq (%) | | Yes Freq (%) | No Freq (%) | | Yes Freq (%) | No Freq (%) | |
| **Overall** | 229 (36.1) | 406 (63.9) | | 487 (76.7) | 148 (23.3) | | 233 (36.7) | 402 (63.3) | |
| **Age Category (years)** | | | | | | | | | |
| < 1 | 0 (0) | 2 (0.5) | **0.000*** | 1 (0.2) | 1 (0.7) | **0.015*** | 0 (0) | 2 (0.5) | **0.003*** |
| 1 – 5 | 7 (3.1) | 43 (10.6) | | 43 (8.8) | 7 (4.7) | | 11 (4.7) | 39 (9.7) | |
| 6 – 12 | 12 (5.2) | 38 (9.4) | | 42 (8.6) | 8 (5.4) | | 10 (4.3) | 40 (10.0) | |
| 13 – 19 | 13 (5.7) | 37 (9.1) | | 42 (8.6) | 8 (5.4) | | 16 (6.9) | 34 (8.5) | |
| 20 – 35 | 55 (24.0) | 115 (67.7) | | 119 (24.4) | 51 (34.5) | | 61 (26.2) | 109 (27.1) | |
| 36 – 59 | 87 (0.1) | 130 (28.3) | | 159 (32.6) | 58 (39.2) | | 89 (38.2) | 128 (31.8) | |
| 60 Above | 55 (24.0) | 41 (10.1) | | 81 (16.6) | 15 (10.1) | | 46 (19.7) | 50 (12.4) | |
| **Sex** | | | | | | | | | |
| Male | 144 (62.9) | 255 (62.8) | 0.985 | 316 (64.9) | 83 (56.1) | 0.052 | 143 (61.4) | 256 (63.7) | 0.562 |
| Female | 85 (37.1) | 151 (37.2) | | 171 (35.1) | 65 (43.9) | | 90 (38.6) | 146 (36.3) | |
| **Region** | | | | | | | | | |
| Northern | 113 (49.3) | 234 (57.6) | **0.006*** | 318 (65.3) | 29 (19.6) | **0.000*** | 106 (45.5) | 241 (60.0) | **0.000*** |
| Eastern | 42 (18.3) | 91 (22.4) | | 73 (15.0) | 60 (40.5) | | 52 (22.3) | 81 (20.1) | |
| Central | 61 (26.6) | 64 (15.8) | | 70 (14.4) | 55 (37.2) | | 65 (27.9) | 60 (14.9) | |
| Western | 13 (5.7) | 17 (4.2) | | 26 (5.3) | 4 (2.7) | | 10 (4.3) | 20 (5.0) | |
| **Employment status** | | | | | | | | | |
| Unemployed | 118 (51.5) | 220 (54.2) | 0.338 | 297 (61.0) | 41 (27.7) | **0.000*** | 107 (45.9) | 231 (57.5) | **0.001*** |
| Informal | 77 (33.6) | 115 (28.3) | | 126 (25.9) | 66 (44.6) | | 91 (39.1) | 101 (25.1) | |
| Formal | 34 (14.8) | 71 (17.5) | | 64 (13.1) | 41 (27.7) | | 35 (15.0) | 70 (17.) | |
| **Religion** | | | | | | | | | |
| Catholic | 113 (49.3) | 248 (61.1) | **0.014*** | 293 (60.2) | 68 (45.9) | **0.000*** | 116 (49.8) | 245 (60.9) | **0.030*** |
| Anglican | 52 (22.7) | 88 (21.7) | | 111 (22.8) | 29 (19.6) | | 63 (27.0) | 77 (19.2) | |
| Born Again | 35 (15.3) | 33 (8.1) | | 51 (10.5) | 17 (11.5) | | 24 (10.3) | 44 (10.9) | |
| Muslim | 25 (10.9) | 28 (6.9) | | 27 (5.5) | 26 (17.6) | | 22 (9.4) | 31 (7.7) | |
| Seventh-Day Adventist | 3 (1.3) | 6 (1.5) | | 4 (0.8) | 5 (3.4) | | 6 (2.6) | 3 (0.7) | |
| Others | 1 (0.4) | 3 (0.7) | | 1 (0.2) | 3 (2.0) | | 2 (0.9) | 2 (0.5) | |
| **Education Level** | | | | | | | | | |
| Primary | 119 (52.0) | 204 (50.2) | 0.098 | 273 (56.1) | 50 (33.9) | **0.000*** | 117 (50.2) | 206 (51.2) | 0.782 |
| Secondary | 75 (32.8) | 132 (32.5) | | 160 (32.9) | 47 (31.8) | | 77 (33.0) | 130 (32.4) | |
| Tertiary | 20 (8.7) | 56 (13.8) | | 37 (7.6) | 39 (26.4) | | 26 (11.2) | 50 (12.4) | |
