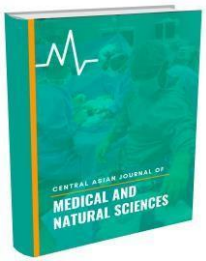

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Article

Urogenital Injury Assessment in Obstetrics and Gynecology Procedures

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Abstract: Urological injuries, particularly involving the bladder and distal ureter, are critical concerns in gynecological and obstetric surgeries, such as hysterectomy and Caesarean section. These complications, while infrequent, can cause significant morbidity, mortality, and psychosocial issues. This study aims to determine the prevalence and types of urological injuries resulting from these procedures. Conducted at Alfalluja Teaching Hospital and Al-Karama General Hospital in Baghdad, Iraq, from September 2021 to January 2023, the prospective case series included 21 patients who experienced iatrogenic bladder and ureter injuries. Detailed patient evaluations were performed, documenting injury type and frequency. Results showed that 0.18% of 11,861 procedures resulted in urological injuries, predominantly from obstetric operations (80.95%), with bladder injuries more common than ureteral injuries. Emergency procedures and previous Caesarean sections were significant risk factors. These findings underscore the importance of discussing potential urinary tract injuries with patients undergoing such surgeries to improve outcomes through early identification and proper management.

Keywords: Urogenital injuries, Obstetric procedures, Gynecological surgeries, Iatrogenic bladder injury, Ureteric injury

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1. Introduction

Human genital and urinary systems are closely related to one another in both adulthood and throughout embryonic development [1]. The scientific literature has extensive documentation of this link. Because the female genital system and the urinary tract are so near together, there is an increased risk of urinary system damage during pelvic surgical operations. Even though these incidents are not frequent, the consequences that follow may be serious and negatively affect the patients' quality of life [2]. The bladder and distal ureters are often found to be the organs in this area that sustain damage the most often during surgical procedures [3]. Particularly, bladder injuries have been reported to happen during obstetric and gynecological (OBG) operations such cesarean birth, pelvic organ prolapse (POP) correction, abdominal, vaginal, or laparoscopic/robotic hysterectomy, and mid-urethral sling implantation [4]. The organ most often damaged during cesarean section procedures is the bladder, according to research [5] [6], with incidence rates ranging from 0.104% to 0.28% [7], [8]. It has been repeatedly noted that the bladder is often involved in pelvic procedures. This emphasizes how crucial it is to use cautious planning and precise surgical methods in order to reduce the possibility of bladder damage during such surgeries. Overall, in order to maximize patient outcomes

and reduce the likelihood of problems, healthcare professionals participating in pelvic procedures must have a thorough awareness of the anatomical linkages and possible hazards in the urinary and genital systems.

Certain conditions may increase the likelihood of harm, such as a fundamental pathological illness that distorts normal anatomy or situations where major surgical events like adhesions or significant bleeding make it difficult to identify essential organs [9]. It is possible for the bladder to swell up greatly during protracted, obstructed labor. An improper uterine incision might cause the bladder to get involved. Iatrogenic bladder injuries are staged according to different grades. Contusion, intramural hematoma, and partial thickness laceration are all included in Grade 1. Less than 2 cm of extraperitoneal bladder wall laceration is included in grade 2. Grade 4 comprises intraperitoneal bladder wall tears larger than 2 cm, whereas Grade 3 includes extraperitoneal lacerations larger than 2 cm or intraperitoneal lacerations less than 2 cm. Bladder wall abrasions that impact the bladder neck or trigone that occur intra- or extraperitoneally are under grade 5 [10]. Even though they are uncommon after abdominopelvic surgery, iatrogenic ureteric injuries may have major repercussions such infections, sepsis, and perhaps even more serious problems [11], [12].

According to study results [13], ureteric injury is an uncommon but serious complication that may arise after abdominal and pelvic procedures, with an incidence rate ranging from 0.2% to 1%. The risk varies based on the kind of operation; rates for vaginal hysterectomy are predicted to be 0.02% to 0.5%, and for abdominal hysterectomy, they are expected to be between 0.03% to 2.0%. Surgery known to increase the risk of ureteric injury includes complete abdominal hysterectomy, bilateral salpingoophorectomy, radical hysterectomy (Wertheim), and Caesarian section [14]. During pelvic procedures, the lower part of the ureter is most often injured (51%) followed by the upper third (30%) and the middle third (19%) [15].

