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Surgical Management of Complicated Upper Genital Tract Infections in Yaoundé and Subsequent Fertility Outcomes

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Abstract

Background: Complicated Upper Genital Tract Infections (CUGTI), such as tubo-ovarian abscesses and pelvic peritonitis, represent severe gynecological emergencies with significant implications for morbidity and mortality in low-resource settings. Delayed diagnosis frequently results in severe infectious forms requiring surgical management, with potential long-term reproductive consequences. Data on their surgical management and reproductive outcomes in sub-Saharan African settings are scarce. This study describes the clinical profile, surgical management, and subsequent fertility of patients treated for CUGTI at a tertiary care hospital in Yaoundé, Cameroon. **Methods:** A descriptive cross-sectional study with retrospective and prospective data collection was conducted at the Yaoundé Gynaeco-Obstetric and Pediatric Hospital from January 2018 to May 2023. Women surgically treated for intraoperatively confirmed complicated UGTI were included. Data on socio-demographics, clinical presentation, paraclinical findings, surgical management, and postoperative outcomes were collected. Fertility outcomes were assessed at least 12 months after surgery. Data were analyzed using IBM SPSS 26 version. **Results:** Among 63 patients with a preoperative suspicion of CUGTI, 53 were included for analysis. The mean age was 29.5 years, with the 26 - 35 age group most

represented (45.3%). Pelvic pain (67.9%) and fever (56.6%) were the most common presenting symptoms. A history of sexually transmitted infection (STI) was reported by 43.4% of patients. The most frequent per-operative findings were pelvic peritonitis (34%), tubo-ovarian abscess (32%), and generalized peritonitis (28.3%). Laparotomy was the primary surgical approach (88.7%). Conservative surgical gestures (e.g., abscess drainage, uterine suture) predominated. The postoperative mortality rate was 5.6%. Among 40 patients eligible for fertility assessment, only 8 (20%) achieved a subsequent pregnancy, predominantly within 1 - 2 years post-surgery, with one case being ectopic. **Conclusion:** CUGTI predominantly affects young women and often presents with severe clinical features requiring mainly laparotomic intervention. The subsequent pregnancy rate remains low, underscoring the substantial impact of these infections on reproductive potential. These findings highlight the critical need for enhanced prevention, early diagnosis, and optimized multidisciplinary surgical management to improve both survival and fertility outcomes.

Keywords

Upper Genital Tract Infection, Tubo-Ovarian Abscess, Pelviperitonitis, Surgery, Fertility, Cameroon

1. Introduction

Upper genital tract infections (UGTI), commonly grouped under pelvic inflammatory disease (PID), include infections of the uterus, fallopian tubes, ovaries, and surrounding pelvic structures. These infections usually result from ascending sexually transmitted pathogens, particularly Chlamydia trachomatis and Neisseria gonorrhoeae, but polymicrobial infections are frequent, especially in advanced disease stages [1] [2]. When these infections progress, they can lead to severe complications like tubo-ovarian abscess (TOA), pelvic peritonitis, and generalized peritonitis, collectively termed complicated UGTI (CUGTI). These conditions are gynecological emergencies associated with considerable morbidity, risk of mortality, and a well-documented deleterious effect on tubal function and future fertility [3] [4].

In high-income countries, early diagnosis and prompt antibiotic treatment have substantially reduced the incidence of severe complications. In contrast, in low- and middle-income countries, delayed presentation, limited access to healthcare, high prevalence of sexually transmitted infections (STIs), challenges in implementing comprehensive reproductive health services, sociocultural barriers, and self-medication often lead to advanced infectious forms such as tubo-ovarian abscesses, pelviperitonitis, and generalized peritonitis [1]. Surgical intervention often becomes necessary for diagnostic confirmation, source control, and treatment of complications like visceral perforations [5].

