Sex Disparities in Access to Surgical Care at a Single Institution in Malawi

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Abstract

Introduction There is a paucity of data regarding sex-based disparities in surgical care delivery, particularly in low- and middle-income countries. This study sought to determine whether sex disparities are present among patients presenting with surgical conditions in Malawi. *Hypothesis* compared to men, fewer women present to Kamuzu Central Hospital (KCH) with peritonitis and have longer delays in presentation for definitive care.

Methods This study performs a retrospective analysis of prospectively collected data of all general surgery patients with peritonitis presenting to KCH in Lilongwe, Malawi, from September 2013 to April 2016. Multivariable linear and logistic regressions were used to assess the effect of sex on mortality, length of stay, operative intervention, complications, and time to presentation.

Results Of 462 patients presenting with general surgery conditions and peritonitis, 68.8% were men and 31.2% were women. After adjustments, women had significantly higher odds of non-operative management when compared to men (OR 2.17, 95%CI 1.30–3.62, $P = 0.003$), delays in presentation (adjusted mean difference 136 h, 95%CI 100–641, $P = 0.05$), delays to operation (adjusted mean difference 1.91 days, 95%CI 1.12–3.27, $P = 0.02$), and longer lengths of stay (adjusted mean difference 1.67 days, 95%CI 1.00–2.80, $P = 0.05$). There were no differences in complications or in-hospital or Emergency Department mortality.

Conclusion Sex disparities exist within the general surgery population at KCH in Lilongwe, Malawi. Fewer women present with surgical problems, and women experience delays in presentation, longer lengths of stay, and undergo fewer operations. Future studies to determine mortality in the community and driving factors of sex disparities will provide more insight.

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Introduction

Sex inequality in health care exists throughout the world, particularly in low- and middle-income countries (LMICs) where women are vulnerable and have less access and control over healthcare decisions than do men [1–4]. In certain regions, the contrast in access to care between men and women is stark: Women cannot seek health care without permission from their husbands [3, 5, 6]. The consequences of disparities in access to surgical care are illustrated in patients with acute abdominal emergencies, where disparities leading to a delay in presentation for an

emergency can be life-threatening [7]. Highlighting this dilemma, a recent survey of Rwandan households discovered that approximately 30% of household deaths might have benefited from surgical treatment and prevented mortality [8]. The majority of general surgery conditions are not sex-specific. A recent review of emergency general surgery cases in the USA demonstrated that 46% of patients were male and 54% were female [9]. Few investigations have evaluated sex disparities among surgical populations in resource-poor settings [10–16].

This study sought to characterize the prevalence of sex-related disparities among patients presenting with abdominal surgical emergencies to Kamuzu Central Hospital (KCH) in Lilongwe, Malawi. We hypothesized that disparities in access to surgical care disproportionally affect women, causing delayed presentation and resulting in higher morbidity and mortality.

Methods

This is a retrospective study of prospectively collected acute care surgery data for all patients who presented to Kamuzu Central Hospital (KCH), Lilongwe, Malawi, between September 2013 and April 2016. KCH is an approximately 1000-bed referral hospital with a catchment of five million people that is the tertiary referral center for eight district hospitals with minimal surgical capabilities. In partnership with KCH, the University of North Carolina (UNC) established a hospital-based acute care general surgery registry to capture disease characteristics and surgical outcomes of this population. The on-site database is kept on password-protected computers and data on the patients consulted on or admitted to the general surgery service are entered weekly by ten trained local clerks hired by UNC.

All patients presenting to the hospital for acute care surgical conditions with peritonitis between September 2013 and April 2016, except those undergoing sex-specific operations (obstetric, gynecologic, and inguinal hernia operations), were included. Trauma patients were also excluded as trauma patients are more likely to be male and men sustaining trauma may have a higher mortality. Peritonitis was defined as generalized abdominal pain with voluntary or involuntary guarding, diagnosed by the admitting clinician. The primary outcome was time to presentation for an acute care surgery condition, defined as hours to presentation to KCH since patient reported onset of symptoms. This was reported as a continuous variable as mean time in hours.