During surgical operations, ureteral damage may result from a number of processes, such as suture ligation and partial or total ureter transection caused by improper use of a clamp. Both during the surgical procedure and thereafter, these injuries may be identified. While 70% of ureteric injuries are discovered after surgery, the majority of bladder injuries are often discovered during the course of the treatment. The patient may suffer major repercussions if these injuries are not identified and treated right away.

The study explores long-term issues ranging from different types of urogenital fistulas to stricture and loss of kidney function. In an effort to assess the prevalence and features of urological injuries during gynecological and obstetric operations.

2. Materials and Methods

The investigation starts with a thorough analysis. The study is conducted as a prospective case series on the grounds of Alfalluja Teaching Hospital and Al-Karama General Hospital in Baghdad, Iraq. Alfalluja. Iraq covered a sizable data span from September 2021 to January 2023. After obtaining patient permission and receiving institutional clearance, all cases of iatrogenic bladder and ureteral damage that resulted from gynecological or obstetric operations were carefully included into the research. The patient profiles included a wealth of information, including age, parity, gravida, primary complaints, prior medical and surgical histories (including prior cesarean sections and pelvic surgeries, as well as any complications from these procedures), the reasons for the current surgery, and the specific procedures that were performed. Painting a clear image of the environment under examination, the records painstakingly detailed whether the surgeries were urgent or elective, obstetric or gynecological.

To sum up, ureteric damage is an uncommon but potentially dangerous side effect that may arise after pelvic and abdominal procedures. To avoid future problems and

encourage improved patient outcomes, healthcare practitioners must be watchful and aggressive in diagnosing and treating these injuries. The effect of ureteric injuries on surgical patients must be minimized by early identification and proper care. Both intraoperative and postoperative bladder and ureteral injuries were reported. The diagnosis was made using one of two methods: either directly visualizing the catheter (for example, by direct visualization), by subsequent investigations (RFT, US, CT, and retrograde cystogram), or by drainage from a surgical incision, increased output from surgical drains, vaginal leakage, ileus, apparent oliguria or anuria, urinary ascites, flank pain, and fever. When an injury was discovered right away during surgery, the precise location of the damage was noted. A bladder injury may happen in the dome, posterior wall, anterior wall, lateral wall, trigon, posterior wall, or fistula, among other places. Bladder damage was graded in five different categories: 1, 2, 3, 4, and 5. When ureters were injured, the amount of damage (upper, middle, or lower) and the location of the injury (left, right, or bilateral) were noted. Comprehending the breadth and gravity of bladder and ureteral problems that may occur during surgical operations depends on the detailed documenting of these injuries and their features. Precise documentation of these injuries facilitates enhanced patient outcomes during the perioperative phase and better care approaches. Whether it affects the upper or lower ureters, ureter injuries may take many different forms, including fistulas, ligations, transections, and contusions.

Minitab Statistical software version 19 was used to do statistical analysis on the study's data, and the findings were given as mean.

3. Results

The research revealed that out of the 11,861 obstetric and gynecological procedures performed over a year and a half, there were urological injuries in 21 patients, accounting for 0.18% of the total cases. Interestingly, none of these patients were found to have congenital anatomical abnormalities, indicating a prevalence of 0%. The patients were categorized into two groups based on age and parity table (1), with the analysis showing that higher parity is linked to an increased risk of urinary injury. This association could be attributed to the elevated likelihood of cesarean delivery in such cases.

Table 1. demographic patient data

Age		Number (n.=21)	percent	Mean
20-34 years		7	33.3	36.47
≥35years		14	66.7	
parity	niliparous	1	4.8	4.33
	Several parents >1	20	95.2	

