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Uncovering the Burden of Urologic Disease: Admissions Patterns at the Main Teaching Hospital of Ethiopia

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Background: ***Limited data exists profiling the urologic needs of populations in sub-Saharan Africa. As the region builds training programs for urology, such data can inform strategic program planning and investment. The objective of this study was to describe admissions patterns for urologic disease at an academic medical center in Ethiopia.***
Methods: ***Retrospective review of admission, discharge, and operative logs of the urology service from November 2011 to October 2014 was conducted at Tikur Anbessa Specialized Hospital. Data were collected on patient demographics, length of hospital stay, specific diagnoses, condition classifications, and procedures performed, generating descriptive statistics.***
Results: ***A total of 1,149 urologic procedures were reviewed. Patients were predominantly male (74%) with median age of 43 years. The most common condition was urolithiasis (31%), followed by malignant tumors (25%) and benign tumors (14%). Almost half of patients underwent open surgical procedures (47%). Median inpatient stay was 14 days.***
Conclusions: ***The breadth and volume of patients treated hints at the large, unmet burden of urologic disease in Ethiopia. A large percentage of patients underwent open procedures and had prolonged inpatient lengths of stay. Continued research to understand urologic disease patterns and increase access to specialty care in this setting is needed.***

Keywords: Ethiopia; Sub-Saharan Africa; Urological Surgical Procedures; Health Care Utilization;
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Introduction

Global burden of disease estimates indicate that kidney and urinary tract diseases are responsible for 830,000 deaths and 18,467,000 disability-adjusted life-years (DALYs) each year, accounting for 1.4% and 1.0% of global mortality and disability, respectively[1]. The limited existing evidence suggests a considerable burden of urologic disease in sub-Saharan Africa. A study of urologic disease in West Africa determined that urologic diseases comprised a significant proportion of surgical disease and surgical interventions[2]. Another study in Malawi concluded that cancer, 25.5% of which was urologic in nature, comprised a significant proportion of surgical caseload in low-income countries[3]. Adequate care delivery for such diseases is an essential component of a functioning health systemand critical to achieving the goal of universal health coverage[4].

Despite this burden, low- and middle-income countries (LMICs) often lack resources crucial to addressing surgical disease, including appropriate infrastructure, skilled human resources for health, and equipment[5]. As in much of sub-Saharan Africa, Ethiopia faces critical resource constraints for appropriate surgical care. Access to prompt surgical care is limited by numerous challenges, including the significant distances patients must travel to receive treatment and insufficient infrastructure, such as electricity, water, central oxygen supply, and blood banks[6].

One of the most significant barriers to adequate surgical care is the lack of healthcare providers. The national health worker ratio per 1,000 population is 0.84, considerably below the 2.3 per 1,000 population minimum threshold set by the World Health Organization[7, 8]. In a study of five medical schools in Ethiopia, the most commonly sought specialty training was general surgery[6]. However, the country continues to have an especially large deficit of surgeons. Studies in Ethiopia suggest that rates of surgery

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are very low, consistent with the severe shortage of health workers providing surgical services[9]. This is a common problem across LMICs. While Ethiopia has few physicians serving large populations, there are even fewer specialists, with only one specialist per 100,000 population in the country in 2009[7]. Patients seeking care for urologic disease may have better outcomes when receiving care from specialists as opposed to general surgeons or practitioners[10].

Understanding the true burden of urologic disease is the first step towards evaluating how to address gaps in service provision and care delivery – for Ethiopia and the region. There is extremely limited data available profiling the needs of the population with regards to urologic diagnoses in sub-Saharan Africa[11]. As Ethiopia and other countries in the region build training programs for urology, this information can inform strategic program planning and investment. While there are inherent difficulties in measuring the true prevalence of urological disease in resource-poor settings due to widespread unmet surgical need, review of hospital admissions records can reveal valuable preliminary information for strategic health planning and development for improved surgical care systems[12]. The objective of this study was to describe admissions patterns for urologic disease at a public academic medical center in Ethiopia to begin characterization of the urologic disease burden in the country.

Patients and Methods

Located in the Horn of Africa, Ethiopia is the second most populous country in Africa spanning 1.1 million $km^2$with a population of over 99.6 million and an estimated 29.6% living below the national poverty line[13, 14]. With less than three physicians per 100,000 inhabitants, Ethiopia struggles with a general shortage of health workers alongside concerns regarding appropriate skill-mix and distribution of workers[7, 15]. In 2011, 45% of the total number of physicians and 28% of nurses work in Addis Ababa, the country's capital[15]. Ethiopia has very few urologists, and until 2009, all urologists were trained abroad.

