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Epidemiologic and Therapeutic Aspect of Urogenital Fistula Following Obstetric and Gynecologic Surgeries Repaired at the Nkwen Baptist Hospital

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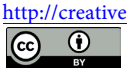

Abstract

Introduction: Urogenital fistula is an abnormal communication between the urinary and the genital systems. It may occur following vaginal deliveries or following pelvic surgeries. Data concerning urogenital fistula post-surgery is limited and we have noticed in recent years in Sub-Saharan Africa, an increase in the burden of iatrogenic urogenital fistula. **Objective:** The aim of this study was to assess the epidemiology, clinical profiles and therapeutic aspects of urogenital fistula following obstetric and gynaecologic surgeries repaired at the Nkwen Baptist Hospital Bamenda. **Materials/Methods:** This was a longitudinal descriptive study with a retrospective and prospective phase carried out at the Nkwen Baptist Hospital for 5 months. However the complete duration of the study was about 17 months. Data was collected using a pretested questionnaire containing socio-demographic information, clinical features, and therapeutic methods used. We used the statistical software SPSS (Social Package for Statistical Sciences) V 26.0 for data analysis. **Results:** The number of participants in the study was 40. The mean age was 43.5 years (+/−13.3) ranging from 16 - 74 years. The prevalence of urogenital fistula post obstetric and gynecologic surgeries at the Nkwen Baptist hospital was 64.6%. The most common symptom was urine leakage and the most common surgery that exposed the patient to the urogenital fistula was total abdominal hysterectomy (60%) followed by caesarean section (35%). The different indications for these surgeries were mostly symptomatic leiomyoma (70.8 %) and prolonged labor (64.2%) respectively. The different types of fistula encountered were Vesicovaginal fistula (55%), Ureterovaginal fistula 40%

and Vesicoutetrine fistula 5%. The different treatment modalities used were trans abdominal (77.5%) and transvaginal repair (22.5%). The overall repair success rate after one month was 85%. **Conclusion:** There is high burden of urogenital fistula post surgeries in our setting. Having more specialists trained in obstetric and gynaecologic procedures may help in the prevention of such an event.

Keywords

Urogenital Fistula, Obstetric Surgery, Gynecologic Surgery

1. Introduction

1.1. Background

A urogenital fistula is an abnormal communication between the urinary and the genital system which results in leaking of urine [1]. It may occur as a complication of childbirth or as a result of surgical injury, malignancy, infection or trauma [2]. It has long been held as conventional wisdom that female urogenital fistulae in low-income and middle-income countries are almost exclusively of obstetric aetiology, related to prolonged obstructed labour, whereas those seen in high-income countries are largely iatrogenic in nature [2]. However, there is a growing perception amongst those working in the field that an increasing proportion of urogenital fistulae in low and middle-income countries may be iatrogenic, resulting from caesarean section [3]. A 2018 World Health Organization (WHO) report stated that "each year between 50,000 to 100,000 women worldwide are affected by urogenital fistula and more than 2 million young women are living with untreated urogenital fistula in Asia and Sub-Saharan Africa" [4]. A 12 years prospective study of almost 6000 cases of urogenital fistula in women in the sub Saharan Africa and Asia suggested that about 13% were iatrogenic, of which (80%) occurred following surgery for obstetric complications including caesarean section (57%), repair of ruptured uterus (20%), and hysterectomy for ruptured uterus or obstetric indications (3%), with the remainder occurring during gynaecologic surgery [2]. A study done in Yaoundé Cameroon by Tebeu *et al.* reported that genito-urinary fistula was encountered in 72.2% of all non-obstetrical fistula in the study population making it the most frequent form of genital fistula with an iatrogenic prevalence of 19.74% [5].

The major symptoms are leakage of urine through the vagina that can lead to infection, genital ulceration, pain, depression, isolation and social stigmatization [4].

The management of urogenital fistula depends on the type of fistula but is based on the principle of psychosocial support, conservative or surgical interventions and reinsertion into normal community life [6].

With this devastating medical and social condition, we intend to raise awareness on the burden of iatrogenic fistula in our context.

1.2. Problem Statement

Urogenital fistulas lead to devastating medical, social, and psychological problems; thus negatively impacting the lives of women living with them, especially in developing countries where they are victims of stigmatisation, shame and social segregation cause by the persistent offensive odour [7].

