

Management of symptomatic urolithiasis during pregnancy: Clinical experience from a tertiary centre



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ABSTRACT

Background: Urolithiasis during pregnancy is a complex health problem that can affect maternal and fetal health, needs adequate understanding of the management options available and their relative pros and cons. Patient management needs involvement of obstetrician, radiologist and urologist, as a multidisciplinary team, to avoid any obstetric complications, such as spontaneous abortion and preterm delivery. **Aims and Objectives:** The aim of the study was to evaluate urolithiasis and its management in pregnant women at our tertiary care center. **Materials and Methods:** We analyzed data of 45 patients diagnosed with urolithiasis during pregnancy between January 2017 and March 2022. We evaluated patients age, gestational age history of urolithiasis, physical examination findings, routine laboratory findings, location, and size of the stone. The effectiveness and complications of the applied treatment methods were also evaluated. **Results:** The mean age of 45 patients included in our study was 25 (25.2 ± 4.8) years with mean gestational age of 18.2 weeks. The mean stone size was 10.2 mm and the most common symptom at the time of presentation to hospital was flank pain (73%). Kidney stones were detected in 26 patients and ureteral stones in 19 patients. Although conservative treatment was sufficient in 22 (48.9%) patients, 31 (51.1%) patients required surgical intervention. Major obstetric complications, such as preterm delivery and miscarriage, did not occur in any patients. **Conclusion:** Urolithiasis during pregnancy can pose a challenge to urologists, obstetricians, and radiologists, requiring a prompt diagnosis and urgent treatment. On failure of medical management, definitive endoscopic treatment of an acute stone event is a reasonable strategy. In determining the treatment options, fetal and maternal health should be of utmost importance.

Key words: Urolithiasis; Pregnancy; Ureterorenoscopy; DJ-stenting; Percutaneous nephrostomy

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INTRODUCTION

Urolithiasis during pregnancy is an important health problem that can potentially affect the well-being of both mother and fetus. It is the most common cause of urological-related abdominal pain in pregnant women.¹ In the previous studies, the incidence of urolithiasis during pregnancy has been reported from 1:188 to 1:4600, however symptomatic urolithiasis complicating pregnancy reported in 1:3300. The incidence of stones has previously been shown to be equal in pregnant and nonpregnant

women of childbearing age, studies evaluating the effect of geographical location show that the incidence of urolithiasis is increasing in industrialized societies, although there is minimal data about the role of geographical location in the incidence and prevalence of urolithiasis in pregnant women.^{1,2} About 80–90% of the patients are diagnosed in the second and third trimesters.

Urolithiasis may be associated with ureteral obstruction, upper urinary tract infection, perinephric abscess and eventually urosepsis that needs immediate hospitalization,

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surgical intervention, and causes considerable morbidity to the mother and fetus.

Urolithiasis in pregnancy poses both as a diagnostic and treatment dilemma due to the limitations in the use of imaging modalities and treatment methods during pregnancy. The presentation may mimic other acute conditions such as appendicitis, diverticulitis or placental abruption, thereby delaying diagnosis.^{3,4} Management of this condition often entails simultaneous multidisciplinary involvement of Obstetrician, Radiologist and an experienced Urologist. In addition, adverse effects with usage of anesthesia, radiation, medications, and surgery on mother and fetus, limit utilization of the full armamentarium of diagnostic and therapeutic modalities available to an urologist.

The incidence of physiologic hydronephrosis is as high as 90% on the right side and 67% on the left side during pregnancy, which typically resolves within 4–6 weeks in postpartum period.^{5,6}

The hydronephrosis in pregnancy is associated with multiple factors, mostly hormonal and mechanical factors. It is primarily caused due to ureteral obstruction secondary to compression by the gravid uterus at pelvic brim. The anatomic relations of the ureters at the pelvic brim explain the susceptibility for development of right hydronephrosis, as right ureter crosses the iliac artery at the pelvic brim, and the left ureter does so, more proximally and laterally. Differentiating between physiologic and pathologic hydronephrosis still is quite difficult.

Urolithiasis in pregnancy is caused by complex interaction of several physiological and biochemical factors. During pregnancy, the urinary tract, chiefly the upper compartment, undergoes physiological and anatomical changes that may promote lithogenesis along with changes in biochemical parameters (Table 1), may further aggravate the risk of urolithiasis.

