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ORIGINAL ARTICLE

Conservative Versus Surgical Management for Symptomatic Hydronephrosis Among Pregnant Women

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Abstract

Background: ***During pregnancy, changes occur in the morphology and physiology of the upper urinary tract. Some individuals may have symptoms as a result of these changes, and others may potentially develop pathological diseases. During pregnancy, systemic vascular resistance naturally falls along with increased cardiac output. Both the glomerular filtration rate and the renal blood flow increase by thirty percent. Serum urea and creatinine levels will consequently drop.***

Aim of the work: ***To compare the effectiveness of conservative and surgical approaches in treating pregnant women with acute, moderate, or severe symptomatic hydronephrosis.***

Patients and Methods: ***A prospective controlled study was conducted on 100 pregnant women diagnosed with symptomatic hydronephrosis who were admitted to the Obstetrics and Gynaecology department at Al-Azhar University during the study period from February 2022 to April 2023.***

Results: ***Among group A, there was a significant decrease among the severe group (8.18±2.52) than the moderate group (9.61±2.27) regarding serum BUN (P=0.044). On the other hand, the preterm labor and culture-positive rate did not significantly differ between the severe and moderate groups (P>0.05). Serum BUN, serum creatinine, WBC, and C-reactive protein did not significantly differ between group B's moderate and severe groups (P>0.05).***

Conclusion: Double pigtail stent implantation is an effective treatment for moderate to severe symptomatic hydronephrosis in pregnancy with a lower failure rate than conservative care. On the other hand, early or late problems may occur if ureteral stents are left in place for more than three months. Therefore, a cautious approach to treatment should remain the chosen course of action.

Keywords: Conservative management; Moderate hydronephrosis; Severe hydronephrosis; Pregnancy

1. Introduction

Maternal hydronephrosis may occur asymptomatically in almost 90% of pregnant women.[1] Therefore, it is widely acknowledged that pregnancy-related hydronephrosis in mothers is a normal physiological occurrence. However, in some instances of maternal hydronephrosis, medication is required. Therefore, it is critical to differentiate between maternal physiological dilatations and pathological obstructive hydronephrosis cases.[2]

To avoid the stigma attached to the name "maternal hydronephrosis," some authors propose calling this condition physiological maternal renal pelvic dilatation. Over 90% of pregnancies are thought to be affected by asymptomatic mild hydronephrosis, which is a common condition throughout pregnancy. [3]

Previous studies found that 0.2–3% of mothers had symptoms of hydronephrosis.[4] When urinary infections are present, untreated cases of symptomatic maternal hydronephrosis can result in fulminant pyelonephritis and urosepsis. If not, it can result in urosepsis, which might put the mother's life and the developing fetus in jeopardy. Premature birth risk is also significantly increased by acute antepartum pyelonephritis.[5] According to Wadasinghe et al.,[2] progesterone's influence on the smooth muscle in the urinary system and the pressing of the growing uterus into the ureter account for urine dilatation in pregnant women. This idea is further supported by other research on right-sided dilatations and twin pregnancies.

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The dextrorotation of the uterus, the ovarian vein's crossing of the ureter at the pelvic brim on the right and parallel on the left, and the left ureter's relative protection by the sigmoid colon are further potential contributory factors. [6] The first-line imaging diagnostic for detecting pregnant hydronephrosis is ultrasound (US); following birth, the uterine constriction is eased and virtually goes away a few weeks later.[7]