Due to inadequate prenatal care, 19.05% of obstetrical operations were deemed elective, while the majority of treatments—61.9% of cases—were classed as emergencies. Regarding urological injuries, 76.2% of patients had prior cesarean sections performed, while 23.8% of cases had no history of such procedures. Pelvic adhesion is the reason for the high frequency of previous cesarean sections in instances of urological damage; of these, 52.4% had had numerous procedures, while only 23.8% had had a single procedure. Table 2 delineates the numerous reasons for obstetrical treatments that predispose persons to urological injury and provides a thorough breakdown of these situations. When it came to cases with morbidly adherent placenta, all of them ended with intrapartum hysterectomy (see Table 2). The involvement of midwives in two instances of obstructed labor was shown to be the reason, underscoring the crucial role that healthcare professionals play in mother outcomes. The information provided highlights the complexity of urological and obstetrical issues during labor, highlighting the need for

appropriate therapies and a thorough awareness of risk factors in order to provide the best possible care for patients. The lack of development in the early stage of labor, particularly in two cases of breech presentation, might be the reason for the three prior C.S. cases with additional indicators. Just four incidences of urological injuries were found during gynecological operations out of 517 patients in total; one of these cases constituted a combined injury involving both the bladder and ureter. A uterine fibroid was present in one instance, malignancy (associated with an ovarian neoplasm in one and a uterine sarcoma with metastases in another) was the reason for one of the gynecological procedures, and another case included dysfunctional uterine hemorrhage that did not improve with medication. A sliding ligature in the last instance made things more difficult and led to a combination injury. Crucially, there was no prior history of Caesarean section in any of the instances. The patient had two distinct cases of ureteral damage, one on the left side and one on the right. The two instances differed in the extent of their injuries; one showed up as a contusion, while the other as a ligature. Hematemesis was seen after Folley's catheter was implanted, and there was also urine leaking into the surgical area. An expert urologist evaluated one intraoperative bladder injury (IBI) case in order to evaluate the state of the ureters. A cautious therapy strategy was used in one of the instances where the ureteral damage was discovered during the surgical process as a consequence of hematuria brought on by a contusion in the right lower part of the ureter. On the other hand, the second instance was treated with a ureterostomy and the implantation of a double J stent when it was discovered postoperatively, some ten days after the patient complained of flank discomfort.

Table 2. demonstrated the signs of an obstetrical operation that puts a person at risk for urological harm

Indication		Number	Percentage
	≥2 Previous C.S	6	35.3
	In Labor	4	23.5
	Not giving birth	2	11.8
Impeded Work		2	11.8
Hysterectomy During Child Birth.		9	1 5
Prior C.S. with additional indication		3	17.6
Placenta adhering morbidly		5	29.4
Addenda.		9	1 5
Periclase		4	23.5

Table 3. showed the frequency of urological injuries in OBG

Kind of. Method	NO	Bladder Injury Percentage	Damage to The Ureters	Multiple Injuries	Urological Damage
Birthing	11,344	0.14	-0.009	0	0.15
Reproductive	517	0.58	0	0.19	0.77
Total	11861	0.16	0.008	0.00 8	0.18

Table 4. shown the incidence of urological injuries resulting from obstetric operations

obstetric practices	The number of steps	Bladder Injuries as a percentage	injury to the ureters	Multiple injuries	Total
C.S	11294	0.09	0.01	0	0.10
C.S without BTL*	11029	0.09	0	0	0.09
C.S with BTL	265	0	0.01	0	0.01
Intrapartum hysterectomy	50	0.05	0	0	0.05

Table 5. shown the prevalence of urological injuries resulting from gynecological operations

Gynecological Treatments	The Number of Steps	Bladder Injuries as a percentage	Injury to The Ureters	Multiple Injuries	Total
TAH±BSO**	215	0.58	0	0.19	0.77
Cystectomy of the ovaries Opherectomy	168	0	0	0	0
Surgical Removal of Myoma	68	0	0	0	0
The Laproscopy	66	0	0	0	0

4. Discussion

Iatrogenic urological injuries are a significant a cause of worry for patients and surgeons alike because of the possibility of long-term morbidity. Numerous consequences, such as valval dermatitis, hydroureteronephrosis, chronic UTIs, and even renal failure, may result from such injuries. Urinary tract damage was shown to occur often (between 0.5% and 1.5%), with a study-specific frequency of 0.18% [16], [17]. According to a 2007–2011 research done in Seoul, Korea [18], the incidence of urinary tract injuries after pelvic surgery varied from 0.2% to 1%.