Secondary outcomes included in-hospital mortality, mortality in the Emergency Department, hospital length of stay in days, operative intervention, time in days from presentation to operative intervention, and postoperative complications. Similar to time to presentation, total hospital length of stay in days was reported as a continuous variable. The variable had a skewed distribution but with a normal distribution of the residuals (errors) thus was used in the models described below. Time to operation was broken down into time to operation in days from presentation to KCH and in days from presentation to any hospital (to include any transfer time.) These were reported as continuous variables in median days for Table 1 and adjusted models and categorized for Table 2 and Fig. 1 to show distribution. Postoperative complications included wound infection, dehiscence, enterocutaneous fistula, need for re-operation (bleeding, enterotomy, and abscess), and respiratory insufficiency requiring noninvasive or invasive ventilation. Outpatient complications were difficult to track given poor follow-up; thus, the complications were limited to in-hospital complications. Baseline information was collected and reported in Table 1.

Comorbidities that are common in HICs were rare among this patient population; thus, calculating comorbidity indices was not useful. The clerks documented history of tuberculosis, recent malaria, HIV, sickle cell, hypertension, diabetes, known cancer, and mental retardation. The presence or lack of any comorbid condition was used for multivariable analysis. While data were collected on admission vitals, more than half of patients were missing these variables; thus, the study could not reliably use these measures as markers of disease severity. Limiting the cohort to patients presenting with peritonitis was the only way to account for disease severity.

Patient demographics, stratified by sex, were compared using Chi-squared tests. A P value ≤ 0.05 was considered significant. Wilcoxon–Mann–Whitney test was used for length of stay, and two-variable t-test was performed for time to presentation, stratified by sex. Multivariate linear regression was performed for primary and secondary outcomes that were continuous variables, and logistic regression was performed for dichotomous variables. All models adjusted for potential confounders including age, occupation, year of presentation, comorbidities, diagnosis, and surgical intervention. The models for mortality and complications adjusted for delay in presentation and delay in operative intervention, while the model for length of stay adjusted for complications and operative intervention.

All analyses were performed using Stata/MP (Version 12) (Stata Corp, College Station, TX). This study was approved by both the Malawi Ministry of Health and the UNC Institutional Review Board.

Results

Overall, 1788 patients presented to KCH between September 2013 and April 2016 with general surgery problems. Of the 462 patients with peritonitis included in our analysis, 318 (68.8%) were men and 133 (31.2%) were women, Table 1. The majority of patients who presented to KCH were transferred from district hospitals (87.7% of

men and 87.5% of women), and 61% of both men and women were from rural settings. The most common employment was blue collar work (45.7%), which included farming, construction, driving, mechanics and plumbing, restaurant work, and housekeeping. Men were more likely to do blue collar work (53.8% vs. 27.8%, $P < 0.0001$). Men and women had equal percentages of overall comorbidities (21.4% of men and 23.6% of women, $P = 0.56$).

Table 1 General surgery patient characteristics, stratified by sex. $N = 462$

|	Male 318 (68.8%)	Female 144 (31.2%)	P value[a]
Age, in years, mean ($\pm$ SD)	34.3 ($\pm$ 0.9)	32.7 ($\pm$ 1.5)	0.30
Occupation, n (%)			
Child	1 (0.3)	4 (2.8)	**0.02**
Blue collar	171 (53.8)	40 (27.8)	**< 0.0001**
White collar	52 (16.4)	16 (11.1)	0.14
Student	60 (18.9)	30 (20.8)	0.62
Unemployed	32 (10.1)	23 (16.0)	0.07
Housewife	2 (0.6)	31 (21.5)	**< 0.0001**
Transferred from other hospital	279 (87.7)	126 (87.5)	0.88
Domicile location			
Urban	124 (39.0)	56 (38.9)	0.98
Rural	194 (61.0)	88 (61.1)	0.98
Postoperative diagnosis			
Primary peritonitis	26 (8.2)	15 (10.4)	0.21
Appendicitis	83 (26.1)	29 (20.1)	0.50
Bowel obstruction	27 (8.5)	17 (11.8)	0.10
Bowel perforation	49 (15.4)	22 (15.3)	0.07
Volvulus	15 (4.7)	4 (2.8)	0.47
Ventral hernia	3 (0.9)	2 (1.4)	0.56
Gastric perforation	38 (11.9)	3 (2.1)	**0.002**
Other	7 (2.2)	6 (4.2)	0.14
Comorbidities			
None	250 (78.6)	110 (76.4)	0.56
TB treatment in past	5 (1.6)	0 (0.0)	0.13
Malaria in past 2 weeks	37 (11.6)	21 (14.6)	0.38
Hypertension	1 (0.3)	0 (0.0)	0.50
Diabetes	4 (1.3)	0 (0.0)	0.18
Known cancer	1 (0.3)	0 (0.0)	0.50
Sickle cell	1 (0.3)	0 (0.0)	0.50
Mental retardation/delay	1 (0.3)	1 (0.7)	0.57
Other	11 (3.5)	9 (6.3)	0.17
HIV positive	5 (1.6)	4 (2.7)	0.61
Operative intervention	249 (78.3)	98 (68.1)	**0.02**
Intensive care unit stay	7 (2.2)	2 (1.4)	0.56
Blood transfusion	26 (8.2)	20 (13.9)	0.06
Length of stay in days, median ($\pm$ SD)	10.1 ($\pm$ 0.64)	12.9 ($\pm$ 1.5)	**0.04**
Hours to presentation, mean ($\pm$ SD)	144 ($\pm$ 153)	291 ($\pm$ 115)	0.54