Although several studies have described the clinical management and microbiological aspects of PID, data on surgical management and long-term fertility out-

comes following complicated UGTI in Africa remain scarce. Most available studies focus on acute management, with limited follow-up on reproductive outcomes. Previous studies from Cameroon have reported on the prevalence and general management of pelvic infections [6]-[8], but a detailed analysis of surgical strategies and their impact on fertility is lacking. Understanding fertility prognosis after surgery is crucial for counseling patients and guiding postoperative care.

This study aimed to describe the surgical management of complicated UGTI at a tertiary referral hospital in Yaoundé, Cameroon, and to describe subsequent fertility outcomes among affected women.

2. Methods

2.1. Study Design and Setting

This study was a descriptive cross-sectional study with retrospective and prospective components conducted at the Yaoundé Gynaeco-Obstetric and Pediatric Hospital (YGOPH), a tertiary referral center for gynecological and obstetric emergencies in Cameroon. The study period extended from January 2018 to May 2023.

A cross-sectional analytical approach was chosen to allow both characterization of surgical management practices and assessment of subsequent fertility outcomes among women treated for complicated upper genital tract infections (UGTI).

2.2. Study Population

The study population consisted of women who underwent surgical intervention for complicated UGTI during the study period. Complicated UGTI were defined as pelvic inflammatory disease associated with tubo-ovarian abscess, pelvic abscess, pelviperitonitis, or generalized peritonitis, confirmed intraoperatively.

2.3. Inclusion Criteria

- Women aged ≥ 14 years
- Surgical management for intraoperatively confirmed complicated UGTI
- Availability of operative reports
- Consent to participate in postoperative fertility follow-up

2.4. Exclusion Criteria

- Incomplete medical records
- Pregnancy at the time of surgery
- Known non-infectious causes of infertility (e.g., Müllerian anomalies, endometriosis, male factor infertility)
- Patients lost before the minimum postoperative follow-up of 12 months for fertility assessment

2.5. Sampling and Data Collection

After obtaining administrative and ethical clearances, the operating theater and hospitalization registries were reviewed to identify eligible cases. Corresponding

medical files were consulted. Eligible patients operated on at least 12 months prior were contacted by telephone to complete a fertility assessment questionnaire. Patients were enrolled via non-probability sampling with exhaustive recruitment

Variables included:

- **Sociodemographic data:** age, parity, marital status
- **Clinical data:** presenting symptoms, physical examination findings
- **Paraclinical data:** complete blood count, C-reactive protein, and ultrasound findings
- **Intraoperative findings:** type of infection, anatomical involvement, severity
- **Surgical procedures:** approach (laparotomy/laparoscopy), conservative or radical procedures
- **Postoperative outcomes:** complications, ICU admission, mortality
- **Fertility outcomes:** spontaneous pregnancy, time to conception, ectopic pregnancy

Fertility outcomes were assessed at least 12 months after surgery, consistent with WHO definitions of infertility.

Statistical Analysis:

Data were entered and analyzed using IBM SPSS 26 version. Descriptive statistics were computed. Frequencies and percentages were calculated for categorical variables. For continuous variables, measures of central tendency and dispersion (mean, standard deviation) were determined.

2.6. Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee of YGOPH. Written informed consent was obtained from all participants. Confidentiality and anonymity were strictly maintained in accordance with the Declaration of Helsinki.

3. Results

3.1. Flow of Participants

Initially, 63 patients with a preoperative diagnosis of CUGTI were identified. Ten were excluded: one for a per-operative suspicion of ovarian cancer, three for negative laparotomy findings, two for unusable medical records, and four who refused the telephone interview. Consequently, 53 patients constituted the final study population for clinical and surgical analysis. For the fertility assessment, after excluding one menopausal patient, seven patients with surgery less than one year prior, three deaths, and three patients who underwent hysterectomy, 40 patients were evaluated.

3.1.1. Sociodemographic and Gynecological Characteristics

The mean age of the 53 patients was 29.5 years (±9.12), with the 26 - 35 years group being the most represented (45.3%). Nulliparous women accounted for 32.1% of the cohort. The majority (60.4%) reported having a single sexual partner at the time of surgery. A history of STI was reported by 23 patients (43.4%), with

Chlamydia trachomatis (56.5%) and *Mycoplasma* (52.2%) being the most frequent among them. Only 15.1% reported consistent condom use, and 26.4% had a history of prior pelvic surgery (Table 1).