Moreover, years ago, the results of maternal prosopography during pregnancy were documented both quantitatively and qualitatively. The ultrasound examination has long been the cornerstone of obstetric imaging. Maternal hydronephrosis can be detected with an abdominal ultrasound as early as the first trimester of pregnancy. The US is a beneficial diagnostic technique for hydronephrosis. Nonetheless, several problems could distinguish pregnancy-dependent physiological hydronephrosis from stone-dependent obstructive hydronephrosis.[8] More specifically, because the stones are usually not in the middle of the ureter, a literature study suggests that ureteral stones account for 77–80% of obstructions that conventional gray-scale US cannot detect. Magnetic resonance imaging (MRI) might be more advantageous for certain patients. However, Dell'Atti et al.[7] state that the US should be the first place where pregnant women can have imaging. Conservative treatment of symptomatic hydronephrosis in pregnancy can result in excellent outcomes for the fetus and the mother, especially in situations of moderate hydronephrosis. Surgery, such as the placement of a double pigtail stent, should be performed when a patient's condition does not improve with treatment; this is particularly important for expectant mothers with severe hydronephrosis.[3]

Constant monitoring, painkillers, intravenous fluids, and, if necessary, antibiotics make up conservative therapy. Percutaneous nephrostomy and double pigtail (JJ) ureteral stent implantation are examples of surgical procedures. It is also frequently used in cases of severe non-responsive flank pain and significant hydronephrosis. The best course of action for patients with symptomatic maternal hydronephrosis is still being discussed.[1] Thus, this study aimed to evaluate the efficacy of conservative versus surgical methods in managing acute, moderate, or severe symptomatic hydronephrosis in pregnant patients.

2. Patients and methods

A prospective controlled study included one hundred pregnant patients with symptomatic hydronephrosis (pain, discomfort in the lower abdomen or back, frequent urination, and urinary tract infection) admitted to Al-Azhar University's Department of Obstetrics and Gynecology during the research period from February 2022 to April 2023.

All patients are divided into two groups as follows:

Group A: 50 patients with Conservative.

Group B: 50 patients with Double pigtails.

Ethical consideration: The study was authorized by the ethics committee of the medical faculty of Al-Azhar University. After being informed of the study's goal, every pregnant participant who had been studied provided written or informed consent.

Inclusion criteria: single-parenthood, individuals who are 16 weeks to 36 weeks pregnant, are diagnosed with symptomatic hydronephrosis.

Exclusion criteria: Renal malignancy, structural abnormalities of the renal parenchymal or collecting system (single kidney, horseshoe kidney, renal ectopia, duplicated collecting system, ectopic ureter, and extrarenal pelvis), prior surgical intervention to the kidneys or ureters, and renal tract calculi were the main methods used to detect these conditions. An MRI was done in cases where the ultrasonography could not wholly rule out ureteral stones, mainly middle ureteral stones.

All pregnant women underwent the following assessments: The variables that are measured are birth week, kind of delivery, birth sex, baby weight (FBW), body mass index (BMI), number of pregnancies, number of fetuses, arterial blood pressure, and 5-minute Apgar score. The general examination covered skin, local examination, renal analysis, and signs of hydronephrosis. Laboratory tests included urine analysis for hematuria and leukocyturia, white blood cell (WBC) count, creatinine levels, C-reactive protein, and serum blood urea nitrogen (BUN).

Urine cultures and renal sonography (Logic p7-intimex) were performed at the first visit before admission, then every week until normalization. The urine culture was not routinely redone if the results were negative.

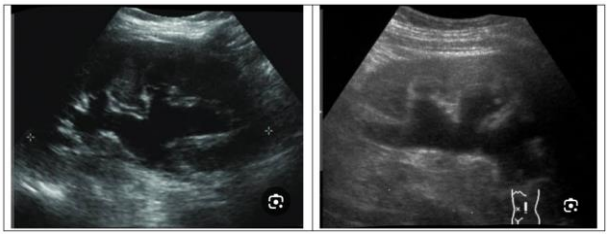

Figure 1. Shows sonography of hydronephrosis for our patients.

Sample size estimation

The sample size was calculated using PASS 11.0 and based on a past review of literature by Zwergel et al.[9] states that the maximal calyceal diameter was used to classify all pregnant women with symptomatic hydronephrosis; hydronephrosis measuring 5–10, 10–15, and >15 mm was categorized as mild, moderate, and severe, respectively. Sample size has been calculated using the following equation: n-(X2 x P x Q)/D2 at CT 95% Assuming = 0.05 (standard value of 1.96), we calculated that we would need 100 patients with symptomatic hydronephrosis (50 for each group) to achieve a power of 80% (0.8).

