

**THE CLINICAL PATTERNS OF PRESENTING SIGNS AND
SYMPTOMS OF ANTERIOR URETHRAL STRICTURE DISEASE AT
THE KENYATTA NATIONAL HOSPITAL (KNH)**



UNIVERSITY OF NAIROBI

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SURGERY, UNIVERSITY OF NAIROBI, IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR AWARD OF THE DEGREE
MASTER OF MEDICINE IN UROLOGY**

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STUDENT'S DECLARATION

I, **Dr. Lavela B. Kortimai**, do hereby declare that this thesis is my original work and has not been submitted for the award of any degree at any other institution

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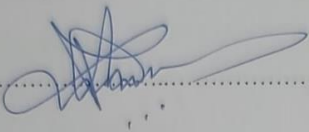
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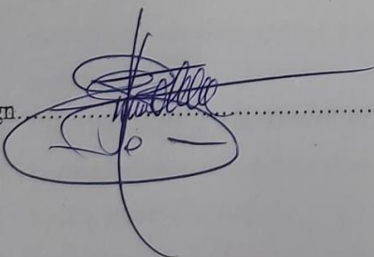
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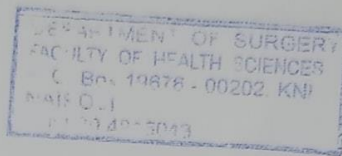
This research proposal was submitted at the Department of Surgery meeting on 21st of April 2022 at the University of Nairobi. It was subsequently approved by the Kenyatta National Hospital-University of Nairobi, Ethics and Research Committee (KNH-UON ERC) on 14th of September 2022. The dissertation is hereby submitted for examination with my approval as the Chairman, of the Department of Surgery.

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DEDICATION

I dedicate this research to my dear lovely wife, **Rev. Dr. Kula A. Kortimai** and my children (**Lavela, Patrick, Charles and Martin**) who stood with me during my academic path.

To my parents, **Prof. Lavela B. Kortimai, Sr.** and my mother, **Pastor Agnes F. Kortimai, Mother Mawein Zogbo Flomo**, and the **Late Ma Musu Bonah**.

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OPERATIONAL DEFINITION OF TERMS

Obstructive/ voiding symptoms:	Entails all symptoms related to difficulty passing urine. For this study urinary retention stands alone. The symptoms include weak stream, straining, stream spraying, hesitancy, and intermittency.
Urinary retention (acute or chronic):	Involves the inability of the patient to void with a palpable bladder. Acute urinary retention has pain while chronic is usually non painful. Urinary retention is a part of obstructive symptoms but for this study, it is treated as an individual entity so as to capture patients with complete obliterative urethral stricture.
Storage/ Irritative Symptoms:	Covers frequency, urgency and nocturia.
Post Micturition Symptoms:	Refers to post voiding symptoms. The symptoms include post void dribbling and sense of incomplete emptying.
Sexual Related Dysfunction:	Captures erectile dysfunction and ejaculatory disorder.
Pain Related Symptoms:	Involves suprapubic, urethra and perineal pain.

LIST OF ABBREVIATIONS AND ACRONYMS

AUA-SI:	American Urological Association- Symptom Index
AUSD:	Anterior Urethral stricture disease
AUR:	Acute urinary retention
DVIU:	Direct Visual Internal Urethrotomy
E.D.:	Erectile Dysfunction
EPA:	Excision and Primary Anastomosis
IPSS:	International Prostate Symptom Index
KNH-	Kenyatta National Hospital
MCUG:	Micturition Cystourethrogram
RCUG:	Retrograde Cystourethrogram
VCUG:	Voiding Cystourethrogram
MRI:	Magnetic Resonance imaging
MRU:	Magnetic resonance urethrogram
SD:	Standard Deviation
UON:	University of Nairobi
USD:	Urethral Stricture Disease
> :	Greater Than
< :	Lesser Than
UTI:	Urinary Tract Infection
STI:	Sexual Transmitted Infection
LUTS:	Lower Urinary Tract Infection
SPC:	Supra Pubic Catheterization
UR:	Urinary Retention
IQR:	Interquartile Range

ABSTRACT

Background: Globally, urethral stricture disease (USD) accounts for 0.6% of older patients and is a disease with associated financial toxicity and multiple comorbidities. This condition dramatically influences patients' quality of life and may require emergency intervention. Most studies show that about 47% of USD presenting signs and symptoms are not captured in most of the assessing tools including American Urological Symptom Index (AUA-SI) and International Prostate Symptoms Score (IPSS).

Objective: To determine the clinical patterns of presenting signs and symptoms of Anterior Urethral Stricture Disease (AUSD) at the KNH, Nairobi County

Methodology: This was a 5-Year (2017-2021) retrospective study of adult (Female/Male) patients diagnosed and managed for AUSD at the Kenyatta National Hospital (KNH).

Sample Size: A sample of 385 was calculated via the Cochrane formula (1963) and all the files were obtained and included in data analysis representing a 100% acquisition rate.

Data Analysis: Data was collected using a standardised questionnaire, cleaned, and analysed using STATA 13.0 to determine the frequency of signs and symptoms, aetiologies, length and sites of urethral stricture. Binary logistic regression was performed to investigate the association between the chief complaints and stricture aetiology, stricture site and stricture length. The odds ratio was calculated to show the direction and strength of the association. The level of significance was considered at $p < 0.05$.

Results: The median age was 46 (IQR: 33 – 62) years with 41.8% ($n = 161$) of patients aged ≥ 50 years while the mean age was 46.8 with standard deviation (SD) of 18.12. Majority, 68.6% ($n = 264$), were married, 65% ($n = 250$) were unemployed while 56.9% ($n = 219$) were urban dwellers. Of the 18 symptoms reported by patients, the commonly occurring chief complaints were straining 24.7% ($n = 95$), urinary retention 22.7% ($n = 87$) and weak stream, 10.2% ($n = 39$). The common stricture aetiology was trauma, 35.8% ($n = 138$) and followed by post infection caused stricture 23.6% ($n = 91$). Bulbar strictures were the commonest, accounting for 78%. A stricture length averaging 1-2 cm (55.8%) was the most predominant.

Infectious, inflammatory, traumatic and iatrogenic strictures presented with straining/difficulty passing urine at 18.7%, 26.7%, 26.1% and 29.6% respectively. Patients with traumatic stricture were 3.3 times more likely to present with Urinary retention (OR=3.33, 95%CI: 2.04- 5.44, $P < 0.001$) while idiopathic stricture had 2 times the likelihood of obstructive/voiding symptoms (OR=1.98, 95%CI:1.20 – 3.25, $p = 0.008$). Stricture length greater than 2 cm was two times more likely to present with pain-related signs/symptoms (OR=2.01, 95% CI: 1.10-3.74, $P = 0.024$). Penile stricture has 1.8 times more likelihood to present with obstructive signs/symptoms (OR=1.84, 95%CI: 1.20-2.81, $P = 0.005$)

Conclusion: It is a disease of protean clinical manifestation. From the forgoing study, conspicuous amongst these were straining, urinary retention and weak stream. Bulbar urethral stricture presented with straining and urinary retention. Traumatic strictures were more likely to present with UR while idiopathic strictures presented with obstructive or voiding symptoms. The greater the length of the stricture (> 2 cm), the greater the obstruction and high likelihood of presenting with pain related symptoms. It is imperative that meticulous documentations of presenting signs and symptoms be done to optimize treatment outcome.

1.0 CHAPTER ONE: INTRODUCTION

1.1 Background Information

Internationally, the order population with urethral stricture account for 0.6%. At Kenyatta National Hospital, about 100 patients undergo urethral stricture surgeries annually. The development of a stand-alone patient assessment tool is fundamental for assessing patients pre-operatively and post operatively. Therefore, the Pattern of urethral stricture presentation should be determined.

Nuss et al. (2012) in a retrospective study of 214 male patients post anterior urethroplasty evaluated fourteen clinical symptoms along with aetiologies, length, and urethral site. It was established that weak stream (49%) and incomplete emptying (27%) were the most common presenting symptoms contributing a total of 76%. Haematuria (5%) and incontinence (4%) were the least reported in the study group accounting for 9% [1]. Osoro et al. in his post graduate thesis (2012-2013) confirmed that stricture length in the Kenyan population was 1.25cm (SD 0.66 cm) [2].

In the study by Nuss et al. (2012), Idiopathic aetiology was the commonest accounting for 48% and the least was Lichen sclerosis, 9.8%. Only 10% of the study population had voiding-related or sexual dysfunction symptoms. The group with Lichen sclerosis presented with obstructive symptoms (76%) than acute urinary retention (AUR). In line with the stricture site, penile stricture patients presented with urinary stream spraying compared to bulbar urethral stricture. Pan-urethral stricture and bulbar urethral stricture show no difference in their presentation. Aside from Acute urinary retention, 21% of the patients presented with dysuria, post-void dribbling, hesitancy, urinary incontinence, and urinary stream spraying. These additional symptoms are not captured in the AUA-SI [1]. Another study by Rourke and Hickie (2012) on clinical signs and symptoms established that the commonest presenting complaint was Lower Urinary tract Symptoms (LUTS) at 54.3%, similar to AUA-SI, while acute urinary retention alone accounted for 23.4%. The rest of the symptoms contributed to 22.3% [3].