Table 1. Characteristics of patients.

Characteristics	N = 53	%
Age		
Means ± SD	29 ± 9.12	
Range	14 - 62	
<18	2	3.8
[18 - 25[	18	33.9
[25 - 35[	24	45.3
[35 - 45[	6	11.3
>45	3	5.7
Number of sexual partners		
virgin	1	1.9
none	7	13.2
1	32	60.4
2 - 3	11	20.7
>4	2	3.8
Marital Status		
Single	18	34
Married	35	66
Parity		
0	17	32.1
1 - 2	18	34
3 - 4	12	22.6
>4	6	11.3
History of STIs		
yes	23	43.4
no	30	56.6
Type of STI (n = 23)		
HIV	3	13
Hepatitis B	3	13
Chlamydia	13	56.5
Mycoplasma	12	52.2
Gonococcus	4	17.4
HSV-2	1	4.3

Continued

History of pelvic surgery		
Yes	14	26.4
No	39	73.6
Condom use		
Yes	14	26.4
No	39	73.6

3.1.2. Clinical and Paraclinical Findings

The most common presenting symptoms were pelvic pain (67.9%) and fever (56.6%). On physical examination, fever (92.4%), pain on uterine mobilization (77.3%), and signs of peritoneal irritation (75.5%) were prevalent. According to the WHO performance status, 37.7% of patients had significantly reduced activity (score of 3) at admission. Hyperleukocytosis was present in 73.6% of cases, and an elevated CRP level was found in 98.1% of patients. Pelvic ultrasound most frequently suggested pelvic peritonitis (30.2%) or a para-uterine abscess (26.4%).

3.1.3. Preoperative Management, Surgical Data and Postoperative Outcomes

Preoperative intravenous antibiotics were administered to 75.5% of patients, most commonly a combination of metronidazole and ofloxacin (60%). Emergency preoperative resuscitation was required for 35.8% of patients. Surgical procedures and postoperative outcomes are presented as follows (Table 2).

Table 2. Surgical data.

Characteristics	N = 53	%
Surgical approach		
Laparotomy	47	88.7
Laparoscopy	5	9.4
Laparoscopy converted to laparotomy	1	1.9
CUGTI		
Tubo-ovarian abscess	17	32
Pelvic abscess	9	17
Pelviperitonitis	18	34
Generalized peritonitis	15	28.3
Volume of pus (mL)		
<200 mL	7	13.2
200 - 500 mL	21	39.6
>500 mL	25	47.2

Continued

Findings		
Uterine perforation	17	32
Pelvic adhesions	32	60.4
Inflamed appendix	8	15
Hemoperitoneum	4	7.1
Presence of gatrointestinal involvement	7	13.2
Type of gastrointestinal involvement (n = 7)		
Colonic perforation	1	14.3
Small bowel perforation	5	71.4
Small bowel perforation with necrosis	1	14.3
Intraoperative procedures		
Incision and abscess drainage	26	49
Salpingectomy	2	3.8
Subtotal hysterectomy	3	5.7
Uterine suturing	14	26.4
Bowel resection and anastomosis	6	11.3
Appendectomy	12	22.6
Pus aspiration/peritoneal lavage only	10	18.9
Bilateral tubal ligation	1	2.0
Postoperative complications		
Wound suppuration	3	5.6
Deaths	3	5.6
Recurrences	2	3.8

Laparotomy was the primary surgical approach (88.7%). The surgical team was multidisciplinary (gynecologists and visceral surgeons) in 47.2% of cases. The main per-operative findings were pelvic peritonitis (34%), TOA (32%), generalized peritonitis (28.3%), and pelvic abscess (17%). A purulent collection exceeding 500 ml was found in 47.2% of patients. Associated findings included pelvic adhesions (60.4%), uterine perforation (32%), and digestive tract lesions (13.2%), predominantly small bowel perforations.

