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A Study on the Incidence and Risk Factors of Urinary Tract Infection in Pregnant Women during the Three Trimesters



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***Mrs. RANI MANJU, Prof. Dr. MATHEW GEORGE, Prof. Dr. LINCY JOSEPH**

Pushpagiri College of Pharmacy, India.

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ABSTRACT

Urinary tract infection represents a serious health problem in pregnant women. Many risk factors could contribute to the occurrence of UTI in pregnant women. The aim of the current study was to assess different risk factors that may influence the infection among pregnant women in a tertiary care teaching hospital in Kerala. A total of 100 women that visited gynecology were investigated. Personal data as well as medical history and some risk factors data were collected using a well-structured Questionnaire. Midstream clean catch urine samples for urinalysis and urine culture were collected from all investigated cases for diagnosis of UTI. The results revealed the presence of the significant association between some investigated risk factors and UTI in pregnant women. The risk factors that were recorded to influence UTI among pregnant women in the current study including advanced age, low educational level, multiparty, as well as unsatisfactory personal hygiene. Moreover, diabetic condition is also an influencing factor. In conclusion, extreme care has to be taken by pregnant women in particular and women in general towards personal hygiene. In addition, the diabetic condition should be avoided or controlled in order to decrease the risk of UTI.

INTRODUCTION

A **urinary tract infection (UTI)** is an infection that affects various parts of the urinary tract.^[1] When it affects the lower urinary tract it is known as a bladder infection (cystitis) and when it affects the upper urinary tract it is known as kidney infection (pyelonephritis).^[6] Symptoms of a lower urinary tract include pain with urination, frequent urination, and feeling the need to urinate despite having an empty bladder.^[1] Symptoms of a kidney infection include fever and flank pain usually in addition to the symptoms of a lower UTI.^[6] Rarely the urine may appear bloody.^[5] In the very old and the very young, symptoms may be vague or non-specific.^[1]

The most common cause of infection is *Escherichia coli*, though other bacteria or fungi may rarely be the cause. Risk factors include female anatomy, sexual intercourse, diabetes, obesity, and family history.^[2] Although sexual intercourse is a risk factor, UTIs are not classified as sexually transmitted infections (STIs).^[7] Kidney infection, if it occurs, usually follows a bladder infection but may also result from a blood-borne infection.^[8] Diagnosis in young healthy women can be based on symptoms alone.^[4] In those with vague symptoms, diagnosis can be difficult because bacteria may be present without there being an infection.^[9] In complicated cases or if treatment fails, a urine culture may be useful.^[3]

In uncomplicated cases, UTIs are treated with a short course of antibiotics such as nitrofurantoin or trimethoprim/sulfamethoxazole.^[5] Resistance to many of the antibiotics used to treat this condition is increasing.^[1] In complicated cases, a longer course or intravenous antibiotics may be needed.^[5] If symptoms do not improve in two or three days, further diagnostic testing may be needed.^[3] Phenazopyridine may help with symptoms.^[1] In those who have bacteria or white blood cells in their urine but have no symptoms, antibiotics are generally not needed,^[10] although during pregnancy is an exception.^[11] In those with frequent infections, a short course of antibiotics may be taken as soon as symptoms begin or long-term antibiotics may be used as a preventative measure.^[12]

Antibiotic Choices for Treatment of UTIs During Pregnancy

| ANTIBIOTIC | PREGNANCY CATEGORY | DOSAGE |
|--|---------------------------|--------------------------------|
| Cephalexin (Keflex) | B | 250 mg two or four times daily |
| Erythromycin | B | 250 to 500 mg four times daily |
| Nitrofurantoin (Macrochantin) | B | 50 to 100 mg four times daily |
| Sulfisoxazole (Gantrisin) | C* | 1 g four times daily |
| Amoxicillin-clavulanic acid (Augmentin) | B | 250 mg four times daily |
| Fosfomycin (Monurol) | B | One 3-g sachet |
| Trimethoprim- sulfamethoxazole (Bactrim) | C† | 160/180 mg twice daily |

*—Contraindicated in pregnant women at term.

†—Avoid during the first trimester and at term.