In 2009, the first urology residency program and fellowship in urology for general surgeons was established at Tikur Anbessa Specialized Hospital (TASH) in Addis Ababa. TASH is a tertiary academic referral center and the main teaching hospital of the Addis Ababa University Faculty of Medicine. A retrospective analysis reported that surgical admissions comprised 35% of all TASH admissions; urological admissions accounted for 20% of all surgical admissions and 5% of surgical mortality[16].

At the time of data collection, TASH was the only public hospital providing urology referral services in the country. While local general surgeons manage most urologic conditions presenting in rural areas, particularly complex cases and those who can afford to seek further care are referred to TASH or other private facilities. The urology service housed at TASH maintained two wards totaling 40 to 50 inpatient beds and two operating rooms.

Data collection

This was a retrospective review of records of urologic admissions at the Urology Unit of TikurAnbessa Specialized Hospital (TASH) between November 2011 and October 2014. A trained researcher retrospectively collected data on patient demographics, length of hospital stay, urologic diagnoses, condition classifications, and procedures performed. Data sources included operating room, admission, and discharge registers at TASH. Data was collected from available existing registers in which information is recorded as routine administration of care at TASH. Collected data was also de-identified for analysis. For these reasons as well as unreasonable difficulty in re-contacting patients recorded in registers, informed patient consent was not sought for inclusion in this retrospective review.

In light of study aims to understand admission patterns for urologic conditions at TASH, only the primary procedure requiring admission was recorded. These data include all admitted patients over the age of 13 years; those under 13 years of age are seen by pediatric surgeons and are not considered urologic admissions in this setting. Patients who were admitted, then deemed unfit for surgery and subsequently discharged, were excluded from review.

The term "benign tumors" used in data collection indicated a number of benign conditions, namely benign prostatic hyperplasia (BPH), benign kidney cysts, renal oncocytoma, and angiomyolipomas. Urinary tract

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infections (UTIs) that were documented refer only to UTI diagnoses associated with underlying surgical conditions as the majority of other UTI diagnoses are treated by internal medicine specialists. As these patients are not admitted for surgical care, UTI classification in data sources do not include simple pyelonephritis.

Statistical analysis

Statistical analyses were performed using SPSS 22 and Stata 13. Descriptive statistical analyses were conducted to determine frequencies and reveal trends across variables.

Ethical review

This study was conducted through collaboration of TASH, an academic tertiary facility affiliated with Addis Ababa University (AAU), in Ethiopia and the University of California, San Francisco (UCSF) in the United States. This retrospective review received ethical approval from the AAU Institutional Review Board and UCSF Committee on Human Research.

Results

Between November 2011 and October 2014, a total of 1,149 urologic procedures were performed. The mean and median age of patients was 44 years (SD=17.14) and 42.5 years [IQR=30, 56], respectively. Figure 1 illustrates the age distribution of the patient sample. A quarter of urologic admissions were female, while the remaining 75% were male. The median duration of inpatient stay was 14 days [IQR: 10, 22]. Diagnosis categories of patients admitted to the TASH urology service are summarized in Table 1. Urolithiasis comprised the greatest number of total urologic admissions (*n* = 360, 31%). Of urolithiasiscases, 73% of patients underwent unilateralupper tract procedures, 25% underwent bilateralupper tract procedures, and 2% were treated for bladder and urethral stones.

Table 1. Frequency and Percentage of Diagnoses among Urologic Admissions (N=1,149)

Diagnosis	Number	Percentage
Urolithiasis	360	31.3
Malignant tumors	282	24.5
Benign	161	14.0
Congenital	117	10.2
Urethral stricture	61	5.3
Obstructive uropathy of unknown etiology	65	5.7
UTI	15	1.3
Trauma	9	0.8
Other	79	6.9

The second most common cause of urologic admissionswas for malignancy (*n* = 282, 25%), the majority of which were urothelial and non-urothelial bladder cancer (67%) followed by kidney cancer (24%). The remainder consisted of prostate cancer (5.0%), testis cancer (2%), penile cancer (1%), and upper tract urothelial cancer (0.4%)(Figure 2).BPH and benign tumors accounted for 161 admissions (14%).Congenital abnormalities accounted for 117 urologic admissions (10%), 59.4% of which were due to ureteropelvic junction obstruction. Urethral stricture made up 5% of cases, obstructive uropathy of unknown etiology comprised 6%, and UTIs were 1% of urologic diagnoses.