Statistical analysis

The data was gathered, tabulated, and statistically analyzed using an IBM-compatible personal computer (Armonk, NY: IBM Corp.) running the Statistical Package for the Social Sciences (SPSS) version 23. Quantitative data were presented as median and range using descriptive statistics. The Mann-Whitney test (U), Student's t-test (t), and Chi-square test (x^2) were examples of analytical statistics. P-values less than 0.05 were regarded as significant.

3. Results

In our study, Figure 1 depicts a flowchart of the research population in our investigation. 52 patients were eliminated from the 152 pregnant patients with symptomatic hydronephrosis admitted to the Obstetrics and Gynecology department at Al-Azhar University during the study period (thirty-two did not match the inclusion criteria, and thirty-two denied consent). After 100 patients consented, they were split into two groups: 50 patients each from Group B (double pigtail) and 50 patients from Group A (conservative), (Figure 2).

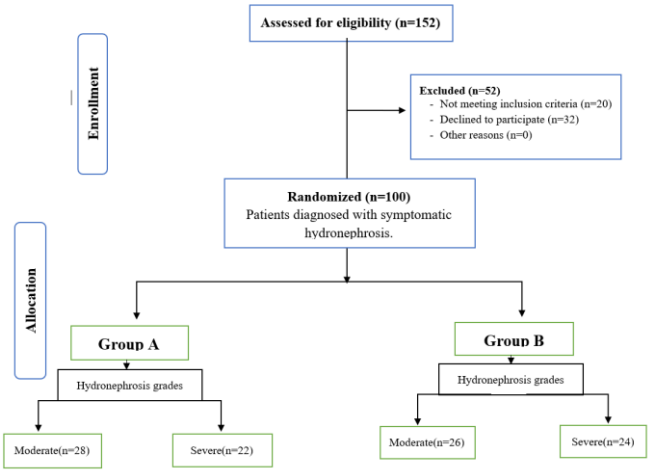

Figure 2. Flowchart of patients diagnosed with symptomatic hydronephrosis.

At five minutes, there was no discernible difference between the groups in terms of APGAR score, FBW, amniotic fluid index, DBP, or SBP (P>0.05), (Table 1). Furthermore, no statistically significant variations were seen concerning hospitalization, premature labor, or culture-positive rates (P>0.05).

Table 1. Demographic data among the studied groups (N=100).

VARIABLES	GROUP A (N=50)	GROUP B (N=50)	T	P VALUE
AGE /YEARS MEAN ± SD RANGE	23.58±6.95 19-40	26.04±6.32 20-41	0.406	0.685
GA/WEEKS MEAN ± SD RANGE	27.92±1.63 26-30	29.12±1.51 28-32	0.318	0.751
GA AT DELIVERY (WEEKS) MEAN ± SD RANGE	36.52±0.99 35.9-37	37.48±1.03 36-38.2	0.197	0.844
BMI MEAN ± SD RANGE	20.76±1.91 19-24	22.38±1.78 20-24.1	0.866	0.841
NUMBER OF PREGNANCIES MEAN ± SD RANGE	1.94±1.02 1-4	2.24±1.08 1.2-3.3	1.429	0.156
NUMBER OF FETUSES MEAN ± SD RANGE	2.00±0.93 1-4	2.08±0.88 1.08-2.9	0.444	0.658
FBW (G) MEAN ± SD RANGE	3208.00 ±225.96 2900-3700	3252.00±208.48 2900-3700	1.012	0.314
APGAR SCORE AT 5 MEAN ± SD RANGE	4.98±0.14 4-5	4.94±0.24 4-5	1.016	0.312

BMI: Body mass index GA: Gestational age t: student t test

Nevertheless, Table 2 shows that Group A's failure rate (38%) was considerably greater than Group B's (8%), (P<0.001). Serum BUN, serum creatinine, WBC, C-reactive protein, presence of hematuria and leukocyturia, hydronephrosis grades, primipara status, and hydronephrosis site did not significantly differ between the groups (P>0.05) (Table 3).