Pregnancy

Urinary tract infections are more concerning in pregnancy due to the increased risk of kidney infections. During pregnancy, high progesterone levels elevate the risk of decreased muscle tone of the ureters and bladder, which leads to a greater likelihood of reflux, where urine flows back up the ureters and towards the kidneys. While pregnant women do not have an increased risk of asymptomatic bacteriuria, if bacteriuria is present they do have a 25–40% risk of a kidney infection.^[13] Thus if urine testing shows signs of an infection—even in the absence of symptoms—treatment is recommended. Cephalexin or nitrofurantoin are typically used because they are generally considered safe in pregnancy.^[14] A kidney infection during pregnancy may result in premature birth or pre-eclampsia (a state of high blood pressure and

kidney dysfunction during pregnancy that can lead to seizures).^[13] Some women have UTIs that keep coming back in pregnancy and currently there is not enough research on how to best treat these infections^[15]

Bacteriology

The organisms that cause UTIs during pregnancy are the same as those found in nonpregnant patients. *Escherichia coli* accounts for 80 to 90 percent of infections. Other gram-negative rods such as *Proteus mirabilis* and *Klebsiella pneumonia* are also common. Gram-positive organisms such as group B streptococcus and *Staphylococcus saprophyticus* are less common causes of UTI. Group B streptococcus has important implications for the management of pregnancy and will be discussed further. Less common organisms that may cause UTI include enterococci, *Gardnerella vaginalis*, and *Ureaplasma ureolyticum*.^{16,17,18}

AIM

To find out the incidence of urinary tract infection in all stages of pregnancy.

OBJECTIVES

1. To find out the incidence of urinary tract infection in pregnancy.
2. To analyze the risk factors for developing urinary tract infection in pregnancy.
3. To analyze the causating agents.

REVIEW OF LITERATURE

1. Abdulghani Mohamed Alsamarai¹, Shuler Ali Khorshed, Hajer Ali et al.; Conducted a prospective cross-sectional study on "THE ASSOCIATION BETWEEN RISK FACTORS AND BACTERIAL TYPE OF UTI" during the period from 1st of June 2015 to the end of January 2016. The population included in the study are 563 women, of them 425 (75.5%) were outpatients, and 138 (24.5%) were inpatients. Their age range between 18 and 80 years, with a mean age of 33.59±15.29 years. Urine samples were immediately cultured on blood agar and MacConkey's agar by spread plate technique. Bacterial colonies with different morphology were selected, purified and identified according to their biochemical characteristics using conventional standard methods. Results: Mean age was significantly (F=5.14, P=0.002) different in relation to bacterial type. Women infected with E. coli were

with higher mean age (37.84 years), followed by those infected with *Staphylococcus aureus* (31.97 years), then *Klebsiella pneumonia* (28.76 years) and *Proteus mirabilis* (28.50 years). BMI mean value was significantly ($F=6.33$, $P=0.000$) different in women infected with different bacteria and higher value was in those infected with *E. coli* (26.15), while it was about the same in those infected with *Staphylococcus aureus* (24.6), then *Klebsiella pneumonia* (24.9 year) and *Proteus mirabilis* (24.1). Pus cell scale mean value was significantly ($F=6.67$, $p=0.000$) higher in cases infected with *E. coli* (2.04), while 1.77 in *Staphylococcus aureus*, infected cases, 1.15 in women infected with *Klebsiella pneumonia* and 1.33 in those infected with *Proteus mirabilis*. Conclusion: Age, BMI, pus cells scale, and education levels were significantly associated with the bacterial type.

2. JOHN E. DELZELL, JR., M.D., and MICHAEL L. LEFEVRE, M.D., M.S.P.H.,
University of Missouri-Columbia School of Medicine, Columbia, Missouri

Am Fam Physician. 2000 Feb 1;61(3):713-720.