| None | 15 (6.6) | 14 (3.4) | | 17 (3.5) | 12 (8.1) | | 13 (5.6) | 16 (4.0) | |
| **Marital Status** | | | | | | | | | |
| Married | 129 (56.3) | 207 (51.0) | **0.000*** | 247 (50.7) | 89 (60.1) | 0.176 | 127 (54.5) | 209 (52.0) | **0.000*** |
| Single | 63 (27.5) | 172 (42.4) | | 191 (39.2) | 44 (29.7) | | 68 (29.2) | 167 (41.5) | |
| Widowed | 27 (11.8) | 15 (3.7) | | 33 (6.8) | 9 (6.1) | | 2 (0.9) | 18 (4.5) | |
| Divorced | 10 (4.4) | 12 (2.9) | | 16 (3.3) | 6 (4.1) | | 14 (6.0) | 8 (2.0) | |
| **Income Level** | | | | | | | | | |
| <200,000 | 162 (70.7) | 287 (70.7) | 0.093 | 371 (76.2) | 78 (52.7) | **0.000*** | 162 (69.5) | 287 (71.4) | 0.661 |
| 200,000 – 500,000 | 57 (24.9) | 81 (20.0) | | 93 (19.1) | 45 (30.4) | | 56 (24.0) | 82 (20.4) | |
| 501,000 – 1000,000 | 8 (3.5) | 30 (7.4) | | 21 (4.3) | 17 (11.5) | | 12 (5.2) | 26 (6.5) | |
| >1000,000 | 2 (0.9) | 8 (2.0) | | 2 (0.4) | 8 (5.4) | | 3 (1.3) | 7 (1.7) | |
| **Home to Hospital Distance (kilometers)** | | | | | | | | | |
| <10 | 64 (27.9) | 120 (29.5) | 0.128 | 123 (25.3) | 61 (41.2) | **0.000*** | 55 (23.6) | 129 (32.1) | **0.030*** |
| 11 – 30 | 77 (33.6) | 112 (27.6) | | 150 (30.8) | 39 (26.4) | | 65 (27.9) | 124 (30.8) | |
| 31 – 50 | 21 (9.2) | 26 (6.4) | | 32 (6.6) | 15 (10.1) | | 19 (8.2) | 28 (7.0) | |
| >50 | 67 (29.3) | 148 (36.4) | | 182 (37.4) | 33 (22.3) | | 94 (40.3) | 121 (30.1) | |
| **Caretakers' acceptance of surgery** | | | | | | | | | |
| Yes | 202 (88.2) | 391 (96.3) | **0.000*** | 451 (92.6) | 142 (95.9) | 0.152 | 199 (85.4) | 394 (98.0) | **0.000*** |
| No | 27 (11.8) | 15 (3.7) | | 36 (7.4) | 6 (4.1) | | 34 (14.6) | 8 (2.0) | |
| **Type of surgery** | | | | | | | | | |
| General Surgery | 183 (79.9) | 298 (73.4) | **0.001*** | 404 (83.0) | 77 (52.0) | **0.000*** | 161 (69.1) | 320 (79.6) | **0.021*** |
| Orthopedic surgery | 21 (9.2) | 83 (20.4) | | 46 (9.4) | 58 (39.2) | | 46 (19.7) | 58 (14.4) | |
| Urology | 24 (10.5) | 24 (5.9) | | 35 (7.2) | 13 (8.8) | | 25 (10.7) | 23 (5.7) | |
| Neurosurgery | 1 (0.4) | 1 (0.2) | | 2 (0.4) | 0 (0) | | 1 (0.4) | 1 (0.2) | |
| **Number of surgeons** | | | | | | | | | |
| Three | 111 (48.5) | 164 (40.4) | **0.046*** | 154 (31.6) | 121 (81.8) | **0.000*** | 127 (54.5) | 148 (36.8) | **0.000*** |
| Four | 116 (50.6) | 241 (59.3) | | 330 (67.8) | 27 (18.2) | | 103 (44.2) | 254 (63.2) | |
| Five | 2 (0.9) | 1 (0.2) | | 3 (0.6) | 0 (0) | | 3 (1.3) | 0 (0) | |
| **Number of Anesthetists** | | | | | | | | | |
| Three | 112 (48.9) | 164 (40.4) | **0.001*** | 155 (31.8) | 121 (81.8) | **0.000*** | 127 (54.5) | 149 (37.1) | **0.000*** |
| Four | 9 (3.9) | 50 (12.3) | | 41 (8.4) | 18 (12.2) | | 31 (13.3) | 28 (7.0) | |
| Five | 108 (47.2) | 192 (47.3) | | 291 (59.8) | 9 (6.1) | | 75 (32.2) | 225 (56.0) | |