Table 2. Outcome among the studied groups (N=100).

VARIABLES	GROUP A (N=50)		GROUP B (N=50)		*T*	*P-VALUE*
HOSPITALIZATION (DAYS) MEAN ± SD RANGE	1.08±0.97 0-3		1.06±0.87 0-3		0.109	0.913
VARIABLES	N	%	N	%	X^2	P-value
FAILURE RATE (%) NO YES	31 19	62 38	46 4	92 8	14.918	<0.001*
PRETERM LABOR NO	50	100	50	100	---	---
CULTURE POSITIVE RATE (%) NO	50	100	50	100	---	---

t: student t-test X2: Chi-square test

Table 3. Lab investigations and hydronephrosis data among the studied groups (N=100).

VARIABLES	GROUP A (N=50)		GROUP B (N=50)		T	P-VALUE
SERUM BUN (MG/DL) MEAN ± SD RANGE	7.88±2.46 5-12		8.94±2.45 6-12		0.081	0.935
SERUM CREATININE (MG/DL) MEAN ± SD RANGE	1.03±0.12 0.9-1.2		0.94±0.12 0.8-1.06		0.147	0.884
WBC (103/ML) MEAN ± SD RANGE	4.90±2.56 2-8		3.92±2.45 1.5-6.4		U= 0.160	0.873
C-REACTIVE PROTEIN MEAN ± SD RANGE	17.50±5.48 10-25		16.15±5.06 10-20		0.686	0.498
C-REACTIVE PROTEIN	N	%	N	%	X^2=0.437	0.509
NEGATIVE	34	68	37	74		
POSITIVE	16	32	13	26		
PRESENCE OF HEMATURIA AND LEUKOCYTURIA	22	44	26	52	2.395	0.495
NO	2	4	4	8		
HEMATURIA	24	48	17	34		
LEUKOCYTURIA	2	4	3	6		
HEMATURIA AND LEUKOCYTURIA						
HYDRONEPHROSIS GRADES	28	56	26	52	0.161	0.688
MODERATE	22	44	24	48		
SEVERE						
PRIMIPARA (%)	29	58	28	56	0.041	0.840
NO	21	42	22	44		
YES						
HYDRONEPHROSIS SITE (%)	9	18	12	24	2.931	0.231
RIGHT	6	12	11	22		
LEFT	35	70	27	54		
BILATERAL						

BUN: Blood urea nitrogen WBC: White blood cell t: student t test X2: Chi square test U: Mann-Whitney test

Hospitalization (1.50±1.06) and failure rate (13.6%) in Group A were significantly higher in the severe group than in the moderate group (0.75±0.75 and 0%, respectively) (P<0.05). There was no discernible difference between the severe and moderate groups (P>0.05) regarding premature labor and culture-positive rates. In Group B, Hospitalization, failure rate, preterm labor, and culture-positive rates did not significantly differ between the severe and moderate groups in Group B (P>0.05), (Table 4).

Table 4. Relationship between Hydronephrosis grades and outcome data among the studied groups (N=100).