Table 1: Changes in pregnancy affecting stone formation risk

Stone promotion	Stone inhibition
<ul style="list-style-type: none"> - Urinary stasis (mechanical compression, progesterone effect) - Increased GFR and Renal Plasma Flow - Lithogenic factors -Hypercalciuria (increased 1,25 (OH)² vit-D from placenta), decreased PTH. - Elevated urine pH - Increased excretion: Uric acid, Sodium, and Oxalate 	<ul style="list-style-type: none"> - Hypercitraturia - Increased excretion: <ul style="list-style-type: none"> • Magnesium, • Glycosaaminoglycans, • Urinary proteins like-Uromodulin, and Nephrocalcin.

GFR: Glomerular filtration rate

Conservative treatment is the first option in the treatment of urolithiasis, as approximately 70–80% of the stones can be passed spontaneously during pregnancy. However, 20–30% of patients may require surgical intervention.⁷ In cases, where invasive treatment is required, double-J stents or percutaneous nephrostomy are the preferred less invasive techniques for drainage. Insertion of a double-J stent can be done under ultrasound (US) guidance until the end of pregnancy and placement of percutaneous nephrostomy can be done in local anesthesia under US guidance without much bladder irritation. Extra-corporeal shock wave lithotripsy may affect the fetus and may cause premature birth or miscarriage.

Other methods such as Per-cutaneous nephrolithotripsy (PCNL) may be difficult due to anatomic distortion and may also provoke uterine contractions especially in third trimester.

In this retrospective study, we describe our experience with the diagnosis and management of symptomatic nephrolithiasis in pregnant women by assessing the clinical data and reviewing the current literature.

Aims and objectives

The aim of the study was to evaluate urolithiasis and its management in pregnant women at our tertiary care center.

MATERIALS AND METHODS

In this study, we retrospectively reviewed the data of pregnant women who presented in the Department of Urology, Sri Aurobindo Institute of Medical Sciences, Indore with complaints of flank pain between January 2017 and March 2022 after obtaining approval from the ethics committee (IEC) of our hospital.

Those patients who were diagnosed with urolithiasis were included in this study. Patient's age, gestational age, trimester, urolithiasis history, physical examination findings, serum creatinine level, complete blood count, complete urine analysis, urine culture, location, and size of the stone and treatment method were recorded.

Urolithiasis was diagnosed by the evaluation of the clinical findings, US findings and ureteroscopy findings. No use of X-ray and CT-scan was done for diagnostic purposes in our study.

Medical treatment comprised fluid therapy, safe analgesics, and antibiotic treatment according to the culture reports, if infection was present. Surgical treatment comprised percutaneous nephrostomy, ureteral DJ-stenting, and ureteroscopy as required for the patient.

Percutaneous nephrostomy was done with US guidance under local anaesthesia, and DJ stent was inserted under local anesthesia or sedation. Percutaneous nephrostomy was performed in the lateral position. Ureteroscopy was performed under general or spinal anesthesia after acquiring sterile urine culture in patients for definitive treatment. Ureteroscopy was performed with 7 Fr, 43 cm semirigid ureteroscope (Karl Storz, Germany) under direct vision.

Ureteric stones were classified as proximal or distal, depending on its location, proximal, or distal to Iliac artery pulsations. The stones were fragmented with Holmium-YAG laser or pneumatic lithotripter. All patients who underwent surgical treatment were referred to the obstetric and gynecology department for further obstetric evaluation in the early post-operative period.

SPSS 27.0 (IBM Corp., Armonk, NY) program was used in the analysis.

RESULTS

The mean age of 45 pregnant females treated for urolithiasis in our department was 25 (25.2 ± 4.8) years with the mean gestational age of 18 (18.2 ± 8.6) wks. The mean stone size was 10 mm (10.2 ± 5.4) (Table 2).

On evaluation 19 patients had a history of urolithiasis before pregnancy, 26 patients had no history of urolithiasis. The most common cause for presentation to hospital was flank pain (71%) followed by hematuria (11%) and fever (8.9%) (Table 3).