Despite its importance, we noticed that the cases are still largely neglected in the developing world, and the data regarding urogenital fistula after obstetric and gynaecologic surgeries are limited [7] [8]. These surgeries carry an inherent risk to the urogenital tract for reasons of proximity [9]. The long-term consequences of an undiagnosed injury to the bladder include fistula formation and altered urinary patterns. Specifically, most studies focus on only obstetric fistula cause by obstructed labour and not the iatrogenic causes [9]. More so, due to the public health issues, previous studies focused more on obstetric fistula that is due to delivery in absence of qualified and competent staff. Hence, little is known about iatrogenic urogenital fistula in Cameroon [10].

To the best of our knowledge there is paucity of data on urogenital fistula resulting from obstetrical and gynaecological surgeries in our setting.

1.3. Justification

Urogenital fistula is one of the most devastating complications that can result from labour or urogenital surgeries. Fistulas typically develop during prolonged, obstructed labour, but providers can also inadvertently cause a fistula when performing obstetric or gynaecological surgery [11]. Obstetric fistulas are particularly prevalent in parts of the world where emergency obstetric care is limited, nutrition is poor, and there is an early age of marriage. In Cameroon, however, it is more than 19,000 women who suffer from obstetric fistula, amongst which more of the patients are from the Far-North region of Cameroon mostly due to early marriages [12]. Previous studies in high-resource countries reported that a majority of iatrogenic fistula (83.2%) are caused by pelvic surgery or radiation therapy. In the industrialized world, the most common cause of urogenital fistula is injury to the bladder at the time of gynaecologic, urologic, or other pelvic surgery [13]. Most of the studies in our setting focused on obstetric fistulas [12] [14] [15] however, specialists of the field perceived a change of trend in developing countries, revealing an increasing proportion of iatrogenic fistula [4]. In 2014, a study conducted in Yaoundé Cameroon showed that the prevalence of non-obstetric genitourinary fistula represented 19.78% of urogenital fistula post surgeries accounting for 72.20% while non-obstetrical genito-digestive fistula represented 27.80% [10]. Giving the devastating medical, social, and psychological problems posed by urogenital fistulas, (that is the continual wetness, odour, and discomfort causing serious social problems), and the paucity of data concerning iatrogenic fistula, there is need to have a better knowledge of the actual burden of urogenital fistulas especially following surgery in developing countries as ours. This study will therefore help to bridge the existing knowledge gap in our setting, in a bid to raise awareness on the condition and forester the putting in

place and implementation of good preventive measures.

1.4. Research Questions

1) What is the prevalence of iatrogenic urogenital fistula among all women who presented with urogenital fistula in the Nkwen Baptist hospital?

2) What are the clinical and diagnostic modalities of patients with urogenital fistula following obstetric and gynaecologic surgeries?

3) What are the therapeutic options and outcome of iatrogenic urogenital fistula at Nkwen Baptist hospital?

1.5. Objectives

1.5.1. General Objective

To assess the epidemiological profiles, clinical features and therapeutic modalities of urogenital fistula following obstetric and gynaecologic surgeries repaired at the Nkwen Baptist Hospital.

1.5.2. Specific Objectives

To measure the prevalence of iatrogenic urogenital fistula cases among all women who presented with urogenital fistula at the Nkwen Baptist hospital.

To assess the clinical and diagnostic options of patients with urogenital fistula following obstetric and gynaecologic surgeries.

To identify the therapeutic options used in the management of iatrogenic urogenital fistula and their outcomes.

2. Materials and Methods

2.1. Study Design

This study was a hospital-based longitudinal descriptive study with a retrospective and a prospective phase.

2.2. Study Period

Thisstudy covered the period from January 2019 to May 2022.

2.3. Study Duration

The study lasted for 5 months study, from the 1st of February 2022 to July 2022.

2.4. Study Setting

The study was carried out at Nkwen Baptist Hospital, which is located in Bamenda II municipality. Bamenda is a city in the North West region of Cameroon and the capital of this region. The North West region has a population of about 2,278,503 people. The Nkwen Baptist Hospital receives patients from both the rural and urban areas in the region.

Nkwen Baptist Hospital is strategically located in the heart of health care provision in the capital city of the North-West Region of Cameroon.