Urinary tract infections are common during pregnancy, and the most common causative organism is *Escherichia coli*. Asymptomatic bacteriuria can lead to the development of cystitis or pyelonephritis. All pregnant women should be screened for bacteriuria and subsequently treated with antibiotics such as nitrofurantoin, sulfisoxazole or cephalexin. Ampicillin should no longer be used in the treatment of asymptomatic bacteriuria because of high rates of resistance. Pyelonephritis can be a life-threatening illness, with an increased risk of perinatal and neonatal morbidity. Recurrent infections are common during pregnancy and require prophylactic treatment. Pregnant women with urinary group B streptococcal infection should be treated and should receive intrapartum prophylactic therapy.

3. Gulfareen Haider, Aftab Afroz Munir, Nishat Zehra, Ambreen Haider et al; conducted a descriptive study was conducted in the Obstetric and Gynaecology Department of Isra University Hospital, Hyderabad from 1st January to 30th August 2008. : Out of 232 women, 108(46.5%) reported urinary symptoms which were due to pregnancy-induced changes on the urinary system as no growth was obtained on urine culture, while 10 (4.3%) were due to underlying UTI. The most common urinary symptom in these women was abnormal voiding pattern 85(40.3%) followed by irritative symptoms and voiding difficulties. Illiteracy, history of sexual activity, low socioeconomic (monthly income < Rs. 10,000 /

month) group, past history of UTI and multiparity were found to be risk factors for UTI in these women.

On complete urine examination, 222 (95.6%) patients either did not reveal any pus cells or had less than 5 WBC/HPF. Out of 108 cultures, only 10 (4.3%) specimens showed growth. E-coli was the most commonly detected organism 7 (3%) followed by S-aureus in 3 (1.3%).

METHODOLOGY

Study site, study population, duration of study and data collection

A hospital-based retrospective study was conducted at **PUSHPAGIRI MEDICAL COLLEGE HOSPITAL**, Thiruvalla from January 2017 to April 2017 to determine associated risk factors for urinary tract infection (UTI) among pregnant women.

A pre-designed and structured questionnaire was used for the collection of data on associated risk factors. The required data were collected from the case sheet.

Pregnant women who were not willing to participate were excluded from this study.

RESULTS AND DISCUSSION

1. AGE Vs RISK OF UTI

Table.1

The highest percentage of both significant and non-significant UTI in pregnant women in this study comes under the age group of 26 to 30 years (34.3%) followed by 20 to 25 years(29.8%)and the minimum age group ranged from 41 to 45 years (3%).

| SOCIODEMOGRAPHIC FACTORS AND ASSOCIATED RISK FACTORS | | | |
|--|-----------------------------|---------------------------------|---------------|
| Characteristics | | | |
| Age | Significant bacteriuria (%) | Non Significant bacteriuria (%) | Total No. (%) |
| 20-25 | 7 | 13 | 20(29.8%) |
| 26-30 | 8 | 15 | 23(34.3%) |
| 31-35 | 5 | 11 | 16(23.8%) |
| 36-40 | 3 | 3 | 6(8.9%) |
| 41-45 | 0 | 2 | 2(3%) |
| Total | 23 | 44 | 67 |