Urine culture study showed growth in 15 (33.3%) patients and was sterile in 30 (66.7%).

Among the total 45 patients 26 had renal stones, with most common location being pelvis (20%), followed by the lower pole (15.6%) and ureteral stones in 19 patients (Table 4).

Conservative treatment was successful in 22 patients (48.9%), 23 patients (51.1%) required surgical intervention (Table 5).

In 10 (22.2%) patients, DJ stenting was done for persistent pain or urinary tract infection and 2 (4.4%) patients received

percutaneous nephrostomy for persistent renal colic and pyonephrosis. Ureteroscopy was performed under anesthesia in 11 (24.4%) patients and stone fragmented with Ho-YAG laser or pneumatic lithotripter.

Major obstetric complications such as preterm delivery and abortion were not observed in any patients.

DISCUSSION

The most common non-obstetric cause of abdominal pain needing hospitalization in pregnant women is urolithiasis. Most (80–100%) of patients present with flank pain along with the lower urinary tract symptoms or hematuria. Incidence of microscopic hematuria was reported at a rate between 95% and 100% on repeated urinalysis examinations.⁸ In our study, it was found that 71% patients presented with flank pain, 11% with hematuria.

Table 3: Clinical findings of patients

Parameters	No of cases (n)	Percentage
Trimester		
First	14	31.1
Second	20	44.4
Third	11	24.4
Laterality		
Right	19	42.2
Left	26	57.8
H/o Urolithiasis		
Present	24	53.3
Absent	21	46.7
Symptoms		
Flank Pain	32	71.1
Hematuria	5	11.1
Fever	4	8.9
Dysuria	3	6.7
Frequency	1	2.2
Urine culture		
Positive	15	33.3
Negative	30	66.7

Table 4: Location of stones in the urinary system

Stone location	No of cases (n)	Percentage
Pelvis	9	20
Upper pole	6	13.3
Middle pole	4	8.9
Lower pole	7	15.6
Proximal Ureter	8	17.8
Distal Ureter	11	24.4

Table 5: Distribution of the treatment methods applied to the patients

Treatment Modalities	No of cases (n)	Percentage
Medical Therapy	22	48.9
DJ-Stenting	10	22.2
Percutaneous Nephrostomy	2	4.4
URS	11	24.4

Table 2: Patient demographics

Parameters	Range	Mean±SD
Age (years)	19–42	25.2±4.8
Gestational age (weeks)	6–36	18.2±8.6
Serum Creatinine (mg/dL)	0.5–2.4	1.2±0.4
Stone Size (mm)	3–36	10.2±5.4

Urolithiasis can lead to urinary stasis, causing urinary tract infection, pyelonephritis, pyonephrosis, and eventually obstetric complications.^{3,9}

About 80–90% of the patients are being diagnosed in the second and third trimester.¹⁰ In this study, 31.1% of the patients were diagnosed in the first trimester and 68.8% in the second and third trimesters.

Ultrasonography (US KUB) is recommended as first-line imaging for pregnant women with renal colic,^{11,12} with transvaginal route being preferred for distal ureter and uretero-vesical-junction. US has lower specificity and sensitivity as compared to CT scans, but it is harmless to patient and fetus.^{12,13}

Plain X-ray (X-KUB) and intravenous urography are rarely used due to risk of radiation exposure.

Although CT scans being the gold-standard diagnostic tool for renal colic evaluation in adults, they are avoided in pregnant women due to potential teratogenic effects (particularly in the first trimester). Nevertheless, it has been shown that radiation doses of less than 50^omGY during pregnancy are not associated with higher risk of malformation or pregnancy loss.^{14,15} Therefore, the judicious use of low dose CT scan protocols that expose the fetus to the lower radiation doses and maintain diagnostic accuracy, can be an option.¹⁶⁻¹⁸

Recently, non-contrast magnetic resonance urography (HASTE protocol) has been used in pregnant patients with urolithiasis with a better accuracy than US.¹⁹⁻²¹

For the diagnosis of urolithiasis evaluation of clinical findings, urinalysis findings, and US findings was done in our study. X-ray and CT-scan were not performed in any patient.

