Iatrogenic urinary tract injuries during obstetric and gynecological operations in Assiut University Women Health Hospital

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Background and aim
The close proximity of the urinary tract to the female genital system makes it vulnerable to damage during pelvic surgical procedures. The objective of the current study was to evaluate iatrogenic urinary tract injuries (UTIs) caused by obstetrical and gynecological procedures.

Patients and methods
The current study was conducted at Department of Obstetrics and Gynecology, Assiut University Hospitals, in the period between March 2018 and March 2021. All women with UTIs secondary to obstetrical or gynecological surgeries during the study period were recruited in the study.

Results
A total of 20 636 women were scheduled for different obstetric or gynecological surgeries, and 170 (0.82%) of them experienced iatrogenic UTIs, 161 (94.7%) women had injury during obstetric surgeries, whereas the other nine (5.3%) had gynecological surgeries. Operations were repeated cesarean section (34.2%) and placenta previa (54.1%) in obstetric surgeries and repeated section in gynecological surgeries (33.3%). Iatrogenic UTIs were detected intraoperatively in 167 (98.2%) women, whereas in only three patients, detection was delayed. Overall, eight (4.7%) patients had both bladder and ureteric injuries, whereas bladder injury alone occurred in 154 (90.6%) patients and another eight (4.7%) patients had ureteric injuries alone. ICU admission was needed in 43 (25.3%) patients.

Conclusion
Although frequencies of UTIs in obstetric and gynecological surgeries were found to be relatively low, yet it may lead serious morbidity and outcome. Proper antenatal care and good knowledge of pelvic anatomy may help in decreasing its frequency.

Keywords:
assiut, gynecologic, iatrogenic, obstetric, operation, placenta previa, procedure, recurrent cesarean section, urinary tract injury

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Introduction

The female genital and urinary tracts are anatomically connected, so the risk of harming either one must always be taken into account when operating on the other. When the normal anatomy is changed by primary pathologic factors or when it is improperly identified owing to severe bleeding or pelvic adhesions, the risk of damage rises [1,2].

Urinary tract injuries (UTIs) resulting from obstetric and gynecological surgeries are typically categorized into two groups: acute complications, such as bladder injury or injury to the ureter, which can be detected right away during the operation, and chronic complications, such as fistula and stricture, which can occur later [3,4].

The possibility of altered anatomy, fibrosis; direct extension of the disease process, such as in cases of placenta previa; chronic pelvic inflammatory disease; endometriosis; large fibroids, especially in the broad ligament; previous pelvic surgery; malignancy; previous irradiation; and congenital abnormalities are risk factors that may contribute to intraoperative bladder injury [5].

The current work aimed to review the frequency, risk factors, and outcome of iatrogenic UTIs during obstetric and gynecological operations.

Patients and methods

Study design and setting

A cross-sectional study was conducted at Department of Obstetrics and Gynecology, Assiut University Hospitals, in the period from March 2018 to March 2021.

Selection criteria

All women who underwent obstetric or gynecological surgery during the study period and complicated by UTIs were enrolled in the study.

Methods

Any laceration, transection, rupture, or ligation of the urinary tract discovered during surgery was classified as a urological complication, as well as the subsequent leakage of urine or contrast material from the urinary tract.

All medical records of women who underwent obstetric or gynecological surgery and complicated by urologic injury during study period were revised, and the following data were collected:

(1) Patients' demographics including name, age, and residency. Moreover, any medical conditions among those patients were also recorded.
(2) Indications of the initial obstetric or gynecological surgery and type of surgery.
(3) In obstetrical cases, details of gravidity, delivery, previous cesarean section (CS), and associated placental abnormalities were also gathered.
(4) Method of diagnosis of UTI and corrective surgical procedure.
(5) Postoperative complications and need to admission to ICU.