* Statistically significant at $P < 0.05$.

developing countries have access to surgery relative to only 14.9% in developed countries that don't have access [8]. This huge discrepancy in the distribution of surgical care is a bottleneck for the universal health coverage and attainment of SDG 3. Our study aimed at identifying the factors associated with delays in accessing essential surgical care in Uganda using a 3-delays framework to provide information for crafting solutions and recommendations.

In this study, while most participants (63.9%) sought immediate medical attention and very few (10.9%) first opted for alternative medicine, less than a third (23.3%) accessed the hospital on time majorly due to lack of transport. Additionally, participants who were hesitant to undergo surgery cited involved costs with the procedure as

**Table 4**
Multivariate logistic regression for factors associated with delayed seeking of surgical care.

| Variable | AOR (95% CI) | p-value |
|---|---|---|
| Age Category (years) | | |
| 1 – 5 | 0.03 (0.01 – 0.11) | **0.000*** |
| 6 – 12 | 0.16 (0.05 – 0.46) | **0.001*** |
| 13 – 19 | 0.18 (0.06 – 0.53) | **0.002*** |
| 20 – 35 | 0.39 (0.19 – 0.79) | **0.010*** |
| 36 – 59 | 0.54 (0.29 – 1.01) | 0.056 |
| 60 Above | Reference | |
| Religion | | |
| Catholics | 6.45 (0.44 – 95.58) | 0.175 |
| Anglican | 9.39 (0.63 – 13.44) | 0.104 |
| Born Again | 12.04 (0.79 – 18.87) | 0.074 |
| Muslim | 16.36 (1.05 – 25.78) | **0.046*** |
| Seventh-Day Adventist | 6.37 (0.29 – 14.35) | 0.243 |
| Others | Reference | |
| Marital Status | | |
| Married | Reference | |
| Single | 1.07 (0.55 – 2.08) | 0.847 |
| Divorced | 4.29 (1.35 – 13.63) | **0.014*** |
| Widowed | 1.40 (0.63 – 3.14) | 0.409 |
| Caretakers' acceptance of surgery | | |
| Yes | Reference | |
| No | 2.41 (1.07 – 5.43) | **0.035*** |
| Education Level | | |
| Primary | Reference | |
| Secondary | 0.49 (0.29 – 0.83) | **0.007*** |
| Tertiary | 0.49 (0.22 – 1.09) | 0.083 |
| None | 9.47 (3.14 – 28.60) | **0.000*** |
| Income Level | | |
| <200,000 | 6.39 (0.94 – 4.40) | 0.058 |
| 200,000 – 500,000 | 7.96 (1.21 – 5.38) | **0.031*** |
| 501,000 – 1000,000 | 2.63 (0.36 – 8.96) | 0.337 |
| >1000,000 | Reference | |
| Home to Hospital Distance (kilometers) | | |
| <10 | 1.27 (0.76 – 2.13) | 0.354 |
| 11 – 30 | 1.18 (0.71 – 1.97) | 0.512 |
| 31 – 50 | 2.28 (1.02 – 5.07) | **0.045*** |
| >50 | Reference | |

* Statistically significant at $P < 0.05$.

**Table 5**
Multivariate logistic regression for factors associated with delayed access to the hospital for surgical care.

| Variable | AOR (95% CI) | p-value |
|---|---|---|
| Age Category (years) | | |
| 60 Above | Reference | |
| < 1 | 0.17 (0.01 – 5.39) | 0.316 |
| 1 – 5 | 0.19 (0.03 – 0.98) | **0.047*** |
| 6 – 12 | 0.35 (0.08 – 1.54) | 0.165 |
| 13 – 19 | 0.22 (0.05 – 0.99) | **0.048*** |
| 20 – 35 | 0.29 (0.11 – 0.77) | **0.013*** |
| 36 – 59 | 0.58 (0.24 – 1.40) | 0.229 |
| Sex | | |
| Female | Reference | |
| Male | 2.09 (1.21 – 3.62) | **0.008*** |
| Income Level | | |
| >1000,000 | Reference | |
| <200,000 | 2.38 (1.38 – 3.142) | **0.029*** |
| 200,000 – 500,000 | 2.57 (1.81 – 4.31) | **0.017*** |
| 501,000 – 1000,000 | 1.68 (0.80 – 19.61) | 0.071 |
| Home to Hospital Distance (kilometers) | | |
| <10 | Reference | |
| 11 – 30 | 1.23 (0.63 – 2.39) | 0.544 |
| 31 – 50 | 1.26 (0.48 – 3.35) | 0.631 |
| >50 | 2.12 (1.06 – 4.26) | **0.034*** |
| Caretakers' acceptance of surgery | | |
| Yes | Reference | |
| No | 5.35 (1.82 – 5.75) | **0.002*** |