Currently, AUSD is a burden with multiple associated financial toxicity and comorbidities such as ED, fistula formation, and chordae just to name a few. Occasionally, it may cause mortality [4].

There is multi-variability in the aetiology of urethral stricture, which may be attributable to access to health care facilities, the patient's diagnostic variability and socioeconomic factors associated with the patient's location [5].

Adwok, in a prospective study (1982 to 1983,) at the KNH of 77 patients, reported that 71.4% of the patients had urethritis as the cause of the stricture. Trauma and iatrogenic etiologies accounted for 27.5% and 1.3% respectively [6].

Mugalo et al. (2013), in a retrospective study at Moi Teaching and Referral Hospital (MTRH) established the main aetiology as emanating from urethritis (51%), follow by urethral trauma (47%) [7]. Otele et al. (2020) in subsequent paper indicated that the aetiologies of urethral strictures at KNH were traumatic (60%), Iatrogenic (17.3%), Idiopathic (10.7%), infective (10.7%), and Lichen sclerosis at 0.6%. The paper included both AUSD and Posterior urethral stenosis/ contracture [4].

Confirmation of urethral stricture is based on radiologic findings and urethroscopy [9]. Retrograde Cystourethrogram and Micturition cystourethrogram are cost-effective, reduce financial toxicity to patient, and are readily available in limited-resource countries. Ultrasound has an axillary role to ascertain the extend of spongio-fibrosis and vascularity of the segment [8].

2.0 CHAPTER TWO: LITERATURE REVIEW

2.1 Background

Three erectile cylindrical bodies (two corpora cavernosa and corpus spongiosum) have partial separation with a septum between the dorsolateral corpora cavernosa. Ventrally, the urethra lies in the corpus spongiosum. The blood-filled spaces of the corpora cavernosa are lined with endothelium enclosed in a tough fibroelastic covering called the tunica albuginea. The albuginea of the corpus spongiosum is thinner than the cavernosa [10]. The proximal extensions of the corpora cavernosa are the crura, while the spongiosum is the bulb of the penis.

They are attached to the inferomedial margins of the pubic arch and bulb, which connects to the inferior surface of the urogenital diaphragm [10]. The male urethra is divided into the prostatic urethra, membranous, bulbar (bend portion of the urethra), and penile urethra (traverses the pendulous penis). The blood supply entails deep and superficial external pudendal arteries, which come from the first part of the femoral, which supplies the skin and subcutaneous tissues of the penis and anterior scrotal wall. The dominant artery is the deep external pudendal for the majority of individuals.

Any abnormal narrowing or complete occlusion of this lumen due to spongio-fibrosis in the anterior urethra leads to Anterior Urethral Stricture (AUS). In contrast, disruption or direct injury to the posterior urethra leads to contraction or stenosis [11]. The symptoms and signs associated with urethral stricture depend on the sites of the stricture, length, degree of spongio-fibrosis, and other coexisting comorbidities.

2.2 History of Urethral Stricture Disease

The earliest records of stricture management point to Hindu medicine, showing significant improvement around the sixth century. A paper published by the British Association of urologic surgeons on the history of stricture (1943) reported that Sushruta described the use of wood and metal dilators for management of urinary retention. Erasistratus introduced the use of an S-Shape catheter in 200 B.C. to treat urethral stricture [12]. During Roman rule, urethral dilators were made of lead, and there were attempts to perform a urethrotomy. Later, bronze catheters in an S-shape were invented. Urethral stricture management improved from S shape catheter to urethrotomy and finally urethroplasty [12].

2.3 Epidemiology

In urologic practice, USD is one of the most typical conditions with associated high morbidity [13]. The prevalence of urethral stricture is 229-627 per 100,000 males, and older males have a higher risk than younger males. Older people, especially after 55 years, are prone to the disease. According to Blachko et al. (2001) showed that patients over 65 years have an increased incidence of stricture disease at 9.0/100,000 compared to 5.8/100,000 patients younger than 65. The hospitalisation rate stood at 3.8 per 100,000 in 2000 (50% less than in 1994) [14].

2.4 Aetiology

In the article published in the Journal of Reconstructive Urology, Rourke and colleague (2012) did a retrospective study in Canada and they reported that the commonest cause of urethral stricture was idiopathic (47%), and the rest were iatrogenic, lichen sclerosis, trauma, and failed hypospadias surgery [3]. A meta-analysis was done for patients with stricture in the United States of America, Italy, and India in 2011 which established geographical variability and multifactorial aetiology of USD [5]. The United States of America and Honduras data showed that idiopathic, iatrogenic, post-inflammatory and traumatic aetiologies accounted for 34%, 32%, 20% and 14%, respectively [18].

The causes of AUSD have significantly changed with aetiology in urban areas slightly different from the rural setting. Previously, the primary cause of urethral stricture was post-infectious cause, but this has changed dramatically in the developed world. Osoba and Alausa, in 1976, at the Special Treatment Clinic in Ibadan, showed that the complication of gonorrhoea infection resulted in urethral stricture formation with or without watering-can perineum [15]. Nwofor and colleagues (2002) did a 5-year retrospective study on urethral stricture at the Nnamdi Azikiwe University Teaching Hospital in Nigeria which showed that of the 62 patients' records reviewed, 51.6% of the Urethral strictures were attributable to trauma, 48% to post-infection, and 1.6% to iatrogenic causes [16].

Oguike et al., (2009) in a 10-year review on the changing patterns of USD, noted that 55.9% of patients had post-traumatic strictures (Pelvic fractures accounted for 60.5% of post-traumatic strictures), 39.7% were post-inflammatory and iatrogenic causes made up 5.3% [17]. Boubacar et al. in 2010, at a Public Teaching Hospital in Senegal, reported that 63% of patients had urethral stricture due to post-infectious cause, 14.9% idiopathic, 13.7% trauma, and 8.2% iatrogenic causes [19].

Ekeke and Amusan, documented that traumatic (55%), inflammation (24.75%), and iatrogenic at 19% were major aetiologies in that part of the world [22]. Irekepita (2017) did a ten year retrospective study of urethral stricture disease in Nigeria and demonstrated that iatrogenic aetiology accounted for 45.7%, followed by post infectious causes at 30.4%, trauma (21.7%), and others (2.2%) [23].

A local retrospective study done in 1983 by Adwok, reviewed seventy-seven patients at the KNH. The results showed that infective urethritis accounted for 71.4%, and trauma and iatrogenic accounted for 27.3% and 1.3%, respectively [6]. Similarly, Mugalo et al. (2013) at the Moi Teaching Referral Hospital in Eldoret, reported that urethral stricture aetiology pulled towards urethritis at 51%, trauma (47%), and 1.8% attributed to urethral carcinoma and urethral diverticulum [7]. On the other hand, Qureshi (2012) reported that trauma was the leading cause of strictures in urban centre, Nairobi. This study showed that trauma (52%), Iatrogenic (21%), and post-infection (10%) were the common aetiologies [21].

The shift from post infectious aetiology to traumatic aetiology in urban setting was also supported by another research done in Kenyatta National Hospital. Osoro (2014) reported that trauma (51.5%), inflammatory causes 19.7%, and Idiopathic causes (28.8%) were predominant [2]. Kamande in a retrospective study from 1997 to 2001, showed that traumatic aetiology (41.4%) and infection (21.2%) were the major causes of urethral stricture [20]. Otele et al. (2020) in a study at the KNH published in the Bali Medical Journal, pointed out that traumatic cause was 60.7%, iatrogenic 17%, post infection 10.7%, idiopathic and Lichen sclerosis at 10.7% and 0.6% respectively [4].

2.5 Clinical Patterns

A retrospective study in the United States of America (USA), aimed at evaluating presenting Symptoms of AUS in 214 patients covering ten years revealed different proportions of the clinical Spectrum including the following: Weak urinary stream 49%, sense of incomplete emptying 27%, frequency 20%, Urinary retention 16%, Dysuria 16%, Urgency 14%, Nocturia 12%, Straining 10%, Spraying stream 9%, Hesitancy 8%, Post-void dribbling 5%, Intermittency 5%, Haematuria 5%, and incontinence 4%. The mean age was 42.1 years and the average standard deviation of the stricture length was 4.9 +/- 3.3 cm. Causes of the stricture included the following: idiopathic 48%, iatrogenic 15%, trauma 11%, Failed hypospadias repair 14% and Lichen sclerosis 9.8%. In the foregoing study, 10 % of the participants reported no voiding-related or sexual dysfunction symptoms. Obstructive symptoms were evident in the group with Lichen sclerosis (76%). In reference to the stricture site, penile stricture patients

presented with the symptoms of stream spraying in 17% compared to bulbar urethral stricture in 6% of the same population. Pan-urethral stricture and bulbar urethral stricture showed no major difference in their presentation. Aside from Acute urinary retention, 21% of the patients presented with dysuria, post-void dribbling, hesitancy, incontinence, and urinary stream spraying [1].

