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ORIGINAL ARTICLE

Evaluation of feto-maternal outcomes among pregnant women with co-existence of ureteric stones and urinary tract infections.

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ABSTRACT… Objective: To determine the fetal and maternal outcome among pregnant women who are diagnosed positive for co-occurrence of Ureteric Stones and Urinary Tract Infections during their third trimester. **Study Design:** Cross Sectional Analytical study. **Setting:** Urology and Gynecology Department of Mukhtar A Sheikh Hospital Multan. **Period:** 6th February 2020 to 6th July 2020. **Material & Methods:** Pregnant women in their third trimester were confirmed for the presence of ureteric stones and urinary tract infections through imaging and urine culture studies. Cases confirmed for the disorders were then evaluated for any complications during the remaining gestational period. The diseased group was compared with healthy pregnant women. **Results:** Out of 200 selected women, 60 (27.7%) were positive for comorbidity of two illnesses. Among pregnancy outcomes, Preterm Labor (46.6%) has the highest rate of incidence followed by Preeclampsia (41.6%), Oligohydramnios (10.6%), Abortion (1.6%), Operative Intervention (cesarean section) (36.6%), Acute Renal Failure (5%), Acute Respiratory Distress Syndrome (11.6%), and Septicemia (1.6%) among the study group. Similarly, fetal outcomes such as fetal demise (1.6%), Low birth weight babies (58.3%), and premature babies (51.3%) were statistically significant in the study group than the control group. **Conclusion:** The coexistence of ureteric stones and UTIs is largely affecting pregnant population and this co-morbid condition has a significant impact on fetomaternal health.

Key words: Fetomaternal Health, Pregnancy, Renal Outcomes, Third Trimester, Ureteric Stones, Urinary Tract Infections.

INTRODUCTION

Gestation is often marked by anatomical and physiological modifications of the urinary tract which might result in the development of pathological conditions. The changes mostly include a 1-1.5cm increase in the size of the kidney; expansion of renal vascular and interstitial volume by 30% of actual volume and rise in glomerulus expansion rate (GFR) by around 40-50%.[1] Further, progesterone acts on smooth muscles of the urinary tract ending up in the dilation of the renal pelvis and ureters.[2] Consequently, the urinary system becomes capable of storing 200-300ml of urine and causing urinary stasis.[3] This set of events lead to several urological problems including the formation of ureteric stones and the manifestation of urinary tract infections.

Urolithiasis is defined as the formation of stones in any organ of the urinary system.[4] About 1 in every 200 to 1 in every 2000 pregnant women report the incidence of renal calculi. The prevalence rate, however, remains uncertain due to limitations in the use of imaging diagnostic techniques and the associated obstetric complications. These stones are mostly made up of calcium phosphate and become apparent during the second or third trimester of pregnancy.[5] Moreover, in certain cases, the symptoms of urolithiasis imitate another emergency disease, such as diverticulitis and appendicitis, therefore delaying the accurate diagnosis till the 2nd or 3rd trimester in around 80-90% of pregnancies.[6]

Urinary tract infection (UTI) is characterized as the detection of a minimum of 100,000 organisms per

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milliliter of urine without any clinical manifestation, or as more than 100 organisms/mL of urine with accompanying pyuria (>5 WBCs/mL) in a clinically symptomatic patient. If left untreated, around 17% to 40% are at risk of developing pyelonephritis. UTI in pregnancy is considered a significant and unacknowledged risk factor for adverse fetal and maternal outcomes in low and middle-income countries, including pregnancy mortality. Recent data, based on middle-income countries of five continents, shows that UTI affects 3 to 35% of pregnancies with a pre-term birth rate greater than ten percent.[7] Women are generally at higher risk for UTI than men and pregnancy further creates an environment conducive for UTI by dilating the renal pelvis and uterus and because of the increasing weight of the fetus.[8] Similarly, the hormonal effect, plasma volume expansion, glycosuria, concentrated urine, and immunosuppression during pregnancy are some of the factors that lead to developing conducive conditions for the growth of bacteria. The causative agents usually peak during the 22-26th month of gestation.