The study was carried out precisely at the urology department of Nkwen Bap-

tist Hospital. NBH is a Faith-based multi-specialty Hospital classified as a secondary referral health facility in Bamenda town and is managed by the Cameroon Baptist Convention (CBC) health services. The Hospital provides comprehensive health care among which the following services standout: Urology, eye surgery, general surgery, orthopaedic surgery, Ear, Nose & Throat (ENT) surgery, Genecology, internal medicine and paediatrics. The health team in the urology department is made up of two urologists, three general practitioners and three urology surgical technicians. The hospital has 445 staff members; 135 nurses, 21 doctors among which 7 specialists (1 urologist, 1 orthopedist, 1 ophtalmologist, 2 internists, 1 paediatrician, 1 ENT surgeon); the hospital counts approximately 110 beds among which 49 beds in the surgical ward; the number of daily consultations per month is approximately 11,943 patients.

2.5. Population of Study

Target Population

It consisted of all patients with urogenital fistula at NBH during the period of interest.

Selection criteria

1) *Inclusion criteria*

Were included in this study:

- All women with urogenital fistula who consented to take part in the study.

2) *Exclusion criteria*

- Patients with non-iatrogenic fistula
- Fistulas that were not repaired

2.6. Sampling Method

Patients were recruited consecutively following the inclusion criteria.

2.7. Study Procedure

2.7.1. Administrative Approval

Administrative approval was sought from Faculty of Health Sciences of the University of Bamenda, the North West Regional Delegation of Public Health and the Director of the Nkwen Baptist Hospital Bamenda.

2.7.2. Selection of Participants

After obtaining the necessary ethical clearance and administrative approvals, we retrieved all files and records of patients that have been managed for urogenital fistula from January 2019 to May 2022 at the Nkwen Baptist hospital. We reviewed the files for our inclusion and exclusion criteria. Most of the patients were referred from different hospital facilities.

2.7.3. Data Collection

Extraction of data was done using pre-designed data collection sheets (questionnaires) with concealment of the participant identities and each of them was assigned a code. The questionnaire was designed and tested for reliability and

validity using AMOS SPSS by an expert in the field. Data on various variables was extracted. The participants recruited retrospectively were invited through a phone call for participation consent and evaluation of repair outcome and those that were recruited prospectively were invited to sign the consent form.

2.7.4. Study Variables

1) Socio-demographic parameters:

- Age: in years as recorded in the file at the moment of the consultation or by subtracting the year of birth to the year of the repair of the fistula.
- Occupation: will be classified as employed, not employed or retired.
- Marital status: married, single, divorced or widow.
- Region of origin: will be determined according to the 10 regions of Cameroon.
- Religion: will be classified as Muslim, Christian or animist.

2) Clinical parameters:

- Presenting complaint: the duration of symptoms was assessed before consultation (in days), then we collected all the patient's symptoms and signs as recorded in the files including: leakage of urine through the vagina, foul smelling discharges from the vagina, passing gas from urethra when urinating, urine incontinence, faecal incontinence, genital ulcer.
- Past surgical history: the patients' medical (HTN, DM, HIV) was assessed and surgical history as it was recorded in the file including caesarean section, hysterectomy, or any other pelvic surgery.
- Paraclinical investigations: The results were obtained from the exam result sheets including: the Dye (blue methylene) test, cystoscopy, retrograde pyelogram, fistulogram, flexible sigmoidoscopy, MRI, vaginal ultrasound or CT urogram.

3) Diagnostic aspect:

- The types of fistulas were registered as recorded in the file (low vesicovaginal fistula, high vesicovaginal fistula, Urethrovaginal fistula, ureterovaginal fistula, or rectovaginal fistula).

4) Therapeutic options:

- type of management were collected from the files (conservative or surgical: transvaginal repair, trans abdominal repair, laparoscopic repair, ureteral reimplantation, urethral reimplantation, cystoplasty, mitrofanoff, etc.).

5) Therapeutic options:

- Treatment outcomes: Part of it as assessed in the files, also through a telephone call and physical exam of patients that could come for follow up: post op complications, catheter duration, take back to OR, recurrent fistula and continence.

2.7.5. Data Management and Analysis

Data entry was done using CS pro 7.7 (Census and Survey Processing System) and analysed using the statistical software SPSS (Social Package for Statistical Sciences) V 26.0.

Categorical variables were presented using frequencies and percentages while continuous variables as mean and standard deviation.

2.7.6. Ethical Consideration

This study was carried out strictly for scientific publications and academic purposes. Ethical clearance was obtained from the Institutional Review Board of the University of Bamenda, while administrative authorization was obtained from Faculty of Health Sciences of the University of Bamenda, the Northwest Regional Delegation of Public Health and the Director of the Nkwen Baptist Hospital.