Rourke and Hickie (2012), in a retrospective study of 611 patients with a mean age of 48.9 years, pointed out that the most typical symptoms were LUTS, as seen in the AUA-SI. LUTS accounted for 54.3% of overall symptoms, followed by AUR with 23.4%. Aside from LUTS and AUR, 22.3% accounted for all other signs and symptoms, namely gross haematuria (3%), genitourinary pain (2.9%), Incontinence (1%) and Sexual dysfunction occurring in different proportions (0.8%) [3]. Tam et al. in the Journal of Reconstructive Urology, concluded that the IPSS had inadequate sensitivity and specificity to be used as a stand-alone screening tool for urethral stricture disease, highlighting the need to develop a stand-alone disease-specific, screening tool [24]. Alwaal et al, in 2015 recommended using the Urethral Score to determine the complexity and outcome of USD [26]. The U-score focuses on essential urethral stricture characteristics and complexity of surgery [6, 25]. Simon et al. (2015) reported that the degree of fibrosis in traumatic stricture was more extensive compared to idiopathic stricture [35].

There is a quest to determine the signs and symptoms associated with Anterior Urethral Stricture disease. Still, few papers have taken a keen interest in studying this unique component of the disease. In 1976, Osoba et al. in an article on Gonococcal Urethral stricture and watering-can perineum established that the latter symptom was predominant at 37.5% [16]. A retrospective study by Oguike et al. demonstrated that 51.7% of the patients had a poor urinary stream, acute and chronic urinary retention accounted for 11.8% and 10.3%, respectively, while 8.8% of patients presented with both retention and overflow incontinence 6%. Other key clinical presentations included watering-can perineum and haematuria. From this study, a substantial number of patients had no clinical signs accounting for 48.5% [17].

Adwok in a dissertation in 1983 at KNH showed that the most predominant clinical presentation was acute urinary retention (AUR) at 59.7%, followed by the reduced urinary stream at 32.5% and fistulations (watering-can perineum) at 3%. [6].

Kamande (2003) in a study at the KNH showed that the commonest symptom was difficulty in passing urine (straining) in 42% of the patients, follow by patients with indwelling suprapubic catheters at 40.8%. Other presentations were chordee, dysuria, haematuria, scrotal/loin pain, penile abscess, fistula, and urinary extravasation [20].

2.6 Investigations (Radiology and Cystoscopy)

Cunningham popularised retrograde urethrography and it's currently accepted as the imaging modality to investigate urethral strictures [8]. Retrograde Cystourethrography (RCUG) can be done in two modalities: static and dynamic [27]. Cystography alongside with voiding dynamic imaging is confirmatory of urethral stricture [28]. Modalities like Urethro-sonography, Magnetic Resonance urethrogram (MRU), and computerised Tomography are adjunct in the diagnosis of urethral stricture [26].

The conventional VCUG visualises mainly the posterior urethra [30]. Urethro-sonography cannot delineate posterior urethra and peri-urethral fibrosis. Furthermore, it can help in assessing the stricture length in the anterior urethra and a 3-dimensional anatomical details [29].

Study confirmed that conventional RCUG/VCUG and MRU have inherent error margin [30]. Surgical findings and RCUG correlation were more profound in the subgroup with stricture lengths greater than 3cm [31]. Murugesan et al. had confirmed the superiority of Magnetic Resonance Urethrography over RCUG [32].

2.7 Management of Urethral Stricture Disease

Urethral stricture has been documented since 3000 BC, and the use of dilators was common amongst ancient people, as seen in the tombs of pharaohs. Internal urethrotomy as a mode of management dates to about two millennia. Before the popularisation of urethroplasty in the 1950s, the management options available to mankind were mainly dilatation and urethrotomy [32].

Later, excision and primary anastomosis and substitution/ augmentation urethroplasty become management modalities for urethral strictures [33]. The gold standard of managing AUSD is urethroplasty [32]. Osoro, in a dissertation in 2014 on the short-term success of DVIU in 66 patients with stricture length less than 2cm at the Moi Teaching and Referral Hospital in Eldoret, concluded that DVIU was a procedure of first resort for short stricture before definitive management [2].

In South Africa, Heyns et al. studied 163 patients who were followed up for 48 months. The 5-year success rate for urethrotomy was less than 50%, while urethroplasty was 83%. Conventional internal urethrotomy has no advantage over laser urethrotomy and vice versa [33]. The AUA guidelines 2016 on Male urethral stricture management proposed that urethral dilation, direct visual internal urethrotomy (DVIU), or urethroplasty be done on short strictures (< 2 cm) located in the bulbar urethra [11].

As for revision urethroplasty, Otele et al (2020), in a retrospective study of 235 patients at KNH, revealed that re-do urethroplasty was feasible but not efficacious as its success rate was only 58%. In the surgeon's armamentarium, EPA and tissue transfer techniques were essential, but the outcome depended on the number, length, and history of prior procedures or surgery [4].

2.8 Statement of the Problem

There is currently no comprehensive study on the clinical patterns of presenting signs and symptoms of anterior urethral stricture disease in our setting. However, there are limited papers on this subject globally. Additionally, there is paucity of data on the frequency of Anterior Urethral Stricture Disease signs and symptoms and its association in various subgroups (aetiology, length, and site of the stricture) in our setting.

2.9 Justification

The data on the frequency of signs/symptoms and their association to aetiology, site, and length of the stricture will guide preoperative planning and post-operative follow-up. Determining the patterns of presentation of AUSD will aid in the formulation of a presurgical assessment tool and post-operative follow-up.

2.10 Research Question

What are the clinical patterns of anterior urethral stricture disease (AUSD) at the Kenyatta National Hospital?

2.11 Objectives of the Study

2.11.1 Broad Objective

To determine the clinical patterns of presenting signs/symptoms of Anterior Urethral Stricture Disease at Kenyatta National Hospital

2.11.2 Specific Objectives

- a) To determine the frequency of signs/symptoms
- b) To determine the frequency of different aetiologies, sites, and length of the stricture
- c) To determine the association between the signs/symptoms of Anterior Urethral Stricture Disease to sites, aetiologies, and length of the stricture

3.0 CHAPTER THREE: METHODOLOGY

3.1 Study Design

The study design was a 5-year retrospective Study from 1st January 2017 to 31st December 2021 of all patients diagnosed and surgically managed for Anterior Urethral stricture disease at the Kenyatta National Hospital.

3.2 Study Site

Kenyatta National Hospital (KNH) is the largest teaching and referral hospital in the Central and East Africa region with a total of 1800 beds capacity. It serves as the national referral hospital for peripheral hospitals. KNH- Urologic Unit does 100 procedures/ surgeries for USD per year. The medical records were obtained from the Health Information Department of patients diagnosed and surgically managed for Anterior urethral disease at the KNH.

3.3 Study Population

The study population was 18-year-old adults (males and females) and above diagnosed and managed surgically for AUSD at the KNH.

3.3.1 Inclusion Criteria

The study included 18-year-old adults (male and female) and above diagnosed with Anterior urethral stricture disease and were surgically managed, 2017-2021 at the KNH.

3.3.2 Exclusion Criteria

- a) Patients with concomitant proximal/posterior urethral stenosis or contracture
- b) Files with missing data

3.4 Sample Size Determination

Cochrane formula (1963) was used to determine the sample size.

- Z: 95% confidence level, which is 1.960
- P: Variability is 0.5 as the maximum variable
- Q: 1-p = 0.5
- e²: Desire procession level 0.05

Formula: $n_0 = \frac{Z^2 pq}{e^2}$

$$No = \frac{(1.96)^2 (0.5) (0.5)}{(0.05)^2} = 384.16$$

3.5 Sampling Procedure

The sampling method included all patients that met the inclusion criteria, and this research used the census method for sampling.

Screening tools (questionnaires) were used to gather the data.

3.6 Variables

3.6.1 Dependent Variables

Presenting signs/symptoms

3.6.2 Independent Variables

- a) Aetiology of the stricture
- b) Site of the stricture
- c) Length of the stricture

3.6.3 Confounding Variables

Urinary tract infection (UTI)

3.7 Data Collection Procedures

Permission was obtained from the KNH Medical Record Department to collect data from patients' files with anterior urethral stricture disease. The printed standardized questionnaire was used to collect the data. The symptoms inclusive in AUASI/IPSS were incorporated in the standardized tool. The files of all patients diagnosed and managed at KNH Urological Unit for Anterior Urethral stricture were retrieved. The study included patients that met the study inclusion criteria. A standardised questionnaire tool was used to collect the data. The data was imported into a data spreadsheet. Each of the selected files was coded for confidentiality.