In this investigation, the rates of bladder and ureteral injuries were reported as 0.16% and 0.008%, respectively, with a total incidence of 0.008% for both conditions. These results demonstrate the greater incidence of bladder injuries than ureteric injuries. They also correlate with other comparable series [19], [20], where bladder injury rates varied from 1.0% to 1.8% and ureteric injury rates from 0.4% to 2.5%.

Table 6. displayed the location and severity of the bladder damage

Site of injury	grade 1	grade 2	grade 3	%
Dome	5	1	4	50
Anterior Wall	0	0	1	5
Posterior wall	2	1	2	25
Trigon	0	0	0	0
Anterior Wall &posterior wall	0	0	1	5
Dome and Posterior Wall	0	1	2	15

The occurrence of bladder and ureteric injuries in gynecological and obstetric surgery was also covered by Raut et al. In their study, with rates of 1.23% and 0.11% in gynecological procedures and 0.67% and 0.33% in obstetric surgeries, respectively. Additionally, the research found that whereas the rates for bladder and combination injuries in gynecological procedures were 0.58% and 0.19%, respectively, they were substantially lower in obstetric surgeries, where the rates were 0.14% for bladder injuries and 0.01% for ureteric injuries. In this research, bladder injuries were the most prevalent form of injuries, especially when the bladder was isolated from the lower uterine portion in patients who had previously had cesarean sections. The results highlight the need for caution and accuracy while performing urological treatments in order to reduce the possibility of iatrogenic injuries and the problems that may arise from them. To improve patient safety and surgical results in urological procedures, further research and technological developments are required. The Royal College of Obstetricians and Gynecologists (RCOG) states that there is a higher risk of bladder damage after surgery, particularly in patients who have had adhesions from prior operations. These adhesions have the potential to destroy the safe surgical margin, which would make the dissection procedure difficult and greatly raise the risk of harm. According to RCOG figures, one out of every 1000 cesarean section cases is thought to result in bladder injury [21]. Furthermore, the reported rates of bladder damage after caesarean sections in Mumbai, Karachi, and Saudi Arabia are 0.44%, 0.46%, and 0.67%, respectively [22], [23], and [24], underscoring the variation in incidence rates across various geographic areas.

According to information from other sources, the incidence of bladder damage after cesarean sections normally falls between 0.104% and 0.28%. One research, for example, reported that the incidence of bladder damage was 0.22% throughout a ten-year period from 2000 to 2010 at Abha Maternity Hospital in Asir, Saudi Arabia. Furthermore, research has shown that the rates of harm after cesarean delivery may range from 0.02% to 0.5% [25], with a greater prevalence seen in women who had previously had cesarean sections. In addition, the incidence rates of ureteral injuries after cesarean births are found to range from 0.10% to a proportion that is comparatively smaller than that of bladder injuries. Overall, our results highlight the need of giving careful thought to and taking preventative steps to reduce the chances of bladder and ureteral injuries during surgical operations.

According to many investigations, the incidence of ureteric damage after cesarean section has been reported to vary from 0.027% to 0.09%. Although it is based on a two-center experience, this study was conducted in the Al-Karama General Hospital in Baghdad, Iraq. and at the Teaching Hospital of Alfalluja. Salutations. Iraq has a decreased frequency of bladder and ureter injuries following cesarean birth, with risks of 0.09% and 0.01%, respectively. There is a clear discrepancy in the injury rates across studies because of a number of variables that increase the risk of damage, including the surgeon's degree of experience, the scheduling of the operation, the purpose for the surgery, and the