Participant's consents were sought after a brief explanation of the aim, risk and benefits of the study. Only consenting participants (written) were included in the study. Participants were not sanctioned when they chose not to participate in the study. Participants were interviewed individually. Each questionnaire was coded to ensure anonymity and kept privately. Participant names were kept in a diary accessible only to the investigator. All information derived from the study was used for research purposes only and not to generate any profit. The data collected were handled so as to maintain patient's confidentiality always by assigning each participant a code.

2.7.7. Differential Diagnosis

Postoperative or postpartum patients 1 to 2 weeks out from pelvic surgery or obstructed labor with a complaint of abnormal vaginal fluid leakage should be properly evaluated to determine the accyrate diagnosis, and the clinician should have a high index of suspicion for vesicovaginal fistula. The diagnosis is traditionally established utilizing clinical evaluation and tampon dye testing. A high creatinine level of the vaginal fluid can confirm the discharge is urine, but the clinician should be cautious in interpreting this as other types of urinary incontinence can also result in the urine collecting in the vagina. Office cystoscopy and imaging studies are also often utilized on the evaluation. The differential diagnosis of postoperative or postpartum abnormal vaginal fluid leakage includes infection, inflammation, malignancy, urgency or stress urinary incontinence, or other urogenital abnormalities.

3. Results

In this study, 65 patients with urogenital fistula were identified. Of the 65 patients, 42 had iatrogenic urogenital fistula following obstetric and gynecologic surgeries meanwhile 23 had non iatrogenic fistula and were excluded. The fistula was repaired in 40 of the 42 patients. These 40 patients all consented for inclusion in the study (**Figure 1**).

3.1. Sociodemographic Characteristics of the Patients

In this study, the mean age of the patients was 43.5 (+/−13.3) years and ranged from 16 to 74 years. The most common age group was 45 to 54 years (n = 15; 37.5%). Majority of the patients were married (n = 25; 62.5%), unemployed

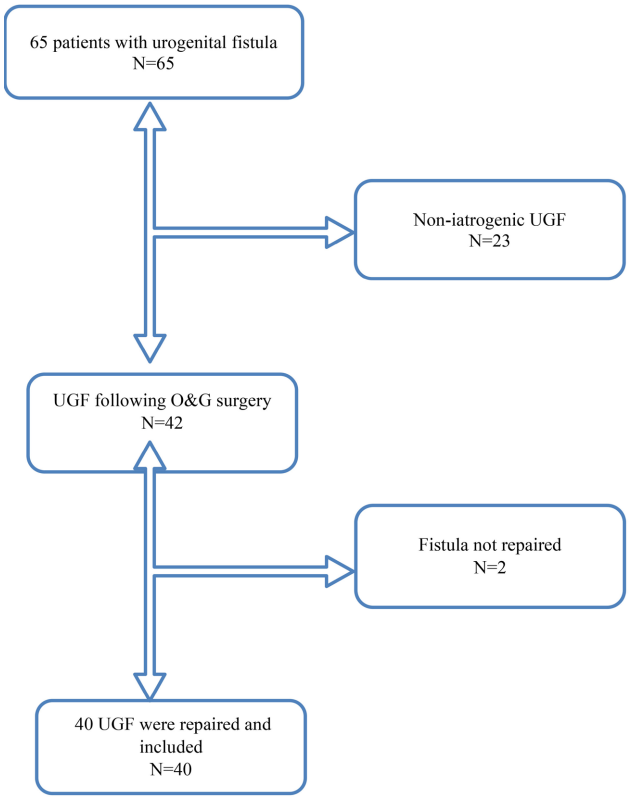

Figure 1. Recruitment flow-chart.

(n = 30; 75%), Christians (n = 35; 87.5%) and reside within the North West region (n = 28, 70%) as seen in **Table 1**.

3.2. Prevalence of Iatrogenic UGF in Our Study Population

Out of the 65 patients with urogenital fistula, 42 were iatrogenic following O & G surgeries and 23 were non-iatrogenic giving a prevalence of 64.6% amongst all patients with urogenital fistula. As illustrated in **Figure 2**.

3.3. Clinical and Diagnostic Aspects

3.3.1. Clinical Aspects

1) Signs and Symptoms

All the patients included in the study presented with urine leakage of which 9 (22.5%) had vulvar dermatitis and 2 (5.0%) had foot drop as demonstrated in **Figure 3**.