3.8 Recruitment and Training

The research assistant recruited was senior undergraduate medical student (MBChB). The principal investigator: the Urologic resident, conducted two days of data collection training for two (2) research assistants. The training covered the retrieval of information from medical registers and the medical records department, filling out the study questionnaire and checking for the accuracy of the information, and maintaining confidentiality. Before commencing the study, the research assistant's proficiency was tested.

3.9 Quality Assurance Procedures

There was a high degree of compliance with the research protocol and data quality standards. The principal investigator verified, and counterchecked data collected against the selected files to assess the data's accuracy and completeness during the study period. After which, the data collected was protected in a cabinet under lock and key. The computer was also password protected.

3.10 Data Analysis

Data was collected using a standardised questionnaire, cleaned, and analysed using STATA 13.0. for frequency of signs and symptoms of urethral stricture. Demographic characteristics were summarized descriptively. Continuous data were summarized using median and interquartile range while grouped data was summarized using frequencies and percentages. Chief complaints were analysed descriptively using frequencies and percentages. Stricture aetiology, site and length were analysed descriptively using frequencies and percentages. Binary logistic regression was performed to investigate the association between chief complaints and stricture aetiology, stricture site and stricture length. The odds ratio was calculated to show the direction and strength of the association. The level of significance was considered at $p < 0.05$.

3.11 Ethical Considerations

The researcher sort authorisation from the KNH Medical Record Department to retrieve and collect data from patients' files covering the research period. This researcher upheld all ethical protocols prescribed by KNH-UON Ethical Review Committee. The high ethical standard was followed in line with the confidentiality of information, the autonomy of research participants and respect for persons' dignity. The standardised questionnaire forms were placed in the cable under the lock and key. The computer used in this study was password protected to avoid unauthorised users.

3.12 Study Results in The Dissemination Plan

The corridor for disseminating results will be through conferences, Continuing Medical Educations meetings, the KNH department, and publication in a peer-reviewed journal.

3.13 Study Limitations and Mitigation Strategies

- The urethral length of RCUG/MCUG was not congruent with the intraoperative findings, and this was mitigated by relying on intraoperative findings.
- The variability in the preoperative urethral length by different surgeons was mitigated by relying on surgeon intraoperative findings.

4.0 CHAPTER FOUR: RESULTS

4.1 Baseline Demographic Characteristics of Patients Diagnosed and Managed Surgically for AUSD at the KNH

A total of 520 files were allocated from KNH data base but 490 files were found while 30 files could not be traced. Of the 490 files, files with missing data were excluded from the data collection process based on the exclusion criteria. 385 patients met the inclusion criteria via a consecutive sampling method. The retrieval ended when the desire sample size was reached. The median age was 46 (IQR: 33 – 62) years with 41.8% (n =161) of patients aged ≥ 50 years while the mean age was 46.8 with standard deviation (SD) of 18.12. Many of the study participants, 68.6% (n=264) were married, 65% (n =250) were unemployed while 56.9% (n =219) were residing in urban areas as shown in Table 1.

Table 1: Demographic characteristics of patients diagnosed and managed surgically for AUSD at the KNH

	Frequency	Per cent
Age, Median (IQR) years	46(33 - 62)	
<30 years	76	19.7
30 - 49 years	148	38.4
≥ 50 years	161	41.8
Gender		
Male	382	99.2
Female	3	0.8
Marital status		
Married	264	68.6
Single	120	31.2
Widowed	1	0.3
Employment status		
Employed	124	32.2
Unemployed	250	65.0
Retired	11	2.9
Residence		
Rural	166	43.1
Urban	219	56.9

4.2 Chief Complaint Among Patients Diagnosed and Managed Surgically for AUSD at the KNH

The commonly occurring primary complaints among patients were straining (difficulty voiding) 24.7% (n =95), urinary retention, 22.7% (n =87) and weak stream, 10.2% (n =39). Others symptoms included spraying stream 9.6% (n =37) dysuria 8.9% (n =34) and urethra-cutaneous fistula, 5.2% (n =20) as shown in Table 2.

Table 2: Chief complaint among patients diagnosed and managed surgically for AUSD at the KNH

Chief complaints	Frequency	Percent
Straining	95	24.6
Urinary retention	88	23.0
Weak stream	39	10.1
Spraying stream	37	9.6
Dysuria	34	8.9
Urethro-cutaneous fistula	20	5.2
Incontinence	10	2.6
Frequency	9	2.3
Hesitancy	8	2.1
Supra pubic and urethral pain	8	2.1
Water-cane perineum	8	2.1
Incomplete emptying	7	1.8
Post void dribbling	6	1.6
ED	5	1.3
Haematuria	5	1.3
Ejaculatory disorder	3	0.8
Urgency	2	0.5
Intermittency	1	0.3

4.3 Stricture Aetiology Among Patients Presenting with Anterior Urethral Stricture

The common stricture aetiology was trauma, 35.8% (n =138), and follow by post-infection, 23.6% (n =91). Other aetiologies were idiopathic 21% (n =81) and Iatrogenic 14.3% (n =55). Inflammatory conditions plus Lichen sclerosis accounted for 5.2% (n=20). These are depicted in Figure 1 below

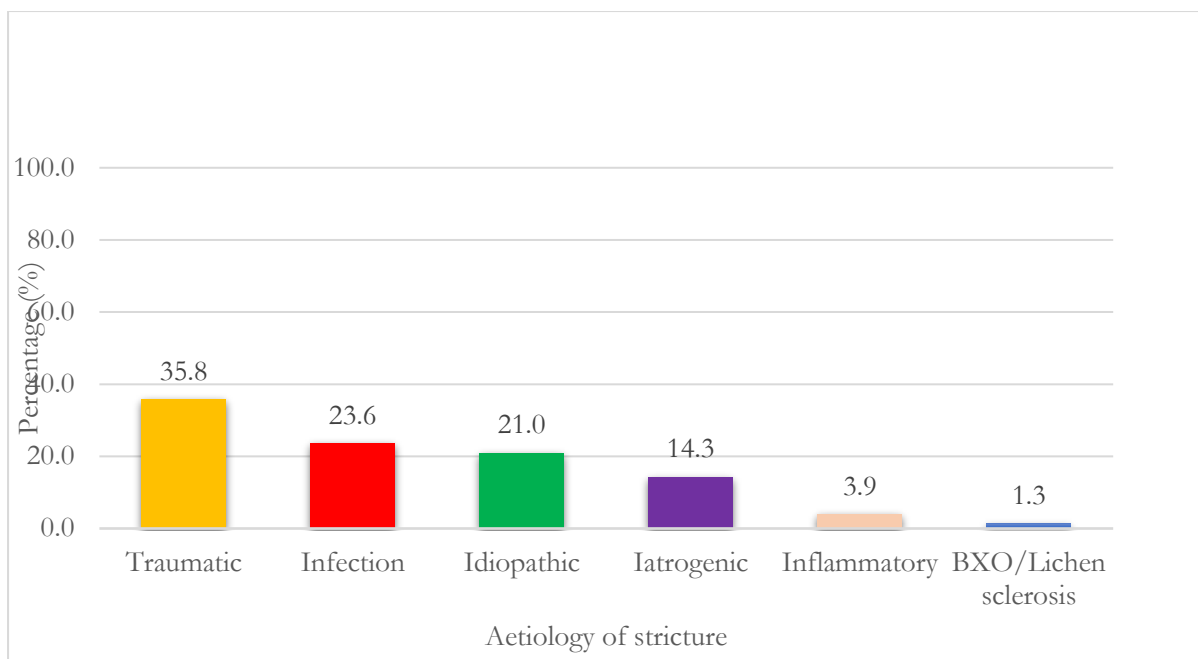


Figure 1: Stricture aetiology among patients presenting with anterior urethral stricture.

4.4 Stricture Site Among Patients Presenting with Anterior Urethral Stricture

The findings established that 29.6% (n =114) of the patients had strictures located in the penile, and 28.6% (n =110) of patients had strictures located in the proximal bulbar region. Other stricture sites included mid bulbar 27.3% (n =105) and distal bulbar 22.1% (n =85). Of the anterior urethral stricture, bulbar urethral stricture was the highest stricture site as shown in Table 3. Note that a patient may have stricture at multiple sites.

Table 3: Stricture sites amongst patients presenting with anterior urethral stricture

Stricture site	Frequency	Per cent
Meatal stenosis	23	6.0
Penile	114	29.6
Proximal	110	28.6
Mid bulbar	105	27.3
Distal bulbar	85	22.1
Bulbar membranous	75	19.5

4.5 Length of the Stricture Among Patients Presenting with Anterior Urethral Stricture

Stricture length of 1-2 cm was seen in the majority of the patients at 56.3% (n =217) while those of less than 1 cm was 21.8% (n =84) as shown in Table 4, Figure 2

Table 4:Length of the stricture among patients presenting with anterior urethral stricture.