Pregnant women with urolithiasis may have a previous history of stones, reported to be between 24% and 30%. In our study, 42.2% of the patients had right, 57.8% had left urolithiasis, and among them 53.3% had a history of urolithiasis.

Medical treatment is still the first option for the treatment of urolithiasis in pregnancy. Medical treatment includes intravenous fluid, safe analgesics, anti-emetics and antibiotic treatment, in the presence of infection, as per the culture reports. The current literature shows spontaneous passage of stones in 50–84% patients with medical therapy. Although response to medical treatment was achieved in 48.9% of the patients in the present study, it was lower than that in the previous studies.

The MET drugs in pregnancy have not been well studied, and both their safety and utility is still unknown. Alpha blockers such as tamsulosin and alfuzosin are considered Pregnancy Category B drugs, while other nonselective alpha blockers such as terazosin and doxazosin, various calcium channel blockers, and glucocorticoid are all considered Pregnancy Category C drugs. As the various selective alpha 1a blockers have not been approved by the US food and drug administration, their use for treatment of stone disease is off-label.²²

Surgical intervention is required in 20–30% of pregnant women with urolithiasis.

Drainage procedures such as DJ stenting and PCN insertion done when definitive surgical treatment is unavailable or patient unfit for definitive management. Both procedures can be accomplished with minimal (local or sedation) anesthesia. Regular flushing is required during the remaining pregnancy due to high rates of encrustation and blockage in pregnant women.

Drainage alone may be indicated in stone patients with active infection, persistent vomiting, uncontrolled pain, large or bilateral stones, abnormal anatomy, obstetric complications, lack of multidisciplinary support, and lack of proper endourological or anesthetic resources.¹¹

For drainage of an infected collecting system both DJ stent and nephrostomy tube are equally effective, and any can be chosen depending upon the scenario.^{23,24}

Percutaneous nephrostomy being a minimally invasive method, provides early and effective drainage in patients with sepsis, done under local anesthesia and causing no radiation exposure. In our study, percutaneous nephrostomy catheter was inserted in 2 (4.4%) patients who presented with sepsis and pyonephrosis.²⁵

DJ stenting is an effective method for drainage, inserted under local anesthesia or sedation. However, it has disadvantages, as being a temporary treatment, needs to be changed periodically and causing irritative lower urinary tract symptoms.^{26,27} In this study, DJ stent was inserted in 10 (22.2%) patients to provide drainage and was changed every 3 months until the pregnancy terminated.

Ureterorenoscopy has become the definitive option for treating ureteral stones in pregnancy mainly due to being less invasive, so being safe in all trimesters for pregnant women who do not respond to medical treatment.²⁸

In ureteroscopy, pneumatic lithotripter and holmium: YAG laser are commonly used for stone fragmentation.²⁹

Pneumatic lithotripter and Ho-YAG laser were compared for stone fragmentation in a study by Bozkurt et al., and concluded that both methods are safe in pregnancy.²⁸ Tissue penetration is lower in holmium: YAG laser when compared with pneumatic lithotripter, posing a lower risk for fetal injury, and less stone migration.

Although, PCNL previously was considered an absolute contraindication in pregnancy. EAU 2022 guidelines state that its a safe and feasible treatment for patients with persistent symptoms when conservative treatment has failed.³⁰

Extracorporeal shockwave lithotripsy is an absolute contraindication during pregnancy due to the high complication rates.

No obstetric complications occurred in our study with either of the method.

Limitations of the study

The present study has some limitations such as small sample size and inclusion of only symptomatic patients in the study.

CONCLUSION

Urolithiasis during pregnancy can pose a challenge to urologists, obstetricians, and radiologists, requiring a prompt diagnosis and urgent treatment.

In determining the treatment options, fetal and maternal health should be of utmost importance.

Usually conservative, supportive management will result in spontaneous stone passage in majority of patients. In cases where surgical intervention is required, the treatment method should be chosen based on the clinical findings, location of the stone, available facilities, and experience of the Urologist. Uses of DJ stents, percutaneous nephrostomy, and ureteroscopy are considered safe in all trimesters at experienced centers. Although prospective studies will be required in future, for ending this debate.

Advances in endourologic equipment and techniques suggest that ureteroscopy, with holmium: YAG laser lithotripsy, is likely to be the safe and effective treatment option.

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