existence of previous cesarean sections. Previous studies have looked at the risk factors for bladder and ureter damage after cesarean sections. In their study, Phipps and colleagues found that, in contrast to the control group, which had a 32% correlation, 67% of bladder injuries were related to prior cesarean births. Additionally, a recent research indicated that previous cesarean births were responsible for 72.4% of bladder injuries, which is equivalent to a five-fold greater risk of bladder injury. These findings are consistent with the 76.2% association identified in this study. Because so many factors contribute to the risk of injury, it is important to emphasize how likely it is for a patient to be injured during delivery. These factors, which may all have a major influence on the likelihood of bladder and ureter injuries after a cesarean section, include the particulars of the operation, the history of prior cesarean births, and the existence of pelvic adhesions. The thorough analysis of risk variables and injury rates from several studies emphasizes how crucial it is to take preventative action and make sure that the best surgical techniques are used in order to reduce the incidence of bladder and ureter injuries during cesarean births. In order to fully understand the intricate interactions between variables that raise the possibility of bladder and ureter injuries in this particular surgical setting, further study is necessary. In an investigation conducted by the Royal College of Obstetricians and Gynecologists (RCOG), it was shown that the frequency of bladder damage was higher in emergency C-sections (24%), as opposed to elective C-sections (16%). An additional study conducted recently revealed that bladder injuries occurred more frequently during emergency C-sections than during elective ones, with rates of 87.5% versus 37.5% respectively. This difference was statistically significant ($P<0.0001$), supporting earlier research findings. In spite of these findings, some research [26] has shown that elective cesarean sections may increase the risk of bladder damage. The research also showed that among individuals with numerous labor scars, emergency surgeries including cesarean sections and hysterectomies accounted for 61.9% of the instances. The high proportion of emergency cases may be explained by patients' lack of health information, which causes them to put off seeking medical attention and raises the possibility of urgent surgical procedures. A different study carried over ten years (2000–2010) at the Abha Maternity Hospital in Asir, Saudi Arabia, found adhesions in 95.8% of urological injuries. In that research, pelvic adhesions were found in 61.9% of urological injuries. The findings underscored the need of taking adhesion-related hazards into account during cesarean sections, since the study shown that intra-abdominal adhesions dramatically raised the chance of bladder injury by a factor of six. The research also clarified the effects of patients' delayed health-seeking behavior, which may have an influence on the kind of cesarean section that is done. These results emphasize the multifaceted nature of bladder injuries in obstetric treatment and further our knowledge of the difficulties underlying cesarean birth outcomes. According to the results of earlier studies the frequency of bladder and uterine adhesions occurring up to six times was noted in this examination. In this specific investigation, placenta previa, accreta, and peraccreta were seen in 23.8% of patients. This increased frequency may be explained by the fact that scars are becoming more common in the population being studied. An additional study found that almost 3 out of 5 patients with placenta peraccreta may sustain bladder damage during pelvic surgical procedures, even in the presence of good preoperative imaging examinations [27]. Carley M. E. conducted a research before. et al. reported occurrences of ureter and bladder damage in obstetric hysterectomy patients at 1.71% and 5.13%, respectively. According to another study [28], between one and four percent of cesarean hysterectomy patients had bladder damage. Furthermore, according to a different research, injury rates may rise to 5% or higher. It has been shown that between 0.5% and 8% of cesarean hysterectomy patients had ureteric damage. It's interesting to note that, in contrast to earlier research results, the present study indicated that the frequency of bladder injuries during obstetric hysterectomy was as low as 0.05% and that there were no ureteral injuries. Similar tendencies were also seen in the studies conducted by Carley M E et al, but with significantly greater injury rates.

A research found that the incidence of bladder and ureter injuries after abdominal hysterectomy was 0.58% and 0.36%, respectively. However, the rates for ureter and bladder injuries were reported to be 0.19% and 0.58%, respectively, in the present study. According to earlier research the rate of bladder damage after a hysterectomy is generally between 0.2% and 2.9%, while the incidence of ureteric injury is between 0.03% and 2%. A person may be more vulnerable to bladder and/or ureteral injuries during gynecological operations if they have a history of pelvic radiation, advanced cancers, cervical fibroids, broad ligament fibroids, distorted pelvic anatomy, pelvic adhesions, ovarian neoplasms, history of pelvic surgery, active infection, endometriosis, or an enlarged uterus. The current investigation indicated that the concurrent incidence of bladder and ureter damage was 0.006%, whereas it is claimed to be 9.1% in instances of injury [29]. According to a different American research, there is a 25% chance that ureteral damage and bladder injury will occur simultaneously, while there is a 12.5% chance that bladder injury will occur concurrently with ureteral injury. Critical side effects from gynecological operations include bladder and ureter injuries; effective therapy and preventative measures depend on knowing the risk factors and incidence rates. Additional investigation is required to identify other risk factors for these injuries and to create focused therapies aimed at lowering their frequency and enhancing patient outcomes.