Length of stricture	Frequency	Per cent
<1cm	84	21.8
1 - 2 cm	217	56.3
3 - 4 cm	43	11.2
>4cm	19	4.9
Pan urethral stricture	22	5.7

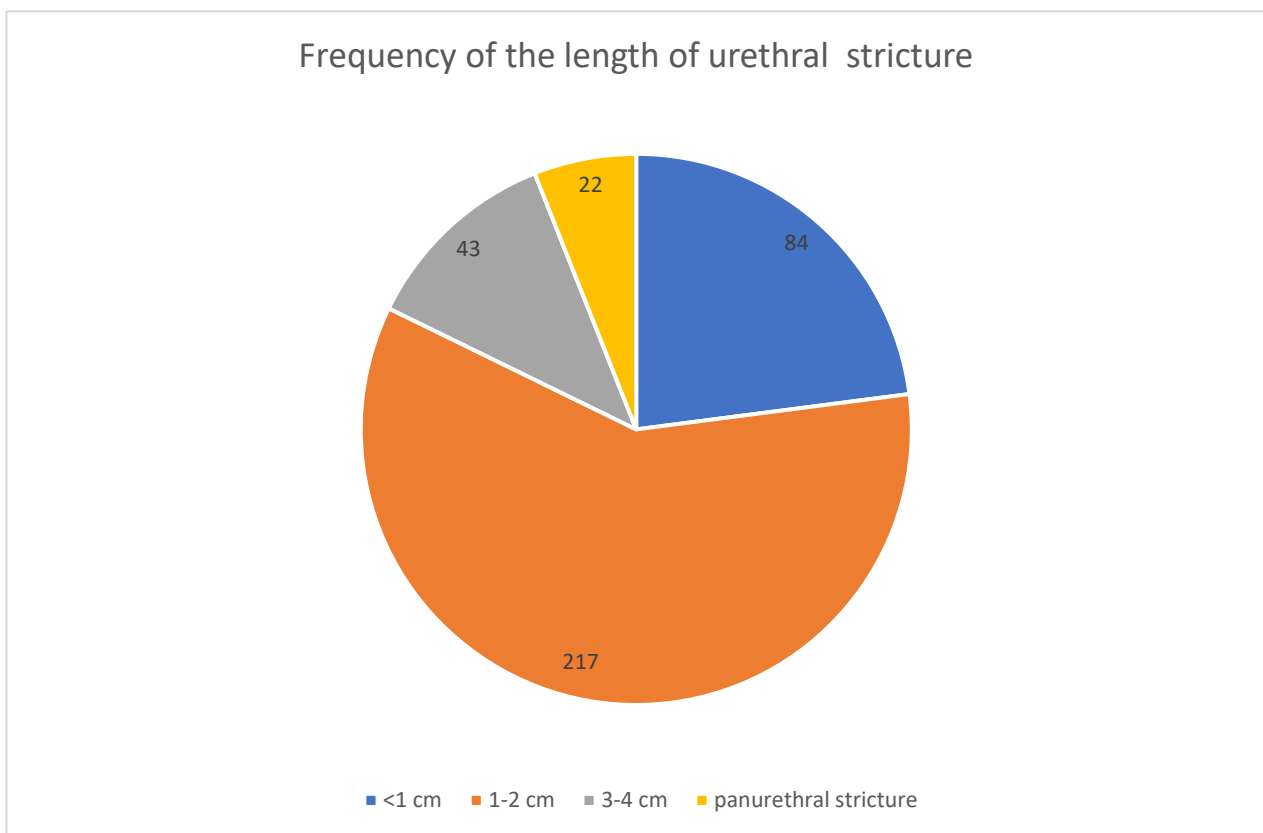


Figure 2:Frequency of the length of urethral stricture

4.6 Associating the Signs and Symptoms of Anterior Urethral Stricture Disease to Sites, Aetiologies, and Length of the Stricture

4.6.1 Associating the Signs and Symptoms of Anterior Urethral Stricture Disease to Aetiology

In associating the signs/symptoms of anterior urethral stricture disease to aetiology, among patients who had the disease due to post-infection, most of them presented with obstructive/voiding symptoms excluding UR 38.5% (n =35), urinary retention 18.7% (n =17) and fistula and incontinence symptoms 8.8% (n =8). In the inflammatory aetiology group, 73.3% (n =13) of them presented with obstructive/voiding symptoms inclusive of UR. Of this number (73.3%), urinary retention accounted for 13.3% (n =2). Amongst those with traumatic aetiology, most of them 37% (n =51) presented with urinary retention. In the iatrogenic stricture aetiology group, 58% (n =47) presented with obstructive/voiding symptoms as shown in Table 5. below

Table 5: Associating signs and symptoms with Aetiology of stricture

Complaints	Infection (n =91)	Inflammatory (n =15)	Traumatic (n =138)	Iatrogenic (n =55)	Idiopathic (n =81)	Lichen sclerosis (n =5)
Obstructive/voiding symptom	35(38.5)	9(60.0)	50(36.2)	29(52.7)	47(58.0)	2(40.0)
Storage/irritating symptoms	5(5.5)	0	4(2.9)	4(7.3)	6(7.4)	0
Post micturition symptoms	3(3.3)	0	3(2.2)	0	7(8.6)	0
Sexual dysfunctional symptoms	4(4.4)	0	2(1.4)	1(1.8)	1(1.2)	0
Urinary retention	17(18.7)	2(13.3)	51(37.0)	8(14.5)	8(9.9)	2(40)
Fistula and incontinence symptoms	8(8.8)	0	13(9.4)	6(10.9)	1(1.2)	0
Pain related symptoms	19(20.9)	4(26.7)	15(10.9)	7(12.7)	11(13.6)	1(20)

4.6.2 Association Between Categorical Signs/Symptoms and Aetiology of Stricture

The data showed that patients with UR were 3.3 times more likely to have traumatic aetiology, (OR=3.33, 95%CI:2.04 – 5.44, **p<0.001**) and 69% less likely to be associated with idiopathic aetiology (OR =0.31, 95%CI:0.14 – 0.67, **p=0.002**). Idiopathic aetiology was highly associated with obstructive symptoms in the absence of UR (OR=1.98, 95%CI:1.20 – 3.25, **p=0.008**). Patients who presented with obstructive/voiding symptoms exclusive of UR were 0.42 times less likely to have traumatic aetiology, (OR =0.58, 95%CI:0.28 – 0.89, **p=0.014**).

Table 6: Association between signs/symptoms and aetiology of stricture

aetiology	Obstructive/voiding symptoms		OR (95%CI)	P-value
	Yes n (%)	No n (%)		
Infection	35(20.3)	56(12.2)	0.72(0.44 - 1.16)	0.186
Inflammatory	11(6.4)	9(4.2)	1.55(0.63 - 3.83)	0.364
Traumatic	50(29.1)	88(41.3)	0.58(0.28 - 0.89)	0.014
Iatrogenic	29(16.9)	26(12.2)	1.46(0.82 - 2.59)	0.241
Idiopathic	47(27.3)	34(15.9)	1.98(1.20 - 3.25)	0.008
Storage/irritating symptoms				
aetiology	Yes n (%)	No n (%)		
Infection	5(26)	86(23.5)	1.16(0.41 - 3.32)	0.784
Inflammatory	0	20(5.5)		
Traumatic	4(21.1)	134(36.6)	0.46(0.15 - 1.42)	0.222
Iatrogenic	4(21.1)	51(13.9)	1.65(0.53 - 5.16)	0.33
Idiopathic	6(31.6)	75(20.5)	1.79(0.66 - 4.87)	0.252
Urinary retention				
aetiology	Yes n (%)	No n (%)		
Infection	17(19.3)	74(23.9)	0.72(0.40 - 1.30)	0.319
Inflammatory	4(4.5)	16(5.4)	0.84(0.27 - 2.57)	0.503
Traumatic	51(58)	87(29.3)	3.33(2.04 - 5.44)	<0.001
Iatrogenic	8(9.1)	47(15.8)	0.53(0.24 - 1.17)	0.122
Idiopathic	8(99.1)	73(24.6)	0.31(0.14 - 0.67)	0.002
Pain related symptoms				
aetiology	Yes, n (%)	No, n (%)		
Infection	19(33.3)	72(22.0)	1.78(0.97 - 3.27)	0.066
Inflammatory	5(8.8)	15(4.6)	2.01(0.70 - 5.76)	0.195
Traumatic	15(26.3)	123(37.5)	0.60(0.32 - 1.12)	0.134
Iatrogenic	7(12.3)	48(14.6)	0.82(0.35 - 1.91)	0.837
Idiopathic	11(19.2)	70(21.3)	0.88(0.43 - 1.79)	0.861

4.6.3 Associating the Signs and Symptoms of Anterior Urethral Stricture Disease to the Length of the Stricture

Among patients who had stricture length less than < 1cm, the commonest presenting signs and symptoms included obstructive/voiding at 45.2% (n =38). Patients with stricture length of 1 – 2cm presented with obstructive/voiding symptoms and urinary retention 47% (n =102) and 24.4% (n =53) respectively. Furthermore, obstructive/voiding symptoms 44.2% (n =19), urinary retention 27.9% (n =12) and other symptoms 23.3% (n =10) were common presenting symptoms among those who had a length of structure of 3 – 4cm. Data analysis revealed that obstructive/ voiding symptoms and urinary retention were the major symptoms in strictures more than 4cm and pan-urethral strictures as shown in Table 7. Voiding symptoms inclusive of UR were seen in all stricture patients irrespective of the length of the stricture.