VARIABLES	GROUP A (N=50)				P-VALUE	GROUP B (N=50)				P-VALUE
	Moderate (n=28)		Severe (n=22)			Moderate (n=26)		Severe (n=24)		
HOSPITALIZATION (DAYS) MEAN ± SD	0.75±0.75		1.50±1.06		0.008*	1.04±0.92		1.08±0.83		0.857
VARIABLES	N	%	N	%	P-value	N	%	N	%	P-value
FAILURE RATE (%)	28	100	19	86.4	0.044*	14	53.8	17	70.8	0.216
NO	0	0	3	13.6		12	46.2	7	29.2	
YES										
PRETERM LABOR NO	28	100	22	100	---	26	100	24	100	---
CULTURE POSITIVE RATE (%) NO	28	100	22	100	---	26	100	24	100	---

In Group A, the moderate group (9.61±2.27) had a higher serum BUN level than the severe group (8.18±2.52) (P=0.044). Regarding premature labor and the rates of culture-positive births, there was no discernible difference between the severe and moderate groups (P>0.05). Serum BUN, serum creatinine, WBC, and C-reactive protein did not significantly differ (P>0.05) between the moderate and severe groups in Group B (Table 5).

Table 5. Relationship between Hydronephrosis grades and lab investigations among the studied groups (N=100).

VARIABLES	GROUP A (N=50)				P-VALUE	GROUP B (N=50)				P-VALUE
	Moderate (n=28)		Severe (n=22)			Moderate (n=26)		Severe (n=24)		
SERUM BUN (MG/DL) MEAN ± SD	9.61±2.27		8.18±2.52		0.044*	9.15±2.31		8.71±2.63		0.529
SERUM CREATININE (MG/DL) MEAN ± SD	0.93±0.13		0.96±0.12		0.383	0.96±0.11		0.92±0.13		0.234
WBC (103/ML) MEAN ± SD	4.25±2.08		5.73±2.90		0.051	4.81±2.28		4.83±2.66		0.971
C-REACTIVE PROTEIN MEAN ± SD	17.50±6.12		17.50±5.40		1.000	18.33±4.08		14.29±5.35		0.151
C-REACTIVE PROTEIN	N	%	N	%	0.071	N	%	N	%	0.624
NEGATIVE	22	78.6	12	54.5		20	76.9	17	70.8	
POSITIVE	6	21.4	10	45.5		6	23.1	7	29.2	

BUN: Blood urea nitrogen WBC: White blood cell

Regarding primipara status, hydronephrosis site, and the presence of hematuria and leukocyturia, there were no significant differences between the severe and moderate groups in either of the two groups

(P>0.05), (Table 6).

Table 6. Relationship between Hydronephrosis grades and Hydronephrosis data among the studied groups (N=100).

VARIABLES	GROUP A (N=50)				P-VALUE	GROUP B (N=50)				P-VALUE
	Moderate (n=28)		Severe (n=22)			Moderate (n=26)		Severe (n=24)		
	N	%	N	%		N	%	N	%	
PRESENCE OF HEMATURIA AND LEUKOCYTURIA					0.108					0.726
NO	16	57.1	6	27.3		13	50	13	54.2	
HEMATURIA	1	3.6	1	4.5		3	11.5	1	4.2	
LEUKOCYTURIA	11	39.3	13	59.1		8	30.8	9	37.5	
HEMATURIA AND LEUKOCYTURIA	0	0	2	9.1		2	7.7	1	4.2	
PRIMIPARA (%)	17	60.7	12	54.5	0.661	16	61.5	12	50	0.412
NO	11	39.3	10	45.5		10	38.5	12	50	
YES										
HYDRONEPHROSIS SITE (%)	5	17.9	4	18.2	0.064	6	23.1	6	25	0.435
RIGHT	6	21.4	0	0		4	15.4	7	29.2	
LEFT	17	60.7	18	81.8		16	61.5	11	45.8	
BILATERAL										

4. Discussion

Asymptomatic moderate hydronephrosis is found in over 90% of pregnancies and is regarded as a normal condition throughout pregnancy. In mid-pregnancy, the right kidney often exhibits more obvious physiological hydronephrosis than the left. It is thought that the gravid uterus pressing on the ureters after delivery causes the dilatation of the urinary tract that happens a few weeks after delivery.[10] Hospitalization, the rate of preterm labor, and the culture-positive rate did not differ statistically across the groups in this study. Group A experienced 38% failures more frequently than Group B, which had an 8% failure rate. Moderate to severe symptomatic hydronephrosis associated with pregnancy is rare.