Ethical consideration

The study was approved by the Research Ethics Committees of Faculty of Medicine, Assiut University, and conducted in accordance with the Code of Good Practice and the guidelines of Declaration of Helsinki, 7th revision, 2013. The study was registered on *clinicaltrials*.gov with NCT04162782. Consent was taken from participants for publication.

Statistical analysis

Recorded data were analyzed using the Statistical Package for the Social Sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean ± SD, whereas qualitative data were expressed as frequency and percentage.

Results

During the study period between March 2018 and March 2021, 20 636 women underwent different obstetric or gynecological surgeries, and 170 (0.82%) women of them experienced iatrogenic UTIs.

Of the total 20 636 women, 18 605 women had obstetric surgeries where UTI occurred in 161 (0.86%) cases of them. The other 2031 women underwent gynecological surgeries with frequency of 9/2031 (0.44%) iatrogenic UTI.

Characteristics of patients experiencing iatrogenic

The mean age of women with iatrogenic UTIs was 33.54 ± 6.63 years. Of those women, 161 (94.7%) women had injury during obstetric surgeries, whereas the other nine (5.3%) women had injuries during gynecological surgeries (Fig. 1).

The most common diagnoses in case of obstetric surgeries were placenta previa (51.2%), previous CS in labor (25.3%), postpartum hemorrhage (6.5%), and ruptured uterus (5.3%). Other indications of surgery are summarized at Table 1.

Possible risk factors for urinary tract injuries

The most frequent risk factors for UTIs in obstetric surgeries were placenta previa (54.1%), repeated CS (84.1%), and ruptured uterus (5.6%). In case of gynecological surgeries, three women had repeated CS and two women had distorted anatomy by fibroid. Other risk factors are summarized in Tables 2 and 3 and Fig. 2.

Table 1 Characteristics of patients with iatrogenic urinary tract injuries

	N=170
Age (years)	33.54±6.63
Range	20–70
Gestational age (weeks)	35.04±4.43
Range	14–40
Parity	0–12
Indications of surgery	
Obstetric surgeries	161 (94.7)
Placenta previa	87 (51.2)
Previous CS in labor	43 (25.3)
Postpartum hemorrhage	11 (6.5)
Ruptured uterus	9 (5.3)
Broad ligament hematoma	3 (1.8)
Obstructed labor	2 (1.2)
Concealed hemorrhage	1 (0.6)
Antepartum eclampsia	1 (0.6)
Preeclampsia	1 (0.6)
Preterm labor	1 (0.6)
Missed abortion	1 (0.6)
Post-evacuation bleeding	1 (0.6)
Gynecological surgeries	9 (4.3)
Multiple fibroid uterus	3 (1.8)
Endometrial adenocarcinoma	2 (1.2)
Adenomyosis	1 (0.6)
Cervical adenocarcinoma	1 (0.6)
Endometriosis	1 (0.6)
Multilocular ovarian cysts	1 (0.6)

Data are expressed as frequency (percentage), mean (SD), range.
CS, cesarean section.

Operation and surgeon in the study

CS was done in 91 (53.5%) women. It was found that peripartum hysterectomy, total abdominal hysterectomy, and radical hysterectomy were performed in 53 (31.2%), five (2.9%), and two (1.2%) patients, respectively. Operations were performed by resident, assistant lecturer, and staff member in 45 (26.5%), 47 (27.6%), and 78 (45.9%) women, respectively (Table 4).

Type of injuries and time of detection among studied women

Iatrogenic UTIs were detected intraoperatively in 167 (98.2%) women, whereas in only three patients, detection was delayed. Overall, eight (4.7%) patients had both bladder and ureteric injuries, whereas bladder injury alone present in 154 (90.6%) patients and another eight (4.7%) patients had ureteric injuries alone (Table 5, Fig. 3).