Conservative surgical procedures were predominant. Incision and drainage of abscesses were performed in 49% of cases. Uterine perforation was managed by suture in 14 cases and subtotal hysterectomy in 3 cases. Salpingectomy was rare (3.8%), and no oophorectomy was performed. On the digestive tract, resection-anastomosis was performed in 11.3% of cases, and appendicectomy in 22.6%. Drainage devices were placed in 80.4% of surgeries.

Postoperative complications included the need for resuscitation (34%), parietal suppuration (5.6%), and death (5.6%, n = 3). Two patients (3.8%) experienced a recurrence of non-complicated UGTI.

3.2. Fertility Outcomes

Fertility was evaluated in 40 patients. Fertility assessment was restricted to women who were actively attempting to conceive and were not using contraception at the time of follow-up. Eight women (20%) achieved spontaneous pregnancy, predominantly within 1 - 2 years after surgery. One ectopic pregnancy was reported. Outcomes of fertility are presented in Table 3.

Table 3. Fertility outcomes.

Characteristics	N = 40	%
Subsequent pregnancy		
Yes	8	20
No	32	80
Time to pregnancy (n = 8)		
1 - 2 years	5	20.3
3 - 5 years	3	37.5
>5 years	0	0
Mode of conception		7.8
Spontaneous	8	100
Assisted reproductive technology	0	0
Pregnancy location		
Intrauterine	7	87.5
Ectopic	1	12.5

4. Discussion

This study provides a detailed overview of the severe spectrum of CUGTI requiring surgical intervention in a Cameroonian tertiary center. Our findings paint a sobering picture of cPID as a disease of young, often nulliparous women, presenting late with severe systemic illness and carrying a dismal prognosis for future fertility.

The demographic profile of our patients, with a mean age of 29.5 years and a high proportion of nulliparous women (32.1%), underscores that cPID strikes women squarely in their peak reproductive years. This aligns with patterns observed across Sub-Saharan Africa, where PID is a leading cause of tubal factor infertility [1] [2] [6] [7] [9] [10]. The high prevalence of self-reported STI history (43.4%), particularly *Chlamydia trachomatis* and *Mycoplasma*, is consistent with the established microbial etiology of PID [3] [11]. However, the strikingly low rate

of consistent condom use (15.1%) highlights a critical gap in preventive sexual health practices, a recurring theme in similar settings [12].

The clinical presentation was marked by severity. The high frequency of fever, peritoneal signs, and a WHO performance status of 3 in over a third of patients indicates advanced infection and systemic compromise. This late presentation likely explains the overwhelming preference for laparotomy (88.7%) over laparoscopy. In resource-constrained environments, laparotomy often remains the safest and most expeditious approach for managing generalized peritonitis, large abscesses, and associated visceral injuries, which were present in nearly half of our patients [5] [13]. In contrast, laparoscopy is increasingly favored in high-resource settings due to reduced morbidity and faster recovery [14]. According to Hüseyin et al, the choice of an open or laparoscopic surgical approach should be largely based on operator skill, experience, and ability to perform the necessary surgical maneuvers [15]. The finding of uterine perforation in 32% of cases is notably high and warrants special attention. This likely reflects complications from clandestine or unsafe uterine instrumentation, a significant public health challenge in regions with restrictive abortion laws and limited access to safe reproductive health services [16]. The high rate of preoperative antibiotic administration reflects standard care for sepsis source control, although the choice of regimens was varied.

The intraoperative findings further illustrate the destructive nature of delayed cPID. The high rate of pelvic adhesions (60.4%) and the large volume of purulent collections are direct consequences of prolonged, untreated infection, leading to extensive tissue inflammation and fibrosis [9]. These adhesions are a primary pathological substrate for subsequent infertility and chronic pelvic pain. The postoperative mortality rate of 5.6% contrasts sharply with near-zero mortality reported in high-income countries where earlier PID are largely managed medically in earlier stage without surgical intervention, emphasizing persistent disparities in timely access to care and intensive postoperative support [17].