SD standard deviation, *TB* tuberculosis

[a]P values ≤ 0.05 in bold

Table 2 Distribution of time to operation by sex, N = 328

Time to operation	Male 236 (72.0%)	Female 92 (28.0%)	P value[a]
Same day, n (%)	165 (69.9)	50 (54.3)	**0.01**
Next day	55 (23.3)	30 (32.6)	0.08
48–72 h	8 (3.4)	5 (5.4)	0.39
3–5 days	4 (1.7)	2 (2.2)	0.77
6–10 days	3 (1.3)	3 (3.3)	0.23
> 10 days	1 (0.4)	2 (2.2)	0.14

[a]P values ≤ 0.05 in bold

Fig. 1 Distribution of time to operation by sex
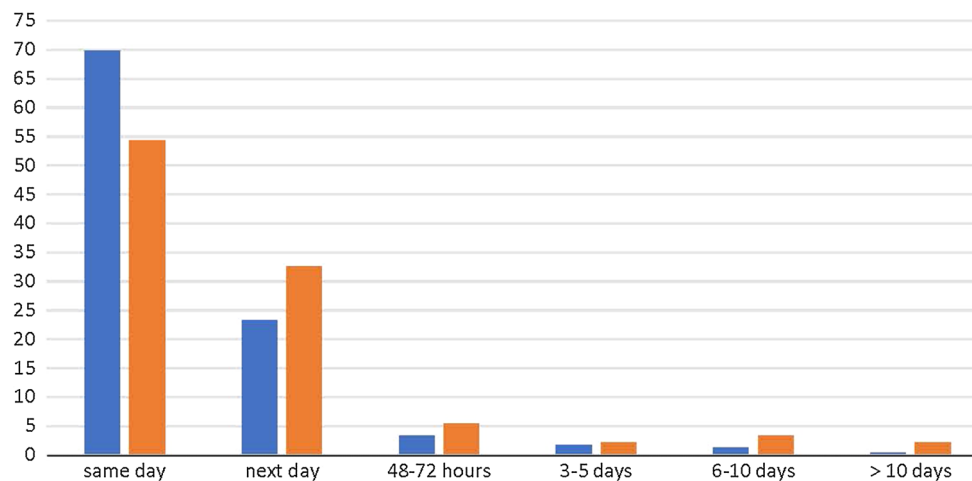
ICU admissions, blood transfusions, and admission and postoperative diagnoses were equally represented among men and women, except for gastric perforations (11.9% of men vs. 2.1% of women, P = 0.002).

Time from onset of symptoms to hospital presentation did not differ significantly between men and women in the unadjusted model (144 h ± 153 for men and 291 h ± 115 for women, P = 0.54.) Before adjustment, women were less likely to undergo operations for peritonitis than were men (68.1% vs 78.3%, P = 0.02), had longer times from KCH arrival to operative intervention, and longer overall lengths of hospital stay (12.9 days vs. 10.1 days, P = 0.04) than did men. Only 54% of women underwent an operation within 24 h of presentation compared to 70% of men (P = 0.01), Table 2, Fig. 1. Inpatient complications were evenly distributed among women and men; 15 (12.2%) women and 26 (9.2%) men had a complication, with wound complications being most common, Table 3.