A conservative approach might be used to treat 96% of the cases, and most cases of pregnancy-related symptomatic hydronephrosis are minor.[6,11,12] Eighty percent of the moderate and severe symptomatic hydronephrosis cases in the Tsai et al.[4] trial responded well to conservative therapy. Furthermore, it demonstrated that the conservative treatment used in this study had a higher failure rate (20%) than the double pigtail treatment group, which experienced a 100% success rate. A double pigtail stent was inserted in all patients who did not respond to conservative treatment; this procedure was effective and trouble-free. Double pigtail stent implantation seems to be a more effective treatment for moderate to severe hydronephrosis during pregnancy than conservative methods. In addition, the fetus is at reduced risk because the pigtail insertion procedure exposes less radiation to the body.

The procedure provides an average increased risk of 1 in 100,000 for heritable sickness to the fetus and 1 in 43,000 for cancer induction, according to Hellawell et al.[13]

Specific results indicate that even while pigtail stent implantation helps treat symptomatic hydronephrosis, double pigtail urethral stents can cause early and late problems.[14,15] Patient discomfort, signs of an irritable bladder, bacteriuria with or without UTI, urosepsis, hematuria, or flank pain are early consequences. Subsequent problems include fragmentation, calcification, and upward or downward stent migration. If the pigtail stent is implanted and kept in place for less than three months, there is a slight chance that something may go wrong.[15] Tsai et al.'s research indicates that the average recovery period following stent implantation was 4.5±1.3 months. Only four patients, meanwhile, reported mild, transient flank discomfort. There were no late issues for any patients.[4]

In our study, the studied group did not exhibit significant differences in serum creatinine, WBC, C-reactive protein, or BUN. The 2021 study by Bayraktar et al.3 found that the VAS scores of the surgical therapy group were higher. However, the two groups had no appreciable variation in the WBC and CRP levels. Data from the literature further supports our conclusions. In individuals with symptomatic hydronephrosis, CRP levels are typically utilized to evaluate treatment response rather than to predict treatment outcomes.[4] Tsai et al.'s prospective randomized trial showed no significant change in WBC, BUN, or creatinine levels between the surgical and conservative treatment groups. Even though high CRP and WBC levels seemed to indicate surgical therapy, a study by Ercil et al.[1] found that the surgical treatment group had higher levels of CRP, WBC, and VAS, which enhanced the likelihood of surgical treatment. Furthermore, no statistically significant difference between the treatment groups was observed in the BUN and creatinine levels. However, the surgical treatment group exhibited significantly greater WBC levels in both

trimesters compared to the conservative therapy group.

The authors hypothesize that the primary causes of this discrepancy could be attributed to the enormous number of patients or the complicated individuals in their study group, mainly to Ercil et al.'s higher-than-average percentage of patients who had bladder infections.[1] Nonetheless, it is essential to consider the possibility of obstruction caused by a urinary tract infection in pregnant individuals experiencing low back or flank pain. If necessary, these infections should receive the proper treatment.[1,16] The analysis of the groups' hydronephrosis grades, primipara, hydronephrosis locales, and prevalence of hematuria and leukocyturia did not show any statistically significant differences. In this regard, women who are primigravids seem to be more vulnerable to hydronephrosis than multiparous women.[6,12] Moreover, Mutiso and Sequeira,[17] found that all the patients in the patient series we looked at were first-time mothers. There is some disagreement over the reasoning for this. However, one theory is that a primigravida's renal system might be more susceptible to compression than a multigravida's.[18,19] Furthermore, dilatation appears to commence in the second trimester, supporting the theory that mechanical compression is the primary pathophysiologic mechanism of hydronephrosis.[12, 19]