2) Surgeries preceding the fistula

The surgeries, as described by **Figure 3** exposed the patients to the urogenital fistula and included: 24 (60%) total abdominal hysterectomy, 14 (35%) cesarean section, and 2 (5%) others pelvic surgeries (including transvaginal hysterectomy; and dilatation and curettage) (**Figure 4**).

3) The different indications for the surgery

The different indications for these surgeries were mostly symptomatic leiomyoma and prolonged labor among these patients, 3 (7.5%) had a previous

Table 1. Sociodemographic characteristics.

Variables	Number (n = 40)	Frequency (%)
Age categories		
15 - 24	5	12.5
25 - 34	7	17.5
35 - 44	8	20.0
45 - 54	**15**	**37.5**
55 - 64	3	7.5
65 - 74	2	5.0
Marital status		
Married	25	62.5
Single	8	20.0
Widow	3	7.5
Divorce	4	10.0
Region of origin		
North West	28	70.0
Out of North West	12	30.0
Religion		
Christian	35	87.5
Muslim	5	12.5
Employment status		
Unemployed	30	75.0
Employed	10	25.0

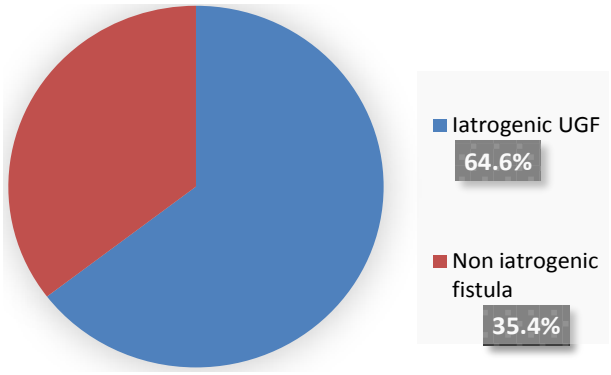

Figure 2. Prevalence of Iatrogenic UGF.

cesarean section and one patient (2.5%) had a myomectomy before. As seen in Tables 2-4.

After the surgery, the median time for the onset of urine leakage was 6.5 (3.3 - 13.5) days and the mean duration of fistula before surgical intervention in this study was 5.36 (±7.7) years ranging from 0 to 30 years as seen on Tables 2-4.

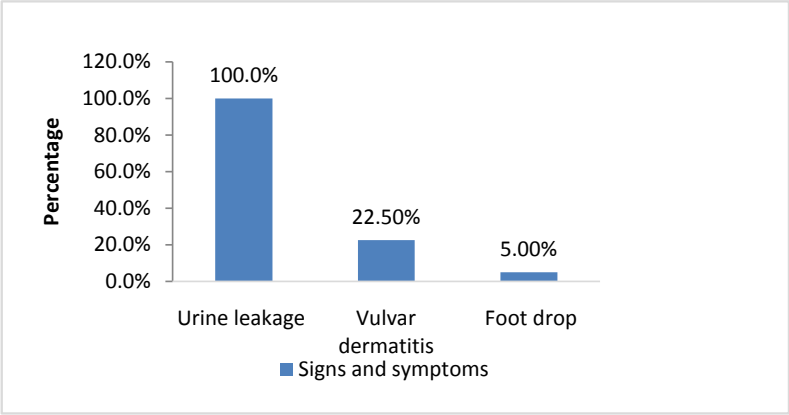

Figure 3. Signs and symptoms of UGF.

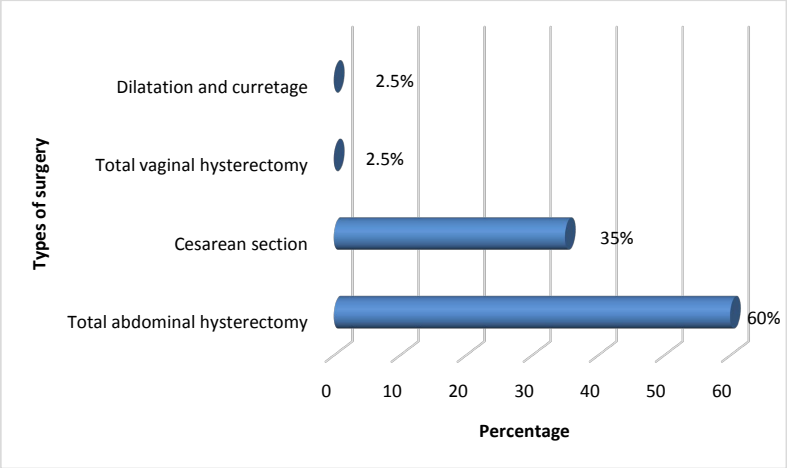

Figure 4. Types of surgeries preceding the fistula.