After adjusting for confounding variables, no differences were found between men and women in terms of in-hospital mortality (OR 1.16, 95%CI 0.64–2.10, P = 0.61) and mortality in the Emergency Department (OR 1.40, 95%CI 0.22–8.89, P = 0.72), Table 3. Additionally, overall complications among men and women did not differ significantly. However, women had significantly delayed time to presentation to KCH, presenting an adjusted mean difference of 136 h later than men (95%CI 100–641, P = 0.05). This significance did not persist in time to presentation to any hospital; however, the data for presentation to other facility were missing for 39% of the patients, regardless of sex. Women had delays in time from presentation to KCH to operative intervention, undergoing operations an adjusted mean difference of 1.91 days later (95%CI 1.12–3.27, P = 0.02). They had delays in time from presentation to any hospital to operative intervention, undergoing operations an adjusted mean difference of 1.89 days later (95%CI 1.12–3.17, P = 0.02); however, as mentioned above, data were missing for 39% of patients. Women had longer lengths of stay (adjusted mean difference of 1.67 days, 95%CI 1.00–2.80, P = 0.05) and fewer

Table 3 Outcomes stratified by sex and adjusted effects of sex on mortality and post-surgical complications, N = 462

	Male female		Adjusted[a]	
	318 (68.8%)	144 (31.2%)	OR (95% CI)	P value[b]
Death in Emergency Dept	3 (0.9)	3 (2.1)	1.40 (0.22–8.89)	0.72
Death in hospital	53 (16.7)	26 (18.1)	1.16 (0.64–2.10)	0.61
Time to presentation to KCH, mean hours (± SD)	144 (± 153)	291 (± 115)	136 (100–641)[c]	**0.05**
Time to presentation to any hospital, mean hours (± SD)[d]	175.2 (± 67)	116.4 (± 27)	− 46.3 (− 249–156)[c]	0.65
Time to operating room on arrival to KCH, median days (± SD)	0.6 ± 3.3	1.3 (± 2.9)	1.91 (1.12–3.27)[c]	**0.02**
Time to operating room from presentation to any hospital, median days (± SD)	1.6 (± 3.7)	2.7 (± 4.1)	1.89 (1.12–3.17)[c]	**0.02**
Length of stay, median days (± SD)	10.1 (± 0.64)	12.9 (± 1.5)	1.67 (1.00–2.80)[c]	**0.05**
No operative intervention	69 (21.7)	46 (31.9)	2.17 (1.30–3.62)	**0.003**
Overall complications	26 (9.2)	15 (12.2)	1.20 (0.58–2.51)	0.62
Wound infection or dehiscence	14 (4.4)	6 (4.2)		
Re-operation[e]	5 (1.6)	3 (2.1)		
Respiratory insufficiency	5 (1.6)	4 (2.8)		

OR odds ratio, CI confidence interval, Dept Department, SD standard deviation

[a]Adjusted for patient age, occupation, year of presentation, comorbidities, presence of peritonitis, surgical intervention, hours to presentation, transfer status, and domicile location

[b]P values ≤ 0.05 in bold

[c]Adjusted mean difference

[d]Missing variable in 39% of transfer patients

[e]Bleeding, enterotomy, abscess

operative interventions when compared to men (OR 2.17, 95%CI 1.30–3.62, P = 0.003). When gastric perforations, which were more common among men, were excluded, the results did not change. When examining the subgroup of patients who underwent surgical management, women continued to have a statistically significant increase in total length of stay.

Discussion

This study demonstrates that disparities in utilization of surgical care based on sex exist in a subset of patients with surgical conditions and peritonitis at KCH. For acute care, surgical conditions that should have equal representation among men and women, men were overly represented, comprising almost 70% of all cases. Women were more likely to have delayed presentation to KCH, delayed time to surgical intervention, longer lengths of stay, and less likelihood of surgical intervention. Although there were no differences in in-hospital morbidity and mortality, the smaller number of women presenting for care may represent mortality prior to transfer to our tertiary referral center or in the community.

This study is the first to study sex-based disparities among patients with acute general surgical conditions in sub-Saharan Africa. There have been few studies on sex disparities among surgical patients, with a particular dearth in LMICs. A study of north Indian children presenting for congenital cardiac surgery revealed that only 37.6% of the children were female [15]. Female children may present less frequently for general hospital conditions in Africa as well; research in Ethiopia and Ghana looking at pediatric admissions and treatment of fever demonstrates different treatment patterns and fewer admission for female patients. [16, 17] Studies in Bangladesh, Pakistan, Botswana, and Malawi have demonstrated that women are less likely to seek surgical treatment for cataract surgery, are more likely to present in a delayed fashion, and are more likely to have worse ophthalmologic outcomes than do men [10, 12–14].