Table 2 Possible risk factors for urinary tract injuries during obstetric surgeries

	N=161
CS in labor	1 (0.60)
Repeated CS (> or=2 CS)	55 (34.2)
Placenta previa	87 (54.1)
Previous one CS	7 (4.3)
Ruptured uterus	9 (5.6)
Obstructed labor	2 (1.2)

Data are expressed as frequency (percentage). CS, cesarean section.

Table 3 Possible risk factors for urinary tract injuries in gynecological surgeries

	N=9
Repeated CS (> or=2 CS)	3 (33.3)
Malignancy	2 (22.2)
Distorted anatomy by fibroid	2 (22.2)
Previous one CS	1 (11.1)
Endometriosis	1 (11.1)

Data are expressed as frequency (percentage). CS, cesarean section.

Table 4 Type of operations in the studied women

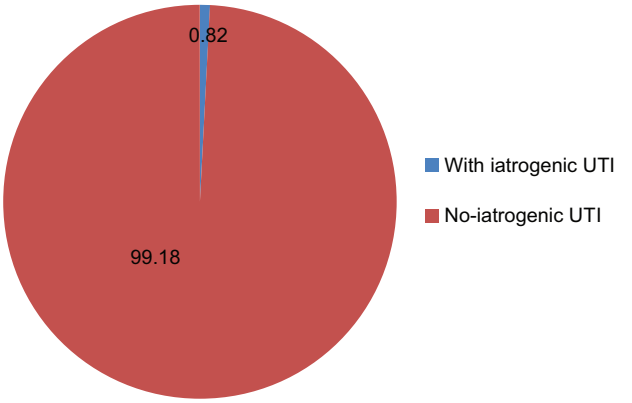
	N=170
Operation	
CS	91 (53.5)
Peripartum hysterectomy	53 (31.2)
Abdominal exploration	15 (8.8)
Total abdominal hysterectomy	5 (2.9)
Hysterectomy	3 (1.8)
Radical hysterectomy	2 (1.2)
Myomectomy	1 (0.6)
Surgeon	
Resident	45 (26.5)
Assistant lecturer	47 (27.6)
Staff member	78 (45.9)

Data are expressed as frequency (percentage). CS, cesarean section.

Characteristics of bladder injuries among studied patients

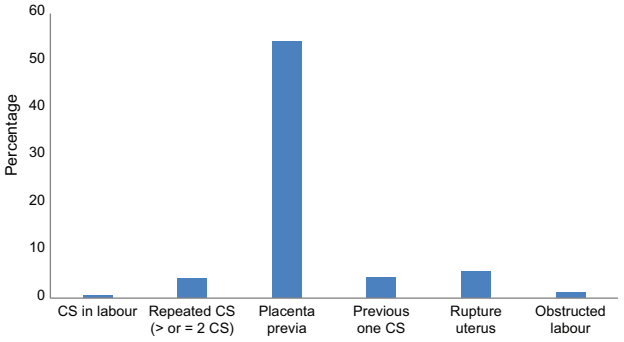
Of those patients with bladder injury, 143 (88.3%) patients had bladder dome injury and only one patient had posterior wall injury. Combined injury of balder dome and posterior wall occurred in 18 (11.1%) patients. Regarding repair of these injuries, repair in layers by vicryl 3/0 and in layers with omental patch repair was done in 133 (82.1%) and 29 (17.4%) patients, respectively (Table 6).

Figure 1



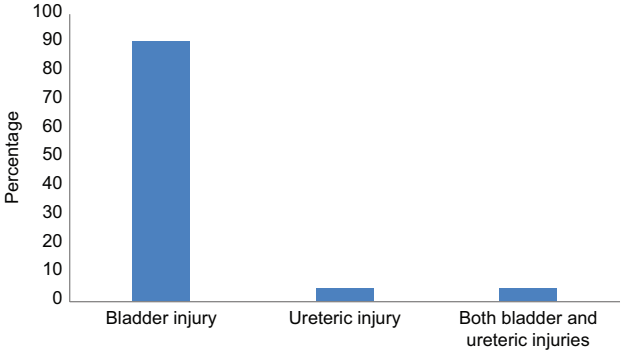
Frequency of iatrogenic urinary tract injury (UTI) in the study.