Table 7: Associating the signs and symptoms of Anterior Urethral Stricture Disease to a length of stricture.

Complaints	Length structure				
	<1cm (n =84)	1 - 2 cm (n =217)	3 - 4 cm (n =43)	>4cm (n =19)	Pan urethral stricture (n =22)
Obstructive/voiding symptom	38(45.2)	102(47.0)	19(44.2)	8(42.1)	5(22.7)
Storage/irritating symptoms	7(8.3)	11(5.1)	0	1(5.3)	0
Post micturition symptoms	4(4.8)	7(3.2)	0	1(5.3)	1(4.5)
Sexual dysfunctional symptoms	0	5(2.3)	1(2.3)	2(10.5)	0
Urinary retention	13(15.5)	53(24.4)	12(27.9)	4(21.1)	6(27.3)
Fistula and incontinence symptoms	5(6.0)	18(8.3)	1(2.3)	1(5.3)	3(13.6)
Pain related symptoms	17(20.2)	21(9.7)	10(23.3)	2(10.5)	7(31.8)

4.6.4 Association Between Categorical Signs/Symptoms and Length of The Stricture

The findings from the analysis revealed that those who presented with pain-related symptoms were two times more likely to have stricture length of more than 2 cm (OR =2.01, 95% CI:1.10 – 3.74, p =0.024). There was significant association between the urethral stricture length and pain related symptoms with a p value less than **0.05**. The longer the length of stricture, the greater the association with pain related symptoms.

The association of stricture length to four main symptomatic categorical data (pain related symptoms, obstructive symptoms, storage and urinary retention) were assessed. Urinary retention is part of the obstructive symptoms, but this paper separated it from the other obstructive/ voiding symptoms to assess patient with complete obliterative stricture presenting in urinary retention.

4.6.5 Associating the Signs and Symptoms of Anterior Urethral Stricture Disease to Stricture Sites

Patients who had meatal stenosis as the site of strictures, presented obstructive/voiding symptoms 73.9% (n =17) and storage/irritating symptoms 8.7% (n =2). Among those who had the penile as the site of stricture, half of the patients 50.9% (n =58) presented with obstructive/voiding symptoms. Patients who had a stricture in the distal bulbar mainly presented with combine obstructive/voiding symptoms, 36.5% (n =31) and urinary retention at 20% (n =17).

Further analysis showed that obstructive/voiding symptoms, 43.8% (n =46) and urinary retention, 26.7% (n =28) were common signs and symptoms in patients who had a stricture in the mid-bulbar. Among those who had stricture in proximal, most of them presented with obstructive/voiding symptoms 38.2% (n=42), and urinary retention 32.7% (n =36). The patients who had urethral fistula presented with obstructive/voiding symptoms 50% (n =1) and pain-related signs/symptoms 50% (n =1) as shown in Table 8.

Table 8:Associating the signs and symptoms of Anterior Urethral Stricture Disease to Stricture sites.

Complaints	Meatal stenosis (n =23)	Penile (n =114)	Distal bulbar (n =85)	Mid bulbar (n =105)	Proximal (n =110)	Bulbar membrane (n =75)
Obstructive/voiding symptom	17(73.9)	58(50.9)	31(36.5)	46(43.8)	42(38.2)	30(40)
Storage/irritating symptoms	2(8.7)	3(2.6)	6(7.1)	2(1.9)	6(5.5)	5(6.7)
Post micturition symptoms	0	1(0.9)	3(3.5)	5(4.8)	4(3.6)	3(4.0)
Sexual dysfunctional symptoms	0	2(1.8)	3(3.5)	2(1.9)	2(1.8)	1(1.3)
Urinary retention	0	13(11.4)	17(20)	28(26.7)	36(32.7)	25(33.3)
Fistula and incontinence symptoms	1(4.3)	12(10.5)	5(5.9)	7(6.7)	5(4.5)	3(4.0)
Pain related symptoms	3(13.0)	25(21.9)	20(23.5)	15(14.3)	15(13.6)	8(10.7)

4.6.6 Association Between Categorical Signs and Symptoms and Stricture Site

The results showed that patients who presented with obstructive/ voiding symptoms were 1.8 times more likely to have a stricture in the penile (OR =1.84, 95%CI:1.20 – 2.81, p =0.005) and 40% less likely to have a stricture in the bulbar (OR = 0.60, 95%CI: 0.39 – 0.90, P=0.019). Those who presented with urinary retention were 1.84 times more likely to have stricture in bulbar (OR =1.84, 95%CI:1.08 – 3.12, p=0.024) and two times more likely in bulbo-membrane (OR =1.96, 95%CI:1.13 – 3.41, p=0.017). UR was 75% less likely in penile strictures (OR =0.25, 95%CI:0.13 – 0.48, **p<0.001**).

Table 9: Association between categorical signs and symptoms and stricture site

Stricture site	Obstructive			
	Yes, n (%)	No, n (%)	OR(95%CI)	P-value
Penile	73(54.5)	61(45.5)	1.84(1.20 - 2.81)	0.005
Bulbar	98(40.0)	147(60.0)	0.60(0.39 - 0.90)	0.019
Bulbar Membranous	30(40.0)	45(60)	1.27(0.76 - 2.12)	0.389
Storage				
Stricture site	Yes, n(%)	No, n (%)		
Penile	5(3.7)	129(96.3)	0.66(0.23 - 1.86)	0.622
Bulbar	14(5.7)	231(94.3)	1.64(0.58 - 4.64)	0.466
Bulbar Membranous	5(6.7)	70(93.3)	0.66(0.23 - 1.89)	0.389
Urinary retention				
Stricture site	Yes, n (%)	No, n (%)		
Penile	13(9.7)	121(90.3)	0.25(0.13 - 0.48)	<0.001
Bulbar	65(26.5)	180(73.5)	1.84(1.08 - 3.12)	0.024
Bulbar Membranous	25(33.3)	50(66.7)	1.96(1.13 - 3.41)	0.017
Pain related symptoms				
Stricture site	Yes, n (%)	No, n (%)		
Penile	27(20.1)	107(79.9)	1.86(1.05 - 3.28)	0.035
Bulbar	40(16.3)	205(83.7)	1.41(0.77 - 2.60)	0.299
Bulbar Membranous	8(10.7)	67(89.3)	1.57(0.71 - 3.48)	0.364

The data captured in table 8 clearly showed that obstructive/voiding symptoms were the most predominant. Table 9 is an extract of table 8 in which key symptoms are highlighted. Table 9 uses the Binary logistic regression to determine the degree of association for individual sites of stricture to the presenting symptoms. To illustrate this point, pain related symptoms showed a strong association to stricture located in the penile region. Patients who presented with pain-related symptoms were 1.9 times more likely to have penile stricture (OR =1.86, 95%CI:1.05 – 3.28, **p =0.035**) as shown in Table 9.

5.0 CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

A total of 520 files were allocated from the KNH database during the study period. 490 files were found but 30 files could not be traced. Of the 490 files, files with missing data were excluded from the data collection process based on the exclusion criteria. 385 patients met the inclusion criteria via a consecutive sampling method. The retrieval ended when the desired sample size was reached. The mean age was 46.8 years which concords with the mean age of 48.9, 42.1 and 41 years as reported by Keith et al., Nuss et al. and Otele et al. respectively [3,1,4].

In line with evaluating the chief complaints, the three major symptoms (straining, urinary retention and weak stream) accounted for over half of the presenting symptoms. Straining was the main presenting symptom which is similar to data by Kamande et al. [20] but differs from Oguike et al. that reported poor stream [17].

Erectile dysfunction and ejaculatory disorder jointly formed 1.1% of the reported symptoms which is slightly lower than what is reported in other papers [1]. The percentage of fistula-related symptoms (urethra-cutaneous fistula, watering can perineum) accounted for 5.2% which differs from previous findings in the 1980s. Osoba and colleague reported that watering can perineum accounted for 37.5%. The reduction in fistulation and watering can-perineum may be attributable to an improved early health-seeking behaviour coupled with the availability of antibiotics to treat urethritis [6].

The common stricture aetiology was traumatic stricture (35%) and 56.9% of the patients reside in urban areas which correlates with previous findings that trauma is the leading aetiology of AUSD in urban settings. The paper by Otele et al (2020) looked holistically at all strictures, AUSD and posterior urethral stenosis/contractures which may account for the high trauma aetiology of 60% [4] compared to the finding of 35% in our study. Lichen sclerosis as a cause of urethral stricture stands at 1.3% which aligns with findings from a study done by Otele et al [4].