In the USA, more robust research has evaluated sex-based outcomes disparities among surgical patients. Female sex has been associated with an increased mortality in burn and pediatric cardiac surgery patients, and higher rates of postoperative complications and mortality following abdominal aortic aneurysm repairs. [11, 18–20]. Women are less likely to receive liver or kidney transplants and are more likely to die on transplant waiting lists [21–24].

The specific drivers of sex-based disparities in access to surgical care are not well delineated, and the reasons for the disparities identified in this study are likely multi-faceted. Sociocultural norms and religion are two reasons why sex disparities in surgery may exist. Women's roles as caregivers drive them to prioritize their families' needs over their own, or patriarchal social norms lead to difficulties in women being able to express their needs [3]. Sex-based disparities in outcomes may also simply be attributable to a sex-based predilection to the specific disease or underlying biological differences between men and women, as is seen in symptom and treatment patterns in women with acute coronary syndrome [25–29].

Disparities may be partially due to nuanced differences in symptomatology between men and women; women may have a broader differential for abdominal pain that includes gynecologic diseases, leading to potential for delay or alterations in treatment [30].

Socioeconomic factors also contribute to disparities. In Malawi, health care is free; thus, once patients are admitted to the hospital, delays and differences in care related to economic factors would dissipate. However, the effects of indirect costs must be considered as well and may contribute to delays in presentation. Obtaining transportation, leaving the home, or taking time off work to seek health care is costly. If men are traveling to work in areas closer to hospitals, perhaps they are more inclined to utilize health services. Health literacy and local perceptions of modern health care and hospitals may also contribute. A landmark study in Giza, Egypt showed that among Egyptian women, the most significant factor in healthcare utilization was the women's own perceptions about their health and the belief that certain gynecological conditions were normal [5].

Many of these factors likely contributed to the disparities seen at KCH. One observation of this study was that while there was no difference in time to presentation to KCH among men and women in the unadjusted analysis, time to presentation became significant in the adjusted model. This difference may have been because women were more likely to be housewives with household or child care responsibilities, and adjusting for occupation led to statistical significance.

Interestingly, 87% of male and female patients were transfers. Delay in transfer may have contributed to delay in presentation. While this delay would still signify a sex disparity, the underlying cause of the disparity might be different. For example, physicians at the district hospital may be culturally biased to place priority on male patients, and real or perceived differences in the differential diagnosis of female and male abdominal pain could influence decisions to transfer. While clinical picture or illness severity may influence operative decision making, similar cultural biases and diagnostic uncertainty may have influenced the observed delay to operative intervention and differences in management of the patients once admitted to KCH.

Misdiagnosis could have affected the clinical course and contributed to the lack of difference in mortality among men and women in spite of delays and disparate operative management. Some gynecological cases may have been inadvertently included that could be treated without operative management, such as pelvic inflammatory disease or tubo-ovarian abscess. Additionally, appendicitis can be treated non-operatively with antibiotics. If more women were being treated with antibiotics only and had appendicitis or a gynecological diagnosis, overall female mortality might have been affected.

Limitations of the study include that this population is a cross section of the country and so may not be generalizable to other regions of the country or other LMICs. The study is hospital-based; therefore, we do not know what morbidity and mortality are being experienced in the community setting.

Unfortunately, 39% of patients did not have data regarding time to arrival at outside facility; thus, time to presentation to any facility and time to operation from presentation to any facility are difficult to interpret and delay in transfers may have affected presentation. There was not a sufficient way to account for disease severity given the large number of patients missing admission vitals and misdiagnosis was certainly possible. This study identifies the presence of inequalities but does not determine why these inequalities exist, which is an area for future investigation.

Conclusion

This study demonstrates in this cohort of surgical patients with peritonitis at KCH, Lilongwe, Malawi that men present more frequently for surgical conditions, while women experience more delays accessing surgical care and surgical intervention and have longer hospitalizations than do men. Although the study did not identify sex-based disparities in short-term surgical outcomes, this may be attributable to presentation bias. Further work is needed to determine if sex-based disparities exist in long-term surgical outcomes, including disability or premature death. Future work must focus on the impact of socioeconomic status, age, sex, level of education, healthcare resources and availability on sex-based disparities in access to surgical care. Further research must also evaluate whether sub-optimal clinician–patient communication and unconscious biases lead to sex-based disparities in access to safe and quality surgical care and optimal outcomes.

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