* Statistically significant at $P < 0.05$.

**Table 6**
Multivariate logistic regression for factors associated with delayed performance of surgical procedures.

| Variable | AOR (95% CI) | p-value |
|---|---|---|
| Age Category (years) | | |
| 60 Above | Reference | |
| 1 – 5 | 0.39 (0.14 – 1.11) | 0.078 |
| 6 – 12 | 0.32 (0.11 – 0.94) | **0.038*** |
| 13 – 19 | 0.47 (0.16 – 1.31) | 0.149 |
| 20 – 35 | 0.54 (0.92 – 3.63) | 0.083 |
| 36 – 59 | 0.61 (0.33 – 1.12) | 0.116 |
| Home to Hospital Distance (kilometers) | | |
| >50 | Reference | |
| <10 | 1.00 (0.61 – 1.63) | 0.997 |
| 11 – 30 | 1.67 (0.77 – 3.59) | 0.193 |
| 31 – 50 | 1.84 (1.12 – 3.01) | **0.015*** |
| Caretakers' acceptance of surgery | | |
| Yes | Reference | |
| No | 2.41 (2.64 – 5.34) | **0.000*** |

* Statistically significant at $P < 0.05$.

the main reason. Indeed, participants earning less than Ugx.200,000 (approximately $50) were twice likely to delay seeking surgical care and accessing hospitals from our findings. Financial expenditures involved with travel, care, and lodging among others are a significant barrier among patients who seek surgical care that is attracting global attention [4,13]. Bearden and colleagues similarly report a lack of money for travel and care as the major factor associated with the delayed seeking of surgical care for children in both rural and urban areas of Uganda [6]. Further, Anderson et al. also note that despite a free care government policy in Uganda public hospitals, patients still face surgical catastrophic economic burdens [14].

More than half of the participants were operated on time upon reaching the hospital with delays hinged along huge numbers of patients on surgical lists. The surgical workforce in Uganda falls below the global recommendations and requires urgent training of more surgical specialists. A study done in the Southern Western region of Uganda identified only 43 accredited surgeons constituting about 0.7 surgeons per 100,000 population [15]. These findings cut across reports from other developing countries like Nigeria [16]. Policy development and government efforts should be consolidated on training more surgical specialists to meet the growing population need and surgical burden in developing countries.

Low education levels also significantly contributed to all three delays in surgical care. Similarly, this has been reported elsewhere [17] underscoring the fact that illiteracy can affect decision-making to seek care but also interplay with other social factors to delay surgical treatment. Staying within long distances from the facility, and caretakers' hesitance to the surgical procedure were other implicated factors. Particularly caretakers' hesitancy contributed to all three delays. Overall, the findings from this study indicate there is an urgent need to invest in social factors that influence health, especially transport to health facilities in terms of functional ambulance systems as well as road networks. An increase in surgical specialist workforce density through training and retention will go a long way in LMICs.

## Conclusions

This is the first comprehensive paper that highlights the surgical gap and corresponding burden in the country. It also demonstrates that All three factors contribute to surgical delay but most significantly access to the hospital which directly influences the other delays. Several socio-economic factors like education, long distances, and poverty interplay in a complex web to hamper access to essential surgical care that needs a holistic multisectoral approach to mitigate. The policy makers as much as the individuals in the community have a part to play in forging a solution to mitigate avoidable surgical-related mortalities. It also

highlights the need for urgent measures to increase the surgical workforce to address the healthcare needs of the population. Increasing training and retention of Surgical specialists in not only Uganda, but all countries around the world will mitigate avoidable death and disability due to preventable and treatable surgical illnesses.

## Ethical approval

This was obtained from the research and review board of Lacor Hospital and Mbale Regional Referral Hospital.

## Guarantor

Nothing to disclose.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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