The bulbar urethral stricture was the most common site of stricture, and this is in line with local and international findings [4, 20, 35]. In our setting, 78.1% of the stricture lengths were less than or equal to 2 cm which is in synergy with the local data reported by Osoro [2], The data from the United States of America by Nuss et al. (2012) reported that the predominant stricture length was greater than 4cm which differ from our findings [1].

There is a paucity of data on the association between the presenting signs/symptoms and the stricture aetiology, site and length of the urethral stricture. Subjects with penile stricture presented with urinary spraying in 47.8% which was similar to the article by Nuss et al. In their article, Nuss and colleagues reported that stream spraying was the highest in patients with penile stricture accounting for 17% [1]. In patients with Inflammatory strictures, weak stream and straining accounted for 26.7% and 26.7% respectively. Post-infection stricture presented mainly with straining at 18.7% plus urinary retention (18.7%). The trauma-associated stricture was noted to have the highest recording of urinary retention and urethra-cutaneous fistula. Urinary straining (29.6%) was associated with iatrogenic stricture.

Traumatic stricture patients were 3.3 times more likely to present with urinary retention in the exclusivity of other obstructive symptoms (OR=3.33, 95%CI:2.04 – 5.44, **p<0.001**) but half the time presented with obstructive/voiding symptoms (excluding AUR). The findings were statistically significant (OR =0.58, 95%CI:0.28 – 0.89, **p=0.014**). Urinary retention was 69% less likely seen in the idiopathic group (OR =0.31, 95%CI:0.14 – 0.67, **p=0.002**). In essence, urinary retention was the hallmark of most patients with traumatic stricture while idiopathic aetiology was two times more likely to present with obstructive or voiding symptoms excluding UR. (OR=1.98, 95%CI:1.20 – 3.25, **p=0.008**).

These findings demonstrate that traumatic stricture has a greater likelihood to develop urinary retention in the background of its association with extensive spongio-fibrosis while idiopathic aetiology is usually not completely obliterative. The proposed explanation of Idiopathic stricture not frequently presenting with urinary retention but other non-obliterative voiding symptoms is due to the limited degree of spongio-fibrosis in idiopathic as elucidated in a paper by Bugeja et al. (2015) [36].

Obstructive symptoms and UR were the predominant findings in bulbar urethral stricture [1,3]. Drawing a line of dichotomy amongst the three segments of the bulbar urethra (proximal, mid and distal bulbar urethra), urinary retention occurred in 32.7%, 15.3% and 15.3% respectively but the highest value was seen in the proximal bulbar group. The likely explanation for the high occurrence of urinary retention in the proximal bulbar group may be explained by the mechanism of traumatic or iatrogenic injury to that site. There is a need to further investigate this occurrence in a future prospective study.

The component of Signs/Symptoms in association with the length of the stricture established that a stricture length greater than 3 cm presented with UR and urinary straining. Obstructive symptoms (straining) 23.8%, were reported in less than 1cm stricture while pan-urethral stricture had the highest urinary retention rate of 27.3%. Significantly was that patients with

pain-related signs/symptoms were two times more likely to have a stricture length of more than 2 cm (OR =2.01, 95%CI:1.10 – 3.74, **p =0.024**). This association may indicate that the greater the length of the stricture, the higher likelihood of pain-related symptoms which was statistically significant. Currently, no article has looked at the length of stricture and its association with pain-related symptoms. The plausible explanation may indicate that the longer the stricture, the greater the surface area involving neural tissues.

In evaluating the association between the site of the stricture to symptoms, penile urethral stricture has 1.8 times more likely to present with obstructive symptomatology (OR=1.84, 95% CI: 1.20-2.81, **P=0.005**) while bulbar is only 0.6 times likely to present with obstructive or voiding symptoms (OR = 0.60, 95%CI: 0.39 – 0.90, **P=0.019**).

Notably, there was no degree of statistically significant association between the site and storage symptoms according to our findings. Inference can be made that the storage symptoms are predominantly bladder irritative symptoms and not significantly related to AUS.

Patients with penile urethral stricture had a 0.25 times likelihood of presenting with urinary retention but in bulbo-membranous stricture, there is almost a 2 times likelihood of urinary retention (OR: 1.96, 95% CI: 1.13 - 3.41, **P value of 0.017**). From this data, we observed that the proximal the stricture, the greater likelihood of urinary retention.

Another intriguing finding from this research was that patients diagnosed with penile urethral stricture had 1.86 times more likelihood of presenting with pain-related symptomatology which was statistically significant (OR: 1.86, 95% CI: 1.05 - 3.28, **P=0.035**).

Accounting for urinary tract infection as a possible confounder was unachievable due the fact that a negative urine microscopic culture and sensitivity was a requirement preoperatively for all patients due for theatre.

5.2 Conclusion

The clincher is that most of the subjects were unemployed married male adults with a mean age of 46.8 years presenting with obstructive symptoms residing in urban communities. AUR was the predominant symptom in traumatic stricture. This study captured 18 symptoms (chief complaints) presented by patients. Traumatic stricture is still the leading cause of AUS in the KNH. The record interrogated demonstrated that the stricture length of less than 2 cm was most predominant. Penile stricture presented mainly with spraying stream while bulbar urethral stricture presented with straining and urinary retention. Urinary retention was seen mainly in the proximal bulbar urethral stricture group. Post Infection and other inflammatory strictures presented with weak stream and straining on urination. The longer the length of the stricture,

the greater the obstruction. Stricture length greater than 2 cm and penile urethral stricture mainly presented with pain-related symptoms. Traumatic stricture presented with urinary retention while idiopathic stricture presented with voiding symptoms. Sexual-related dysfunctional complaints were reported by patients during the index visit. Meticulous documentation of presenting signs and symptoms must be done to optimize treatment outcomes.

5.3 Recommendations

There is a need to develop a pre-surgical comprehensive screening tool to capture the various symptoms reported by patients with AUSD. A prospective study on the association between the pain-related symptoms of penile stricture to stricture length greater than 2 cm be investigated. Public health action on road safety is key to reducing the rate of traumatic stricture in our set up.

5.4 Limitation

The retrospective nature of the study may have led to recall bias and it's an inferior level of evidence compared to a prospective study.

The files did not have data on patients with concomitant benign prostatic enlargement which may it difficult to account for the confounders in this study.

REFERENCES

- [1] G. R. Nuss, et al, "Presenting Symptoms of Anterior Urethral Stricture Disease: A Disease-Specific, Patient Reported Questionnaire to Measure Outcomes," *Journal of Urology*, vol. 187, no. 2, pp. 559–562, Feb. 2012, doi: 10.1016/j.juro.2011.10.043.
- [2] Osoro J "The short-term success of direct vision internal urethrotomy (dviu) in the management of anterior male urethral strictures," p. 60. 2014
- [3] K. Rourke and J. Hickie, "The Clinical Spectrum of the Presenting Signs and Symptoms of Anterior Urethral Stricture: Detailed Analysis of a Single Institutional Cohort," *Urology*, vol. 79, no. 5, pp. 1163–1167, May 2012, doi: 10.1016/j.urology.2012.01.044.
- [4] Otele et al, "Efficacy of revision urethroplasty in the treatment of recurrent urethral strictures at a tertiary hospital (Kenya National Hospital–KNH), in Nairobi Kenya: 2015-2018," *Bali Med J.*, vol. 9, no. 1, p. 67, Apr. 2020, doi: 10.15562/bmj.v9i1.1675.
- [5] D. M. Stein et al., "A geographic analysis of male urethral stricture aetiology and location: Male urethral stricture aetiology and location," *BJU Int*, vol. 112, no. 6, pp. 830–834, Oct. 2013, doi: 10.1111/j.1464-410X.2012.11600. x.
- [6] J. A. Adwok , "Stricture of The Urethra. The Disease as Seen at The Kenya National Hospital Over a One Year Period, 1982 - 1983.7," p. 71.
- [7] Mugalo et al. "Etiology of urethral stricture at MOI Teaching and referral hoapital.pdf.", 2013
- [8] M. L. Gallentine and A. F. Morey, "Imaging of the male urethra for stricture disease," *Urologic Clinics of North America*, vol. 29, no. 2, pp. 361–372, May 2002, doi: 10.1016/S0094-0143(02)00028-9.
- [9] A. Ahidjo et al., "Evaluation of Radiographic Pattern of Male Urethral Strictures in Nigeria: A Preliminary Report of a Proposed New Scoring System for Developing Countries," *Iran J Radiol*, vol. 9, no. 1, pp. 60–62, Mar. 2012, doi: 10.5812/iranjradiol.6357.
- [10] F. Schreiter and G. H. Jordan, Eds., *Urethral reconstructive surgery: DVD with surgery video clips enclosed*. Heidelberg: Springer, 2006.
- [11] H. Wessells et al., "Male Urethral Stricture: American Urological Association Guideline," *Journal of Urology*, vol. 197, no. 1, pp. 182–190, Jan. 2017, doi: 10.1016/j.juro.2016.07.087.