Tubo-ovarian abscess and pelviperitonitis were the most frequent intraoperative diagnoses, in line with African literature identifying these entities as the most common complications of untreated pelvic inflammatory disease [18]. Digestive involvement, observed in over 10% of cases, further illustrates the advanced stage at which patients present.

A key strength of our surgical management strategy was the predominance of conservative procedures. Salpingectomy was rarely performed, and no oophorectomy was recorded. This approach aligns with international recommendations emphasizing organ preservation whenever feasible in women of reproductive age [17] [19]. The high rate of conservative surgical management observed in this study reflects a deliberate fertility-preserving strategy in a context where access to assisted reproductive technologies, particularly in vitro fertilization, remains extremely limited and financially inaccessible for most patients. Despite the known risk of persistent hydrosalpinx and tubal dysfunction, organ-preserving surgery was favored whenever feasible to maintain any residual reproductive potential, especially in young nulliparous women.

The most impactful finding of our study relates to fertility outcomes. A subsequent pregnancy rate of only 20% among eligible women starkly quantifies the devastating toll of cPID on reproductive potential. This rate is lower than some reports following conservative surgical management of isolated TOA in high-income settings, where pregnancy rates between 30% - 40% have been described [20] [21]. However, it aligns closely with studies from Low-and Middle-income Countries and is reflective of the advanced disease stage (high rates of peritonitis and adhesions) in our cohort [4]. The fact that all pregnancies were spontaneous and most occurred within two years suggests that if conception does not happen relatively early, the likelihood diminishes significantly, possibly due to persistent tubal damage or adhesion reformation. The occurrence of an ectopic pregnancy (12.5% of pregnancies) is a classic, feared complication of tubal damage from PID, reinforcing the link between infection and adverse reproductive outcomes [4] [22].

Our findings must be interpreted in the context of the healthcare landscape in Central Africa. The limited use of laparoscopy is a significant constraint. In high-resource settings, laparoscopy is the gold standard for diagnosing and treating cPID, offering advantages in visualization, adhesion lysis, and fertility preservation, with potentially better reproductive outcomes [23]. The high rate of uterine perforation points to an urgent need for improved access to safe family planning and post-abortion care services. Furthermore, the low condom use despite STI history indicates that behavioral change communication and integrated STI/PID prevention programs remain inadequate.

The main strength of this study lies in its 5-year follow-up and the exhaustive nature of the recruitment in a major tertiary center, providing a realistic portrait of CUGTI management in Cameroon. However, its retrospective design may have led to under-reporting of minor complications and a potential recall bias during fertility interviews. The absence of systematic hysterosalpingography also limited objective assessment of tubal patency. The sample size, while representative of a single center, may limit the generalizability to rural areas.

5. Conclusion

Complicated pelvic inflammatory disease in our setting represents a severe condition with major implications for both maternal survival and future fertility, as reflected by the low rate of subsequent pregnancy. These findings highlight the need for a comprehensive response that integrates prevention, early diagnosis, and improved care. Strengthening sexual health education, promoting condom use, and expanding STI screening, particularly for Chlamydia are essential to reduce disease incidence. Early recognition and appropriate medical management of acute PID by trained healthcare providers are crucial to prevent progression to complicated forms. Improving surgical care, including the development of laparoscopic capacity and fertility-preserving techniques, could help mitigate long-term reproductive damage. In addition, structured post-treatment counseling and

timely referral for fertility evaluation and assisted reproductive technologies are needed. Finally, public health policies should address unsafe uterine instrumentation by improving access to safe abortion services and post-abortion care in accordance with national regulations and WHO recommendations.

Authors' Contributions

All authors who contributed to this work have declared that they have read and approved the final version of the manuscript.

Conflicts of Interest

The authors have no conflicts of interest to declare regarding the publication of this manuscript.

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