During the study period, 543 patients (47%) underwent open surgical procedures. Of these, 49% were renal surgeries, 21% were bladder procedures, and 10.7% were urethral procedures (Table2). For another 511 cases, endoscopic procedures were performed. Procedures performed for kidney stones diagnoses were ureteroscopy (14% of total urologic cases recorded), percutaneous nephrolithotomy (PCNL) (4%), and extracorporeal shock wave lithotripsy (ESWL) (0.2%)(Table 2).

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Table 2. Urologic procedures performed at TASH (N=1,149)

Procedure	Number	Percentage
Open surgery (site)	**543**	**47.3**
Renal	264	23.0
Testis	29	2.5
Ureter	25	2.2
Urethral	58	5.0
Penile	21	1.8
Bladder	112	9.7
Combined	14	1.2
Other	20	1.7
Endoscopic	**511**	**44.5**
Kidney Stones		
Ureteroscopy	157	13.7
PCNL	41	3.6
ESWL	2	0.2
Prostate Tumor		
TURP/TUIP	56	4.9
Ureter Obstruction		
Stent	30	2.6
Bladder Tumor		
Cystoscopy	13	1.1
TURBT	166	14.4
Urethral Stricture		
Bladder neck incision	4	0.3
Combined	9	0.8
Other	33	2.9
No Intervention	**95**	**8.2**

Key: DALYs =Disability-adjusted life years. ESWL = Extracorporeal shock wave lithotripsy. LMICs = Low- and middle-income countries. PCNL= Percutaneous nephrolithotomy. . TUIP = Transurethral incision of the prostate. TURBT =Transurethral resection of bladder tumor

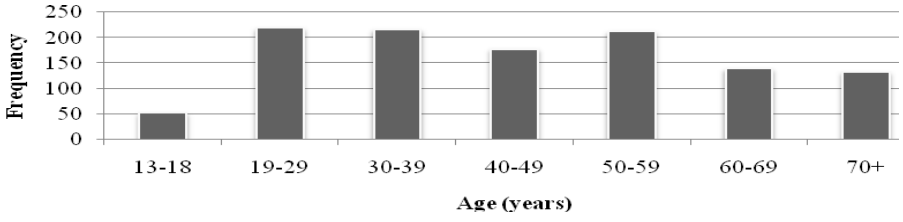

Figure 1. Age distribution of urologic admissions

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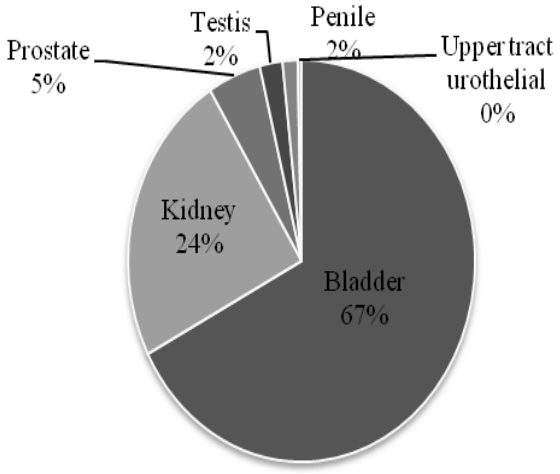

Figure 2. Types of Malignant Tumors Diagnosed (n=282)

The relatively low proportionof ESWL procedures may be attributable to the fact that the extracorporeal shock wave lithotripter at TASH was not properly functioning for the majority of the study period.Less than 5% of urologicpatients underwent transurethral resection or transurethral incision of the prostate (TURP/TUIP). Stents for ureteral obstruction were places in 3% of cases. 166 patients underwent transurethral resection of bladder tumor (TURBT) (15% of total urologic cases). Bladder neck incision was performed for bladder neck contracture or stenosis for 0.4% of urologic cases.

Discussion

Retrospective review of hospital records demonstrates the considerable patient volume, burden of urologic disease, and scope of urology services at TASH. During the study period, the majority of case volume consisted of managing urolithiasis and urologic malignancy. Benign tumor diagnoses also made up a considerable proportion of urologic cases at 14%, notable because of the significant morbidity associated with BPH when left untreated.

The majority of urologic admissions were male. This may be because female urogynecologic conditions are more commonly managed in departments and centers specifically for obstetrics, gynecology, and fistula care. On the other hand, it would be worth investigating the possibility that unidentified barriers to care or different care seeking behaviors among women exist in Ethiopia.