- [12] H. L. Attwater, "THE HISTORY OF URETHRAL STRICTURE*," *British Journal of Urology*, vol. 15, no. 2, pp. 39–51, Jun. 1943, doi: 10.1111/j.1464-410X.1943.tb10503.x.
- [13] Awajimijan Mbaba et al Patterns of urethral stricture Disease in adult males referred fro retrograde urethrography in Port Harcourt metropolis Rivers State, Nigeria," *IJBPAS*, vol. 8, no. 8, Aug. 2019, doi: 10.31032/IJBPAS/2019/8.8.4781.
- [14] A. Alwaal, S. D. Blaschko, J. W. McAninch, and B. N. Breyer, "Epidemiology of urethral strictures," *Translational Andrology and Urology*, vol. 3, no. 2, p. 5, 2014.
- [15] A. O. Osoba and O. Alausa, "Gonococcal urethral stricture and watering-can perineum.," *Sexually Transmitted Infections*, vol. 52, no. 6, pp. 387–393, Dec. 1976, doi: 10.1136/sti.52.6.387.
- [16] Nwofor et al., Nigeria Urethral stricture management experience at Nnewi, south East Nigeria, Volume 10, November 2. 2004
- [17] T. Oguike, et al., "The Changing Pattern of Urethral Stricture Disease in Midwestern Nigeria," *Journal of Medicine and Biomedical Research*, vol. 5, no. 2, Mar. 2009, doi: 10.4314/jmbr.v5i2.10691.
- [18] A. S. Fenton et al., "Anterior urethral strictures: Etiology and characteristics," *Urology*, vol. 65, no. 6, pp. 1055–1058, Jun. 2005, doi: 10.1016/j.urology.2004.12.018.
- [19] B. Fall et al., "Etiology and current clinical characteristics of male urethral stricture disease: experience from a public teaching hospital in Senegal," *Int Urol Nephrol*, vol. 43, no. 4, pp. 969–974, Dec. 2011, doi: 10.1007/s11255-011-9940-y.
- [20] K. Lawrence, "A review on management procedures for urethral stricture disease at Kenyatta National Hospital," p. 71.
- [21] Q. U. Intasab, "The Radiological pattern of Male Urethral strictures in Nairobi," p. 58.
- [22] O. N. Ekeke and O. E. Amusan, "Clinical presentation and treatment of urethral stricture: Experience from a tertiary hospital in Port Harcourt, Nigeria," *African Journal of Urology*, vol. 23, no. 1, pp. 72–77, Mar. 2017, doi: 10.1016/j.afju.2016.06.003.
- [23] E. Irekpita, "A 10-year review of urethral stricture management in Irrua, Nigeria," *Niger J Surg*, vol. 23, no. 2, p. 119, 2017, doi: 10.4103/njs.NJS_50_16.
- [24] C. A. Tam et al., "The International Prostate Symptom Score (IPSS) Is an Inadequate Tool to Screen for Urethral Stricture Recurrence After Anterior Urethroplasty," *Urology*, vol. 95, pp. 197–201, Sep. 2016, doi: 10.1016/j.urology.2016.04.006.

- [25] A. Alwaal et al. “Urethral Stricture Score is Associated with Anterior Urethroplasty Complexity and Outcome,” *Journal of Urology*, vol. 195, no. 6, pp. 1817–1821, Jun. 2016, doi: 10.1016/j.juro.2015.12.100.
- [26] C. Maciejewski and K. Rourke, “Imaging of urethral stricture disease,” *Translational Andrology and Urology*, vol. 4, no. 1, p. 8, 2015.
- [27] A. Kawashima et al. “Imaging of Urethral Disease: A Pictorial Review,” *RadioGraphics*, vol. 24, no. suppl_1, pp. S195–S216, Oct. 2004, doi: 10.1148/rg.24si045504.
- [28] K. W. Angermeier et al. “SIU/ICUD Consultation on Urethral Strictures: Evaluation and Follow-up,” *Urology*, vol. 83, no. 3, pp. S8–S17, Mar. 2014, doi: 10.1016/j.urology.2013.09.011.
- [29] A. F. Morey and J. W. McAninch, “Ultrasound evaluation of the male urethra for assessment of urethral stricture,” p. 7.
- [30] D. J. Sung et al., "Obliterative Urethral Stricture: M.R. Urethrography versus Conventional Retrograde Urethrography with Voiding Cystourethrography," *Radiology*, vol. 240, no. 3, pp. 842–848, Sep. 2006, doi: 10.1148/radiol.2403050590.
- [31] V. K. Murugesan and P. Balasubramanian, “Role of Magnetic Resonance Urethrography in Evaluation of Male Urethral Stricture Against Conventional Retrograde Urethrography,” *JCDR*, 2018, doi: 10.7860/JCDR/2018/26988.11648.
- [32] D. E. Andrich and A. R. Mundy, “What is the Best Technique for Urethroplasty?,” *European Urology*, vol. 54, no. 5, pp. 1031–1041, Nov. 2008, doi: 10.1016/j.eururo.2008.07.052.
- [33] C. F. Heyns, J. W. Steenkamp, M. L. S. De Kock, and P. Whitaker, “TREATMENT OF MALE URETHRAL STRICTURES: IS REPEATED DILATION OR INTERNAL URETHROTOMY USEFUL?,” *Journal of Urology*, vol. 160, no. 2, pp. 356–358, Aug. 1998, doi: 10.1016/S0022-5347(01)62894-5.
- [34] A F Morey et al. AMERICAN Urological Association symptom index in the assessment of urethroplasty OUTCOMES, 1998
- [35] Simon Bugeja et al. Non-transecting Bulbar URETHROPLASTY, Published January 02, 2015

APPENDICES

Appendix I: Data Collection Tool

Data collection- “Clinical Patterns of Presenting S/S of anterior Urethral Disease at a Kenyan National Referral Hospital”

Biodata Unique Identification number: _____

Age: _____ Sex: _____

Address _____

Marital status:

Single

Married

Occupation: _____

Chief Complaint:

	C/C	Tick only one	
Weak stream		Dysuria	
Straining		Intermittent	
Incomplete emptying		urgency	
Spraying stream		haematuria	
frequency		Nocturia	
Hesitancy		Incontinence	
urinary retention		Water-cane P	
Post void dribbling		Pain	
dysuria		Failure of catheterization	
Asymptomatic		Fistula	
Urethral catheter		SPC	
ED		Ejaculatory disorder	

Stricture Site and Length

Stricture site	TICK	Stricture length	Tick
Meatal stenosis		< 1cm	
Penile		1 cm	
Distal bulbar		2 cm	
Mid Bulbar		3	
Proximal Bulbar		=/>4	
Bulbo-membranous		Pan-urethral stricture	

Aetiology

Kindly Tick	
Infection	
Idiopathic	
Traumatic	
Iatrogenic	
BXO/Lichen Sclerosis	
Other Inflammatory conditions	

Appendix II: KNH/UoN-ERC Letter of Approval



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Ref: KNH-ERC/A/341

14th September, 2022

Dr. Lavela B. Kortimai Jr.
Reg. No. H58/11783/2018
Dept. of Surgery
Faculty of Health Sciences
University of Nairobi

Dear Dr. Kortimai Jr.,

RESEARCH PROPOSAL: THE CLINICAL PATTERNS OF PRESENTING SIGNS AND SYMPTOMS OF ANTERIOR URETHRAL STRICTURE DISEASE AT A KENYAN NATIONAL REFERRAL HOSPITAL (P410/05/2022)

This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is **P410/05/2022**. The approval period is 14th September 2022 – 13th September 2023.

This approval is subject to compliance with the following requirements;

- i. Only approved documents including (informed consents, study instruments, MTA) will be used.
- ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by KNH-UoN ERC.
- iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KNH-UoN ERC 72 hours of notification.
- iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH-UoN ERC within 72 hours.
- v. Clearance for export of biological specimens must be obtained from relevant institutions.
- vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- vii. Submission of an executive summary report within 90 days upon completion of the study to KNH-UoN ERC.

Protect to discover

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) <https://research-portal.nacosti.go.ke> and also obtain other clearances needed.

Yours sincerely,



DR. BEATRICE K.M. AMUGUNE
SECRETARY, KNH-UoN ERC

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The Senior Director, CS, KNH
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Appendix III: Certificate of Plagiarism

THE CLINICAL PATTERNS OF PRESENTING SIGNS AND SYMPTOMS OF ANTERIOR URETHRAL STRICTURE DISEASE AT A KENYAN NATIONAL REFERRAL HOSPITAL

ORIGINALITY REPORT

7 %	4 %	5 %	1 %
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	"Advanced Male Urethral and Genital Reconstructive Surgery", Springer Nature, 2014 Publication	1 %
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