Table 2. Indications of caesarean section.

	Caesarean section	
Indications	Number (n = 14)	Frequency (%)
Prolonged labour	9	64.2
Macrosomia in previous scar	3	21.4
Cephalopelvic disproportion	2	14.2

Table 3. Indications of hysterectomy.

	Hysterectomy	
Indications	Number (n = 24)	Frequency (%)
Symptomatic leiomyoma	17	70.8
Endometrial cancer	3	12.5
PPH	2	8.3
Cervical cancer	1	4.2
Cervical ectopic pregnancy	1	4.2

Table 4. Other indications.

Indication	Number (n = 2)	Frequency (%)
Symptomatic leiomyoma Total vaginal hysterectomy	1	50
Incomplete abortion Dilatation and curettage	1	50

4) Comorbidities

The most common associated comorbidities among the patients were Hypertension (6; 15%), HIV (2; 5%) and Diabetes mellitus (1; 2.5%).

3.3.2. Diagnostic Aspect

A dye test (methylene blue test) was performed on all the patients. The blue dye test was positive in 24 (60%) patients confirming the diagnosis of Vesicovaginal fistula in 21 (52.5%) and vesico-uterine fistula in 3 (7.5%) patients in whom the dye leaked through the cervical os.

Of the 16 patients with a negative methylene blue test, abdominal ultrasound was performed in 9 (56.2%) and intravenous urography in 5 (31.2%). In the 16 women with a negative blue dye test, a CT urogram confirms the diagnostic of Ureterovaginal fistula. CT urogram findings indicated in Table 5 included left hydronephrosis (50%), right hydronephrosis (25%), bilateral hydronephrosis (12.5%), and fistulous tract (12.5%).

3.3.3. Types of Fistula

Among the 40 patients with urogenital fistula, 22 (55%) had a Vesico-vaginal fistula, 16 (40%) had an Uretero-vaginal fistula and 2 (5%) had a Vesico-uterine fistula.

The 22 cases of Vesicovaginal fistula were classified into: low VVF without urethral involvement 3 (7.5%), low VVF with urethral involvement 1 (2.5%) and high VVF 18 (45%).

Among the 16 patients with Ureterovaginal fistula, 10 (62.5%) had left UVF, 4 (25%) had right UVF and 2 (12.5%) had bilateral UVF shown in Table 6.

3.4. Treatment

3.4.1. Surgical Technique

The different therapeutic modalities used were: Transabdominal/Transvesical repair and Transvaginal repair.

Transvaginal route was mostly adopted for patients with low VVF or even simple high VVF that could be approached from the vaginal route. The Martius (88%) and Falandry flap (11%) were used to buttress the repaired while transabdominal route was for patients with fistula that could not be satisfactorily approached through the vagina based on the surgeon's experience as well as in most complex VVF.

Of the transabdominal repair, ureteral reimplantation was done for patients with ureterovaginal fistula. Augmentation cystoplasty with mitrofanoff urine

Table 5. Para-clinical investigations and findings.

Variables	Number (n)	Frequency (%)
Methylene blue test (n = 40)	**40**	100
Positive	24	60.0
VVF	21	52.5
Urine leakage through the cervical OS	3	7.5
negative	16	40.0
CT Urogram (n = 16)	**16**	100
Left hydonephrosis	6	37.5
Right hydronephrosis	4	25.0
Left ureterohydronephrosis	2	12.5
Bilateral hydronephrosis	2	12.5
Fistulous tract	2	12.5

Table 6. Types and subs types of fistula.

Variables	Number (n = 40)	Frequency (%)
Vesicovaginal fistula	**22**	55
Low VVF	3	7.5
High VVF	18	45
VVF with urethral involvement	1	2.5
Ureterovaginal fistula	**16**	40
Left	10	62.5
Right	4	2.5
Bilateral	2	12.5
Vesicouterine fistula	**2**	5.0

derivation was used for patients that had reduced bladder capacity with significant destruction of the urethra meanwhile augmentation cystoplasty without the mitrofanoff was used for patients who had reduced bladder capacity with their urethra conserved. Furthermore, orthotopic bladder reconstruction was done in patients with complete destruction of the bladder and intact urethra visible in Table 7.