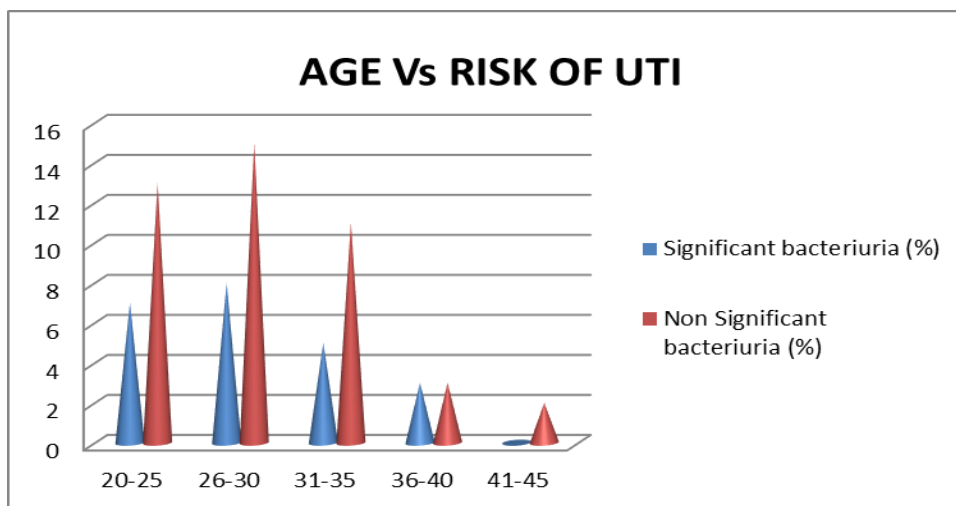


FIGURE: 1

2. EDUCATIONAL STATUS Vs RISK OF UTI

Table.2

| EDUCATIONAL STATUS | | | |
|--------------------|-----------------|-------------|---------------|
| | Non Significant | Significant | Total No. (%) |
| Illiterate | 3 | 3 | 6(8.95%) |
| Read and Write | 4 | 3 | 7(10.4%) |
| Primary | 2 | 12 | 14(20.9%) |
| High School | 12 | 24 | 36(53.7%) |
| Higher Education | 2 | 2 | 4(5.97%) |
| Total | 23 | 44 | 67 |

The study showed that the lowest percentage of UTI was found in the category those who had pursued higher education which indicates the importance of education in the incidence of infections. The graph is shown below:

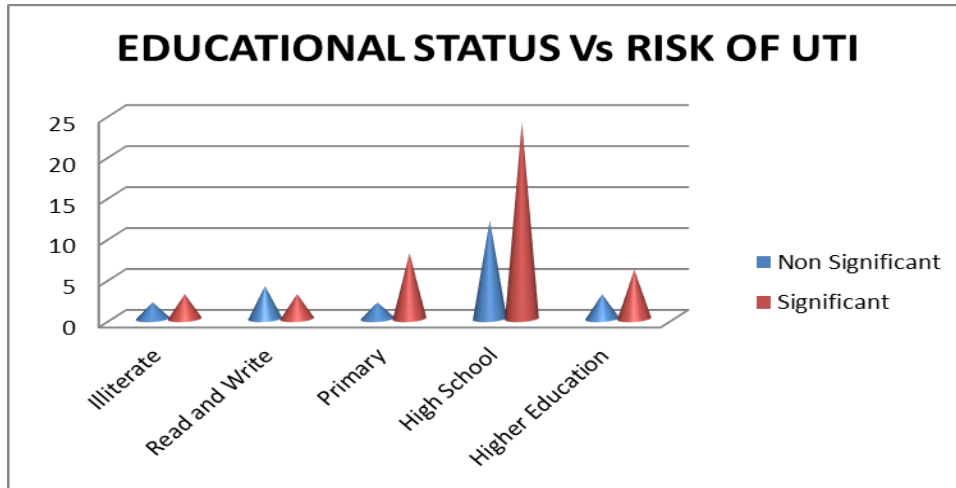


FIGURE: 2

3. LOW ECONOMIC STATUS Vs RISK OF UTI.

Table.3

| FINANCIAL STATUS | | | |
|--------------------|-----------------|-------------|---------------|
| | Non Significant | Significant | Total No. (%) |
| Above Poverty Line | 6 | 42 | 48(71.6%) |
| Below Poverty Line | 4 | 15 | 19(28.3%) |
| Total | 10 | 57 | 67 |

The findings of the study are clear that the financial status has no influence on the incidence of urinary tract infection in pregnant women. About 71.6% of subjects were from middle class and high financial status and only 28.3% were from low socioeconomic status. Graphical representation is shown in figure: 3