Figure 2



Possible risk factors for urinary tract injuries in obstetric surgeries. CS, cesarean section.

Figure 3



Type of injuries among the studied women.

Characteristics of ureteric injuries among studied patients

Only five (31.3%) patients from those with ureteric injuries had bilateral injuries, whereas the other 11 (68.7%) patients had unilateral injuries. A total of 14 (87.5%) patients had ligation injuries, whereas each of devascularization and transection was present in one patient (Table 7).

Regarding repair of ureteric injuries, four (25%), 10 (40%), and two (12.5%) patients underwent bilateral double J (DJ) stent, unilateral DJ stent, and reimplantation with unilateral DJ stent, respectively.

During the study period, 877 cases of placenta previa underwent surgery. Only 87 placenta previa cases were complicated by urologic injuries, with a percentage of 0.099%.

Discussion

During the period from March 2018 to March 2021, 20 636 cases of obstetric and gynecological surgeries were performed at Women Health Hospital Assiut University. In our study, we found 170 cases of urological injuries among those surgeries, representing an incidence of 0.82%.

Obstetric surgeries were done for 18 605 cases, in whom urological injuries occurred in 161 (0.86%) cases, whereas gynecological surgeries included 2031 cases, with nine cases of urological injuries being reported, representing an incidence of 0.44%.

The urological injuries included 162 (0.81%) cases of bladder injuries and 16 (0.07%) cases of ureteric injuries.

In our study, we reported only cases of UTIs among patients who underwent gynecological surgeries, a finding that is supported by the results of Gao *et al.* [6], who reported only seven cases of urologic injuries among cases of total laparoscopic hysterectomy performed during the period from January 2000 to July 2014.

Choosom and colleagues reviewed the gynecological surgeries performed at Songklanagarind Hospital during the period between January 2006 and December 2020. Among 19 003 gynecologic surgeries performed, 125 cases had urologic injuries with an overall incidence of 0.66%. Their results support our findings of urologic injuries in gynecologic surgeries (0.44%) [7].

In a 14-year period from 2004 to 2018, Safrai and colleagues reviewed 17 794 cesarean deliveries and had the incidence of bladder injury of 0.08% (14 cases) and ureteric injury of 0.06% (11 cases) and overall incidence of UTIs of 0.14%. In our study, we reported an overall incidence of 0.86% (161 injuries of 18 605 cases). The higher incidence in our study can be explained by the higher incidence of placenta accrete spectrum in 51% [8].

Among 97 cases of urological injuries reported by El-Mogy and colleagues, obstetric procedures had an incidence of 63.6% (62 cases) versus 36.1% (35 cases) for gynecological surgeries. These findings support our results of increased urological injuries in obstetric surgeries compared with gynecological surgeries [1].

During the period between 2009 and 2014, 8270 cases had obstetric and gynecological surgeries at University of Port Harcourt Teaching Hospital, Nigeria. Ekeke

Table 5 Type of injuries and time of detection among studied women

	N=170
Time of detection	
Intraoperative detection	167 (98.2)
Delayed detection	3 (1.8)
Type injury	
Bladder injury	154 (90.6)
Ureteric injury	8 (4.7)
Both bladder and ureteric injuries	8 (4.7)

Data are expressed as frequency (percentage).

Table 6 Characteristics of bladder injuries among studied patients

	N=162
Site of injury	
Bladder dome	143 (88.3)
Bladder dome and posterior wall	18 (11.1)
Posterior wall	1 (0.60)
Repair of injury	
In layers by vicryl 3/0	133 (82.1)
In layers with omental patch	29 (17.9)

Data are expressed as frequency (percentage).