Although the consequences of individual occurrence of both of the two diseased conditions during pregnancy are well-established in the literature, but, as per our knowledge, no study has been conducted to determine the clinical outcomes if the two conditions coexist in pregnant women. The literature guides that in certain cases Ureteric stones and UTI severely affects the fetomaternal health, therefore it is anticipated that coexistence of the two diseases enhances the probability of multiple critical conditions. We have designed this study to ascertain the fetal and maternal outcome among pregnant women who are diagnosed positive for co-occurrence of Ureteric Stones and Urinary Tract Infections during their third trimester.

MATERIAL & METHODS

A cross-sectional analytical study was conducted for one year from 6th February 2020 to 6th July 2020 in urology and gynecology department of Mukhtar A Sheikh Hospital, Multan to determine the fetal and maternal outcome among pregnant women who are diagnosed positive for co-occurrence of Ureteric Stones and Urinary Tract Infections during their third trimester. A total of 200 women, who were in their third trimester of pregnancy, with or without the symptoms of urinary stones and urinary tract infection were included in the study and were selected randomly through random sampling technique after their informed consent.

The sample size was calculated with the 80% value of power set and p-value of less than 0.05. Women with a history of any renal disorder, renal intervention, or any other illness were excluded from the study to eliminate the risk of bias due to effect of confounding variables. Ethical approval was sought from ethical committee of the hospital (MASH/3210/2020). Initially, gestational age of all participating women was ascertained by First-trimester ultrasound examination. All the participants of the study went through well-established diagnostic protocols to confirm ureteric stones and urinary tract infection.[9] Renal stones were diagnosed using laboratory tests including Urine R/E, renal function tests, renal function tests, complete blood count, serum electrolytes analyses, and serum calcium level, followed by imaging evaluation through ultrasonography, magnetic resonance imaging (MRI). In few cases where regular diagnostic criteria was not helpful, computerized topography (CT) and intravenous urography were performed with proper fetal shielding. For diagnosis of urinary tract infections, clean catch, midstream urine was collected and cultured on blood and MacConkey agar for 24 hours at 37 C. Microscopic analyses of urine was also carried to detect pus and other abnormal findings. A bacterial count of $>10^5$/ml on culture plates coupled with > 5 pus cells/high power cells were considered for bacterial infection. The laboratory results were discussed with a senior urologist to remove the risk of bias in the selection of participants. Women who were diagnosed positive for both ureteric stones and UTI were categorized as a study group while women who were negative for both diseases were included in the control group. These participants were then observed for the remaining gestational period for any possible fetomaternal outcome. The clinical outcomes were also assessed by

keeping in close coordination with the physicians of the women.

The collected data were analyzed through SPSS version 25.0. Continuous variables were compared between both groups through the student's t-test whereas categorical data were contrasted through the chi-square test. All analyses were two-tailed and $p<0.05$ was considered as the threshold for significance.

RESULTS

A total of 200 pregnant women were selected for the initial screening procedure for ureteric stones and urinary tract infection out of which 60 (27.7%) were positive for both illnesses. Among the diseased population, age played a significant role where 55% were in the age bracket of 20- 25 followed by 21.6% in 16-20; 20% in 25-30, and 8.3% in 30-35. 80% of women were multiparous against 20% of primiparous women. No significant difference was found in terms of locality, urban or rural, in the study population while 50% were treated through double J stenting or nephrostomy tube in contrast to 16.6% of ureteroscopy treated patients ($p=0.002$). Similarly, treatment through antibiotics remains significantly high (data not presented).

Among pregnancy outcomes, a significant difference ($p<0.05$) was found between the study and the control group. Preterm Labor (46.6%), Preeclampsia (41.6%), Oligohydramnios (10.6%), Abortion (1.6%), Operative Intervention (cesarean section) (36.6%), Acute Renal Failure (5%), Acute Respiratory Distress Syndrome (11.6%), and Septicemia (1.6%) was observed among the patients with comorbidity with ureteric stones and UTIs (Table-I).

Similarly, fetal outcomes such as fetal demise (1.6%), Low birth weight babies (58.3%), and premature babies (51.3%) were significantly high in the study group than the control group (Table-II)

DISCUSSION

This study was conducted to specifically evaluate the clinical manifestation of comorbidity of these two illnesses. We conducted the study on women who were in the third trimester as the literature guides the maximum occurrence rate of these illnesses during this period.[10,11]

According to our result, 27.7% of women, among the selected participants, were found positive for coexistence of UTI and ureteric stones.