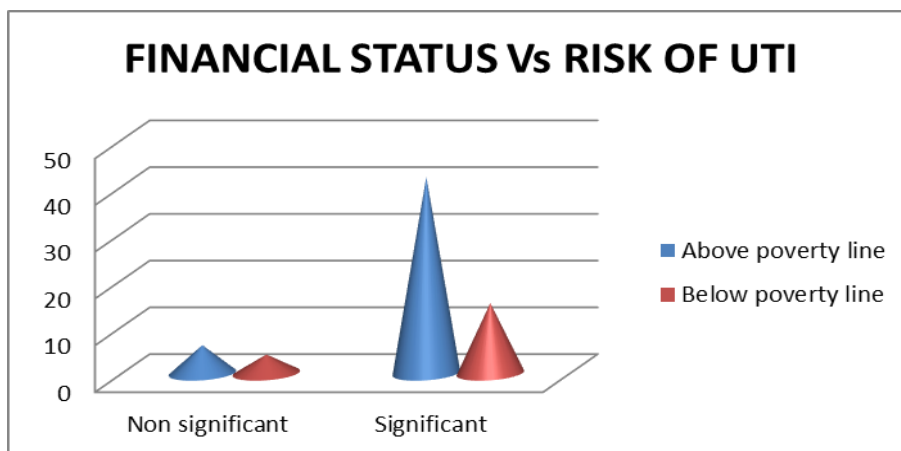


FIGURE:3

4. GESTATIONAL AGE Vs RISK OF UTI

Table.4

| GESTATIONAL AGE | | | |
|------------------|-----------------|-------------|---------------|
| | Non Significant | Significant | Total No. (%) |
| First Trimester | 4 | 5 | 9(13.4%) |
| Second Trimester | 6 | 12 | 18(26.9%) |
| Third Trimester | 14 | 26 | 40(59.7%) |
| Total | 24 | 43 | 67 |

It is very clear from the graph that the gestational period is directly linked to the incidence of urinary tract infection. That is, as the month progresses the incidence of UTI is also increasing. The study depicts that the subjects in the third trimester are more liable in causing UTI (59.7%), the second trimester(26.9%) and finally first trimester (13.4%).Graphical representation is shown in the figure:4

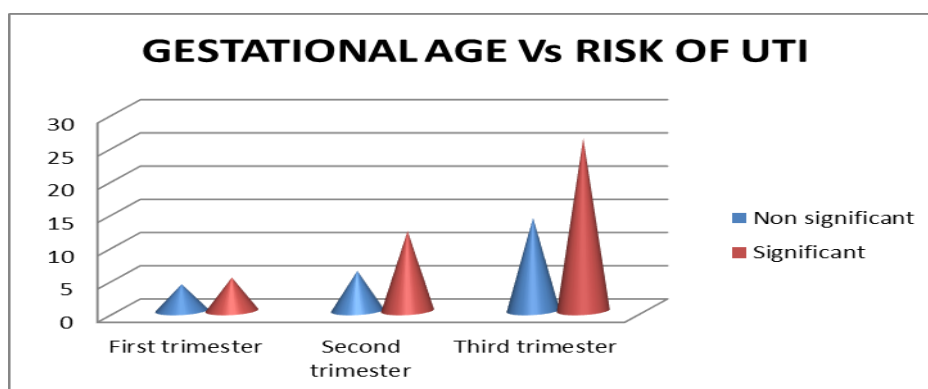


FIGURE:4

5. GENITOURINARY ABNORMALITY.

Table.5

| GENITOURINARY ABNORMALITY | | | |
|---------------------------|-----------------|-------------|---------------|
| | Non significant | Significant | Total No. (%) |
| Yes | 0 | 2 | 2 (3%) |
| No | 11 | 54 | 65 (97%) |
| Total | 11 | 56 | 67 |

The observations of the present study depict that there is no association between genitourinary abnormality and the incidence of both significant and non-significant UTI in

pregnant women. In the study only 3% of women had genitourinary abnormality, rest of 97% are free of the abnormality The data is represented as graph in figure:5