In our study, ureter hydronephrosis during pregnancy may be caused by the following physiological components: i) Hormonal factors: the ureteral smooth muscle is relaxed by progesterone.[20] The right side exhibits more evident structural abnormalities due to the oblique axis of the uterus and the anatomical arrangement of the ureters in the pelvic area. Other obstructive reasons include extrinsic ureteral compression.[21] Compressive factors, such as uterine hypertrophy, lead to dilated iliac vessels, producing ureteral compression and vascular dilatation.[20] It is possible that loose tissue muscle, which is more developed in multiparous women, is why UHN is more evident in primiparous women. More pronounced structural changes are seen in the right kidney; research from the literature suggests that about 85% of people have this disease. [22, 23]

In contrast to the left UHN (67.24%), which was either not identified at all or connected to the right UHN in the group under examination, the right UHN was found in all 58 cases (100%), according to a study by Ciciu et al.[8] The uterus's dextrorotation during pregnancy and the right ureter's compression by the iliac and ovarian arteries could be the cause of these findings. [24] The right ureter crosses the iliac and ovarian vessels at a narrower angle in the pelvic region than the left ureter, which runs parallel to them.[20] The pyelocaliceal system's dilatation is believed to be partially explained by progesterone's role in smooth muscle relaxation; however, this theory is contradicted by the asymmetric dilation of the two ureteropelvic zones.[25, 26] According to the current study, there was no discernible difference between groups A and B regarding primipara, hydronephrosis locations, hematuria, and leukocyturia among the severe and moderate groups. Research by Farr et al.[16] found that in addition to acute pain symptoms, hydronephrosis can cause treatment-resistant urosepsis and renal failure. Additionally, Saylam et al.[27] found that, in line with the incidence reported in other studies, most patients' symptoms significantly improved after 3 to 5 days of medical care, 96%. Although Zwergel et al.[9] suggested using β1-adrenoreceptor blockers for acute hydronephrosis in pregnancy, we did not try them.

We took this action out of concern for the safety of the expectant mother and her unborn child. The research indicates that conservative treatment is possible for 70–80% of pregnant women with symptomatic hydronephrosis.[9,12], Saylam et al. [27] also credits a high value of 96.1%, frequent antibiotic administration, patient compliance, and attentive monitoring for this rate. Saylam et al. also noted that individuals displaying symptoms and signs of urosepsis had a ureteral double-J stent inserted immediately. None of the side effects that were possible with this treatment, like pyelonephritis, stone formation, catheter migration, and vesicoureteral reflux, happened to them.[27,28]

Only the suprapubic area was noted as painful or uncomfortable by patients using a double-J stent. It is interesting to note that none of the patients required the more extreme methods that were previously used, including percutaneous nephrostomy. [29, 30] It is unknown how preterm delivery affects those without urolithiasis who suffer renal colic. According to Ercil et al., [10] out of 211 patients (4.7%) with symptomatic physiological hydronephrosis experienced early labor.[31] Furthermore, the group receiving surgical therapy had a noticeably greater prevalence of preterm births. Despite the rarity of symptomatic hydronephrosis in pregnant women, a 2021 study by Saylam et al. demonstrated the necessity for special attention for these individuals. All patients with bacteriuria, flank pain, or acute urinary infections in pregnant women should get conservative therapy. Urinary ultrasonography should be performed on these individuals, and they should also receive close supervision.

Additionally, Chitale and Chitale,[32] reported that while symptomatic hydronephrosis during pregnancy was just 0.2% in other studies, it was 7.4% in their study.[6]

4. Conclusion

According to the instances discussed, symptomatic hydronephrosis is an uncommon pregnancy issue that often responds satisfactorily to conservative treatment. However, a pregnant woman should be suspicious if she experiences bilateral flank pain that does not go away. Conservative therapy is less likely to fail than double pigtail stent implantation when treating moderate to severe symptomatic hydronephrosis in pregnancy. However, problems could occur early or late if the ureteral stent is left in place for over three months. Therefore, conservative care should always be the initial line of treatment.

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Conflicts of interest

There are no conflicts of interest.

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