Pregnancy Outcome	Patients in Study Group, N=60	Patients in Control Group, N=80	P-Value
Preterm Labor	28 (46.6%)	12 (15%)	0.04
Preeclampsia	25 (41.6%)	3 (3.7%)	0.001
Oligohydramnious	10 (10.6%)	0 (0%)	0.001
Abortion	1 (1.6%)	0 (0%)	0.001
Operative Intervention (caesarean section)	22 (36.6%)	27 (45%)	0.065
Acute Renal Failure	3 (5%)	0 (0%)	0.032
Acute Respiratory Distress Syndrome	7 (11.6%)	0 (0%)	0.002
Septicemia	1 (1.6%)	0 (0%)	0.001

Table-I. Pregnancy outcome of study and control group (N=200)

Fetal Outcome	Fetuses in Study Group, N=60(%)	Fetuses in Control Group, N=80(%)	P-Value
Fetal demise	1 (1.66%)	0 (0%)	0.04
Low birth weight babies	35(58.3%)	12(15%)	0.01
Prematurity	32(53.3%)	8(10%)	0.01

Table-II. Fetal outcome of study and control group (N=200)

In previous studies, although the prevalence of this comorbidity has yet not been evaluated, the frequencies of individual incidences of the diseases are well documented. The finding of high prevalence of ureteric stones during pregnancy goes against the previous hypothesis that risk of ureteric stones is not enhanced during pregnancy.[12] According to Izuchukwu et al., 29.9% of pregnant women suffer from UTIs during their gestational period which complies with our study results.[13] However, a cohort study concluded that incidence of ureteric stones was as low as 0.2% among the studied pregnant population.[14] Schwaderer and Wolfe performed sequencing of the bacteria obtained from renal stones and conducted their life cycle studies which lead to the proposal that bacteria might aggravate the pathological stone formation.[15] Therefore, in our study, it can be predicted that a high incidence of UTI aggravated the formation of stone along with other contributing factors. Further, we have also hypothesized that due to strict diagnostic requirements for kidney stones during pregnancy, it might be possible that most of the cases are missed out during pregnancy and diagnosed later after the delivery with the use of computed tomography scans. Therefore, majority studies might report low incidence rate of kidney stones during pregnancy.

It has been found that the diseased group witnessed multiple obstetric complications. The study revealed significant differences in pregnancy and fetal outcomes between the two observed groups. Preterm labor was the most common complication followed by pre-eclampsia. Our study is in agreement with previous studies which reported complications of ureteric stones and UTIs among pregnant women.[10,16] Back sac noted that around 76% of the urinary tract infected pregnant females were admitted before the thirty-seven-week gestation period while 56% gave early births.[17] In another study, UTI was found to be a significant risk factor for pre-eclampsia.[18] In a set of previous studies, untreated UTI has been associated with several pregnancy complications such as intrauterine growth restriction, preterm birth, low birth weight, and preeclampsia.[19,20] Similarly, in a longitudinal study, preterm delivery rate was as high as 56.3%.[17] However, various obstetrical complications caused by UTIs can be avoided by suitable treatment protocols.[21] Preterm premature rupture of membranes and preeclampsia should especially be the matter of concern of the obstetricians in the cases of UTIs.[22]

Similarly, a cohort study identified urolithiasis as a major causative agent of the development of placenta Previa, pyelonephritis, gestational diabetes, and pre-eclampsia.[23] Apart from pain, ureteric stones are widely linked with critical birth outcomes and pose challenges during their surgical management[24] which mandates schooling of pregnant women about preventive strategies.[25]

The study, however, was limited in terms of small sample size and was dependent upon administrative data for the clinical outcomes of the comorbidity. Therefore, to enhance the reliability of data it is recommended to conduct a cohort study on a larger population to enhance the accuracy and reliability of the conducted study.

CONCLUSION

The coexistence of ureteric stones and UTIs is largely affecting pregnant population and this co-morbid condition has a significant impact on fetomaternal health.

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3	Rehana Yasmin	Manuscript writing, Data collection.	
4	Asma Sajid	Analysis and proof reading.	
5	Mushayyadah Fatima	Concept and design study.	
6	Quratulain Akhtar	Data collection literature review.	