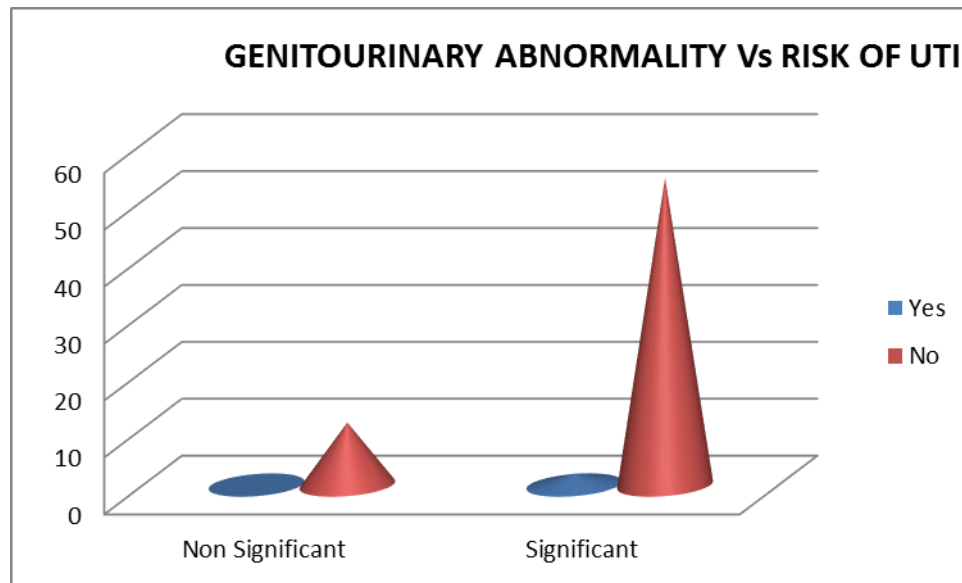


FIGURE:5

6. HISTORY OF CATHETERISATION Vs RISK OF UTI

Table. 6

| HISTORY OF CATHETERISATION | | | |
|----------------------------|-----------------|-------------|---------------|
| | Non Significant | Significant | Total No. (%) |
| Yes | 2 | 4 | 6 (9%) |
| No | 9 | 52 | 61 (91%) |
| Total | 11 | 56 | 67 |

The observations of the present study depict that there is no association between the history of catheterization and the incidence of both significant and nonsignificant UTI in pregnant women. In the study only 9% of women had the history of catheterization, rest of 91% of the infected pregnant women had no history of catheterization. Graphical representation is shown in figure:6

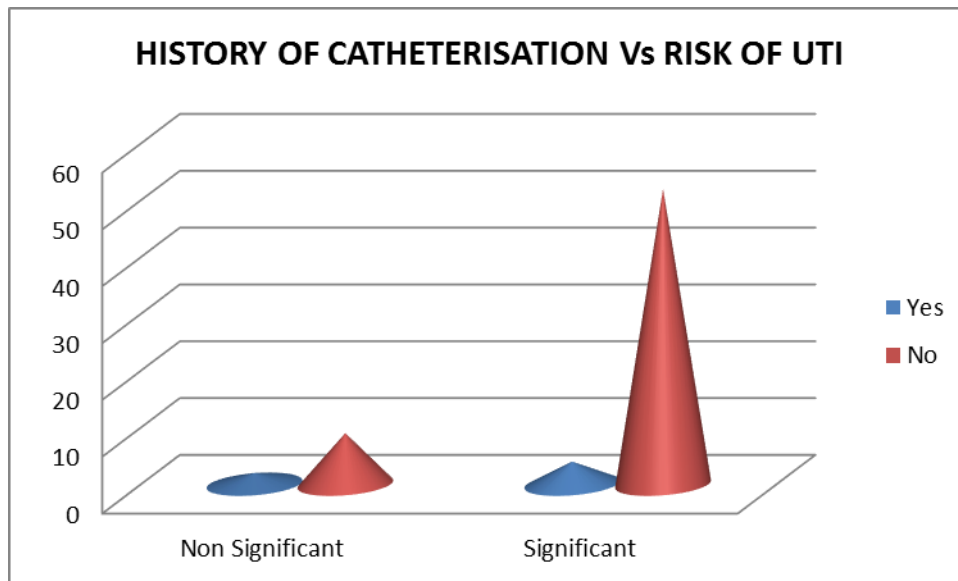


FIGURE: 6

7. HISTORY OF UTI Vs RISK OF UTI

Table.7

| HISTORY OF UTI | | | |
|----------------|-----------------|-------------|---------------|
| | Non Significant | Significant | Total No. (%) |
| Yes | 9 | 39 | 48 (71.6%) |
| No | 7 | 12 | 19 (28.4%) |
| Total | 16 | 51 | 67 |