Values that are greater than previously proposed are seen in cases with bladder injury. Numerous studies have reported that a considerable proportion of bladder injuries occur at the bladder's dome. These findings are consistent with the results of this particular investigation, which showed that 50% of bladder injuries occurred in the dome and 15% occurred in the dome plus the bladder's posterior wall [30]. It is interesting to notice that the pelvic portion of the ureter is often injured, with the left ureter suffering injuries more commonly than the right. The lower part of the ureter is the most often damaged place during surgical operations, accounting for 51% of cases; the middle and upper third of the ureter have been reported to have injury rates of 19% and 30%, respectively. Due to the small number of ureteric injury cases—just two—the distribution of ureteric injuries in this research was interestingly equal, with 50% occurring in the left ureter and 50% in the right ureter. In this investigation, there were two occurrences of ureteric damage, one from ligation and the other from contusion, both of which occurred in the lower portion of the ureter.

Among the most important abilities in the treatment of surgical patients is the ability to correctly detect an iatrogenic urinary tract injury. The ability of a surgeon to accurately diagnose these problems in a timely way is critical to guaranteeing the best possible result for the patient and averting further difficulties. Healthcare professionals must be very watchful and meticulous when evaluating patients who have had surgery, especially if it involves the urinary system, to ensure that any potential wounds or problems are identified and treated as soon as possible. In order to improve their diagnostic skills and give their patients the best care and treatment possible, healthcare professionals who are involved in the care of surgical patients must receive ongoing education and training in the recognition and management of iatrogenic injuries to the urinary tract. Healthcare professionals may enhance patient outcomes and reduce the risks of iatrogenic urinary tract injuries by being up to date on the most recent developments in diagnostic and treatment procedures.

The choice taken will often influence whether the patient stays in the operating room for a longer amount of time or develops considerable and perhaps permanent morbidity, preferably while still in the surgical suite. Every case of bladder injuries found in this study was discovered during the procedure. Urine in the surgical field should raise suspicions of bladder damage; however, bladder decompression using a Foley catheter may prevent urine leaks from being visible in the surgical field. According to research by Mann W. J. et al., 70% of ureteric injuries are discovered during surgery. In this investigation, partial

ureteric ligation was the reason for 50% of ureteric injuries that were discovered after surgery after a hysterectomy. When identifying patients with urinary tract injuries that were missed during surgery, a high degree of suspicion is essential. Patients may arrive with a wide range of symptoms, contingent on the amount of time elapsed after the first operation. Claims may include discomfort in the flanks or other symptoms. Important clinical indicators of possible urinary tract damage include fever, ileus, peritonitis, anuria, and frank fistula in addition to costovertebral angle discomfort. When it comes to the diagnosis of these kinds of injuries, computed tomography imaging with contrast may be useful since it can detect intraabdominal contrast extravasation. Other methods, such as intravenous pyelogram and retrograde urethrography, may be very helpful in identifying urinary tract injuries in addition to CT imaging, particularly when CT scans are not available [31].

Except for one case that was treated conservatively, every bladder injury case was effectively repaired with no documented morbidity. Similarly, there was no morbidity throughout the one-month follow-up period in a case of conservatively handled ureter damage. During the one-month follow-up, another case that was treated with a double J insertion technique also showed no signs of morbidity. It is important to remember that the true incidence of unintentional bladder and ureter injuries during surgeries is probably higher than what this study has documented. This is due to the fact that the report only included injuries that were identified during the surgical process or in the first postoperative phase. As a result, the actual frequency of some injury types may be underestimated since a portion of injuries may go undetected or take longer to manifest. It's possible for other injuries that weren't originally discovered to show up later on or not at all. After being released from the hospital, some patients could have shown symptoms of postoperative damage, which would have prompted them to seek treatment at other hospitals [32]. Accurately identifying these injuries is essential to delivering the right care and avoiding subsequent difficulties. Therefore, medical personnel need to be on the lookout for any possible postoperative injuries in their patients.

5. Conclusion

The study underscores the importance of recognizing and addressing the risk of urological injuries in gynecological and obstetric surgeries. Bladder injuries are more prevalent than ureteral injuries, highlighting the need for careful surgical planning and technique. Discussing potential urinary tract injuries with patients preoperatively is crucial for informed consent and improved surgical outcomes.

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