3.4.2. Duration of Catheterization

The average duration of transurethral catheter for patients with VVF was 30 days in 23 (57.5%) patients and 14 days in 17 (42.5%) patients. For patients with uretero-vaginal fistula a ureteral stent was placed for 6 weeks.

Also, for patients with the mitrofanoff, the catheter was kept in place for two weeks.

3.5. Treatment Outcome

Out of the 40 patients recruited in this study, 32 (80%) had an early (1 month)

Table 7. Description of each treatment modality.

Variables	Number	Percentage %
Transvaginal repair	**9**	22.5
Transabdominal repair	**31**	77.5
Ureteral reimplantation	16	40
Augmentation cystoplasty with Mitrofanoff	5	12.5
Augmentation cystoplasty without Mitrofanoff	2	5.0
Orthotopic bladder	2	5.0
VVF repair	6	15

successful outcome from the primary surgery, 7 (17.5%) patients suffered a repair breakdown, 1 (2.5%) patient had acute urinary retention.

Some of the patients with repair breakdown and acute urinary retention were re-operated. The mean time from the primary surgery to the reoperation was 1.1 (±0.3) day. Among the re-operated patients, 2 (25%) had a successful repair giving an overall success rate after one month of 34 (85%).

Others complications were surgical site infections 3 (7.5%), bladder spasm post-surgery 15 (37.5%) and surgical site infections 3 (7.5%).

The average follow-up period was 30 days and the intervention was a single surgeon experience.

4. Discussion

In this study, we sought to determine the epidemiologic profile, the clinical features and the therapeutic modalities of urogenital fistula following obstetric and gynecologic surgeries repaired at the Nkwen Baptist Hospital.

Our study population had a mean age of 43.5 (±13.3) years. This is similar to 42 years obtained by Raasen *et al.* (2014) after reviewing 805 patients in 11 Eastern African countries. This mean age is also consistent with the average age (45.7 years) of patients who undergo hysterectomy as reported by Egbe *et al.* in Douala, Cameroon (2018) [7]. On the other hand, Kabore *et al.* in Burkina Fasso in 2021 [8] reported a mean age of 35 years in women with iatrogenic urogenital fistula, which is consistent with the mean age of 38 years in women with hysterectomy reports by Dao *et al.* in Burkina Fasso in 2015. In line with Bohoussou *et al.*, Cote d'Ivoire (2017) [9], who reported an 80% unemployed participants, the majority of our participants were unemployed (75%). This may be related to the stigma associated with the constant urine leakage preventing the victims from engaging into income generating activities. Majority of our patients (62.5%) were married, similar to the report made by Kabore *et al.* in Burkina Fasso in which 70% of participants with iatrogenic UGF were married [8].

The prevalence of iatrogenic UGF in our study was 64.6% among all patients with UGF. It is higher than that reported by Tebeu *et al.* in Yaoundé Cameroon, 2014 who had an iatrogenic UGH prevalence of 19.78% [9]. The difference could

be linked to the study population given that all pregnancy related surgery was eliminated by this author. Our study prevalence is slightly lower than that of Tasnim *et al.* in Pakistan in 2020 [10] where iatrogenic UGF had a 71.4% prevalence. This difference can be explained by the fact that, their study was a 12 years study with a larger sample population. Nevertheless; the higher prevalence observed in our study may be related to many factors such as the number of hysterectomies performed. A study carried out in Douala Cameroon by Egbe *et al.* in 2018 [11] revealed that hysterectomies represented 14.54% of all the obstetric and gynecologic surgeries and for benign indications. Furthermore, the North West region of Cameroon has a gynecologist: women of reproductive age ratio of 3:499203 (CIS MINSANTE 2022). The paucity of gynecologists in this large population explained the high prevalence of iatrogenic fistula as many obstetric and gynecologic surgeries are performed by medical personnel without obstetric and gynecologic surgeries training.

In addition to this, hysterectomy was the most common aetiologic surgery for UGF (60%) followed by cesarean section (35%) in our study. This result goes in pair with that recorded in Pakistan by Tasnim *et al.* in 2020 [13] where hysterectomy was the most common aetiologic surgery for iatrogenic UGF (52.5%) followed by cesarean section (26.4%).

The median time for our patients to experience urine leakage after surgery was 6.5 days. This result is similar to a study performed by Raasen *et al.* in 11 African countries in 2018 [14] where the median time for the onset of urine leakage was 7 days. This can be explain by the fact that the denuded ureteral segment becomes gangrenous and leaks, or ruptures by 7 - 10 days [12].