Table 7 Characteristics of ureteric injuries among studied patients

	N=16
Laterality	
Unilateral	11 (68.7)
Bilateral	5 (31.3)
Type	
Ligation	14 (87.5)
Devascularization	1 (6.3)
Transection	1 (6.3)
Repair	
Bilateral double J stent	4 (25)
Unilateral double J stent	10 (40)
Reimplantation with unilateral DJ stent	2 (12.5)

Data are expressed as frequency (percentage).

et al. [9] reported 25 cases of urological injuries, representing an incidence of 0.31%. Injuries occurred in 0.16% of obstetric surgeries and 0.75% in gynecological surgeries.

The higher incidence of injuries in obstetric surgeries in our study can be explained by the prevalence of placenta previa in our community. However, we reported a lower incidence of urological injuries in gynecological surgeries compared with their report. This denotes a good surgical skill in gynecological cases. In our institute, we found that the incidence of urological complications following obstetric surgeries was 0.86%, whereas it was 0.44% in gynecological cases.

Regarding the time of diagnosis in our study, injuries were detected intraoperatively in 167 (98.2%) cases, whereas only three cases were diagnosed later. Contrary to our findings, Ekeke *et al*. [9] reported intraoperative diagnosis in eight (38%) cases, whereas late diagnosis occurred in 17 (68%) cases. This indicates our good surgical evaluation.

In our study, we reported the occurrence of bladder injury alone in 154 (90.6%) cases, whereas ureteric injury alone occurred in eight (4.7%) cases and both ureteric and bladder injuries in eight (4.7%) cases. Our results were similar to those reported by Santosa *et al*. [4], where they reported an incidence of bladder injury alone in 73.2%, ureteric injury alone in 19.5%, and combined bladder and ureteric injuries in 7.3%.

Among 97 cases of urological injuries, Lee *et al*. [3], reported 69 (71.8%) cases of bladder injury alone, 23 (23.9%) cases of ureteric injury alone, and four cases of vesicovaginal and ureterovaginal fistula.

Regarding repair of ureteric injuries in our study, DJ stent was used in 14 cases (four bilateral and 10 unilateral), whereas two cases underwent reimplantation with unilateral DJ stent. Ekeke *et al*. [9] reported ureteric repair as the most common procedure in their study. The procedures included ureteric reimplantation in seven cases (five unilateral and two bilateral), Boari flap repair in one case, and repair of ureteric laceration in 10 cases. In all cases, DJ stents were left *in situ* for an average of 6 weeks postoperatively.

El-Mogy and colleagues found that type of bladder injury was posterior wall and domal tear in seven cases, whereas 20 cases had domal tear only. All patients had primary repair in two layers using absorbable 2/0 sutures and urethral catheter fixed [1].

Both bladder and ureteric injuries can occur together. In our study, eight cases had combined bladder and ureteric injuries. Ekeke *et al*. [9] reported six cases of bladder and ureteric injuries of 25 (24%) cases in their study.

Previously, of 97 cases with urinary injuries, ureter was injured in 8.2% of cases, bladder injured in 27.8%of cases, and fistula injuries were seen in 63.9% of cases. All bladder and ureteric injuries were detected intraoperatively, whereas fistulae injuries were detected later on [1].

Our study could evaluate the incidence of urinary injury in different obstetric and gynecologic operations in Assiut major hospitals, and the findings were similar to those reported worldwide [1]. However, being a retrospective study is one of its drawbacks.

In conclusion, the incidence of urological complications of obstetric and gynecologic surgery was low, although these contributed to morbidity. Distorted pelvic anatomy from benign and malignant conditions was the major risk factor. Late presentation was not predominant. The outcome of different interventions and repair of injuries is satisfactory as no cases were complicated by urogenital fistula after repair, there was good identification of urologic injury, and perfect repairs decreased morbidity. There is a need to improve reporting of injuries in the theaters, so that accurate data may be available when needed.

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Nil.

Conflicts of interest
There are no conflicts of interest.

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