Open surgery was the management strategy most often used to treat urologic patients and these surgeries were most often renal procedures. These high rates of open surgical procedures significantly diverge from trends in high-income settings, where less than 5% of patients are treated by open methods[17]. A lack, shortage, and/or malfunctioning of endourologic instruments as well as the shortage of experts for particular endourologic procedures at any given time contribute to the high rates of open surgical procedures in this setting. For example, only 0.2% of procedures performed were ESWL as a result of non-functioning equipment for the majority of the study period. Increasing capacity for endoscopic procedures could result in improved outcomes and reduced length of stay among these patients. Delayed care-seeking among this patient population may also contribute to patients with more advanced pathologies requiring open surgical intervention presenting to TASH. Previous urological studies at TASH indicate that urolithiasis is a major reason for urologic admissions, and is commonly complicated by renal failure[17]. This may also suggest late patient admission or insufficient medical facilities for appropriate care and treatment of urologic disease.

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Study findings parallel those across sub-Saharan Africa. A recent study by the British Association of Urological Surgeons surveying urologists and general surgeons working sub-Saharan Africa reported most common urological conditions to be BPH, urethral stricture, prostate cancer, bladder cancer, and urethral or ureteric trauma[12, 17, 18]. A study in Nigeria from 2002 determined that there is a significant and increasing burden of urologic disease in the country with the majority of treatment being invasive reconstructive surgery[2]. Open prostatectomy remains the most common approach for prostatomegaly in this setting[2]. In this study, bladder and prostate cancer accounted for a majority of tumors, while 95% of patients presented with advanced cancer[2]. A similar situation may exist in Ethiopia, giving context to the high rates of open surgery as treatment for urologic disease.

Review of the logbooks at a tertiary referral center in Malawi found that cancer surgery makes up a significant proportion of surgical caseload[3]. Worldwide estimates identify cancer as the second leading cause of death in developing countries, while global trends suggest that many seek or are admitted to care late, do not seek medical care at all, or do not receive referrals for cancer treatment[19]. As TASH remains Ethiopia's only cancer referral center, and only public hospital providing urology referral services, it is likely that a significant burden of cancer remains unmet in the country.

Limitations of this study include those associated with the collection of data through the retrospective review of records. Data sources were limited in detail, and only reflect complex cases that received specialist urology care. Patients under 13 years of age were treated by pediatric surgeons and are not included in this analysis. Similarly, UTIs were commonly treated by internists are not addressed here. Data on complications including infection may also be underreported as only primary diagnoses are recorded; additional infections or complications, such as BPH with cystitis, for example, is not regularly recorded in hospital records. Finally, because this is a hospital-based study, we cannot comment on the full extent of urologic needs of the larger population in Ethiopia, or on patients who received urologic care through the private sector.

This review highlights the significant burden of urologic disease in this population. While this study provides only an overview of urologic disease in Addis Ababa and surrounding areas, there is a clear need for increased awareness of urologic need alongside appropriate investment in measures to build infrastructure and human resources to effectively address this need. The establishment of the urology residency and fellowship programs at TASH is an important first step toward addressing the increasing demands on the health system. Still, awareness and advocacy for these programs are necessary to effectively build capacity.

Continued research is critical for a comprehensive understanding of population needs andstrategic development of appropriate infrastructure and services. For example, a study addressing whether treatment choices were dictated by disease severity or resource availability would help to prioritize systems development strategies. Investigating the underlying reasons for under-diagnosis, late presentation, and delayed care may reveal critical opportunities to improve access to care in this setting. Focused research into the effectiveness of care being provided for urologic diseaseis key to strengthening surgical care systems. Population-level research aimed atassessing needs for urologic services, and how institutions such as TASH can address these needs, can build on the foundation laid by this study to inform evidence-based resource allocation and improve the quality of urologic care and services.

Conclusion

Urologic surgery is most often performed to treat urolithiasis and malignant tumors at TASH.Open, invasive surgery has consistently been the primary management strategy in addressing patients' urologic needs. This may indicate a high proportion of patients presenting to TASH with urologic diagnoses arrive to the hospital in late stages of disease, prompting the necessity of invasive treatments.Admissions patterns suggest various potential barriers to accessing care for urologic disease.

Based on hospital admissions patterns, this study describes a large caseload for urologic disease that results in significant morbidity, mortality and healthcare expenditure. Yet, this is only the first step toward uncovering the burden of urologic disease in the region.

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Findings allude to the potentially high burden across sub-Saharan Africa. However, urologic disease israrelyaddressed in the global conversation about the burden of surgical disease in LMICs. There is a clear need to better understand the true burden of urologic disease in these settings. Trends in disease prevalence call for greater strategic planning and investment in health system development and capacity building for urology. Continued research aimed at characterizing broader urologic disease patterns and increasing access to quality medical care for urologic disease is necessary to inform strategies for its effective management in Ethiopia and similar settings.

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