The mean duration from onset of UGF to fistula repair was 5.36 (SD 7.7) years. Tebeu *et al.* in Cameroon 2019 had a similar result [15] where the average duration of fistula progression was 5 years. This can be explained by the fact that few fistula surgeons are available in our setting. Also the shame and isolation created by the symptomatology of these fistulas make these women to hide and not seeking for care.

The blue dye test was negative in all the patients with ureterovaginal fistula. This typical finding was found in a study done by Lengman *et al.* in Nigeria 2017 [16]. This negative result implies the normal integrity of the bladder.

Our study also revealed that VVF was the most represented type of fistula (55%) followed by ureterovaginal fistula (40%). This is similar to a study carried out Pakistan by Hanif *et al.* 2005, where VVF was also the most fistula represented type but with a higher percentage (63%) followed by ureterovaginal fistula (36%) in the same study.

More so, it was observed that in patients with ureterovaginal fistula, the left ureter (62.5%) was more affected than the right (2.5%). This goes in line with a study carried out in Pakistan by Hanif *et al.* in 2005 [17], the left ureter (88%) was more affected than the right (11%). The possible reason for this concordance is inadequate exposure of the left adenexa during application of clamps while standing on right side of the patient.

The transabdominal route was adopted for 77.5% of our patients. This is different from a study carried out in Cameroon by Ngaroua *et al.* in 2019 [18] where the transvaginal route was adopted in 80.89% of cases. This difference could be due to the fact that the majority of fistulas in their study were obstetrical fistula and caused by vaginal delivery, so could be better approached through the vagina.

On the other hand, the transvaginal repair in our study was buttressed with martius or falandry flap. This is contrast to a study carried out by Bohoussou *et al. in* Cote d'Ivoire 2019 where their technique was performed without the addition of neighborhood structures.

One hundred percent of ureterovaginal fistulas in our study, were treated by the ureteroneocystostomy. This is similar to a study done by Lengman *et al.* in Nigeria 2017 [15] in which ureteroneocystostomy was also used in all the patients with ureterovaginal fistula. This is because ureterovaginal fistulae in low resource settings are commonly operated by open abdominal ureteric reimplantation. Added to this, the average urinary catheter removal time was 22 days (range: 14 - 30 days). This compares to the study in Cote d'Ivoire where their average urinary catheter ablation time was 27.27 days (range: 14 - 30 days).

Our early therapeutic result was obtained after a period of one month post-surgical repair.

The primary success rate in our study was 80% which is higher than that reported by Bohoussou *et al.* in Cote d'Ivoire 2017 [10] where their primary success rate after one month was 70% this could be related to the fact that they did all their transvaginal repair without the addition of Flaps. This is slightly lower than a study done by Kumar *et al.* [18] in India 2019 where their primary success rate as 84.12%. This can be explained by the fact that in their study, they had a better patient selection for repair, as they did not attempt repair in those cases where either whole of the posterior bladder wall was involved or sphincter mechanism was destroyed due to involvement of urethra.

The overall success rate of our study was 85% and this corresponds to a study done by Raasen *et al.* in 11 African countries in 2014 [12] where the success rate was 87%. However, it is different from the study carried out by Hanif *et al.* in Pakistan [16] in 2005, where their overall success rate was 95%. This can be explained by the fact that almost all their fistula were simple fistulas as majority (82%) were approached from the vaginal route and their follow up was done over a period of 3 months.

Our study was limited by the following factors:

- Being a single Centre hospital based study may not reflect the true picture of fistula and fistula disease in the community.
- Its retrospective nature limits the parameters that could have been exploited in this study such as the qualification and experience of the operator who carried out the surgery that led to the fistula.
- All patients who had cesarean section following prolonged labour were assumed to have iatrogenic fistulae, but the actual cause of the fistula may not

necessarily be due to cesarean section.

However, the strength of our study lies in the fact that to the best of our knowledge no previous study has been carried out in the North West region on iatrogenic urogenital fistula and as such, this study is the first to bring out the burden of iatrogenic fistulas in our context.

5. Conclusions

1) The prevalence of iatrogenic urogenital fistula is 64.6%.

2) The major aetiologic factor for the UGF is total abdominal hysterectomy followed by caesarean section. The methylene blue is used to make the diagnosis of VVF and vesicouterine fistula while the CT urogram is used for the diagnosis of ureterovaginal fistula.

3) The overall repair success rate at one month in Nkwen Baptist Hospital is 85%.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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