The observation from the data collected related to the history of UTI and the prevalence of the infection shows that there is an association between them. That is about 71.6% of the subjects are with the history of significant or non-significant UTI. The graphically represented data were given in the figure:7

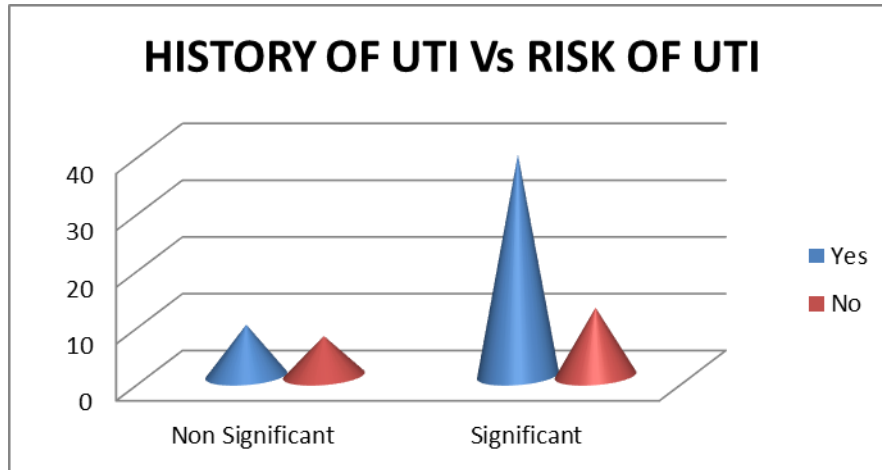


FIGURE:7

8. MULTIPARITY Vs RISK OF UTI

From the study, it depicts that, as the number of pregnancies increases the chance of getting infected with significant bacteriuria is very high.(85%) when compared to primipara which is less than 5 times than multipara.Graphical representation is given in figure:8

Table.8

| PARITY | | | |
|-----------|-----------------|-------------|---------------|
| | Non-Significant | Significant | Total No. (%) |
| Primipara | 2 | 8 | 10 (15%) |
| Multipara | 16 | 41 | 57 (85%) |
| Total | 18 | 49 | 67 |

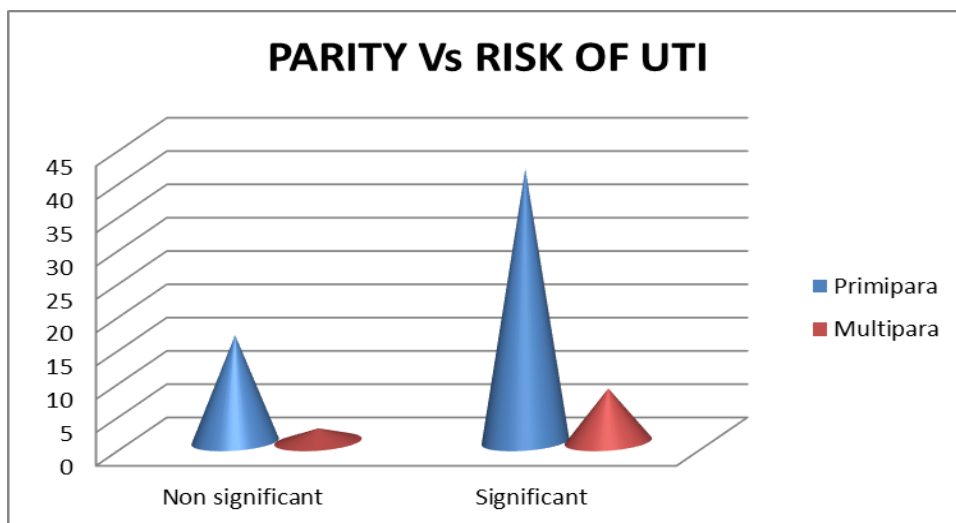


FIGURE: 8

9. COMORBIDITY IN PREGNANCY VERSUS URINARY TRACT INFECTION

Table.9

| COMORBIDITY | | | |
|-------------------|-----------------|-------------|---------------|
| | Non Significant | Significant | Total No. (%) |
| Nil | 4 | 5 | 9 (13.4%) |
| Anaemia | 9 | 15 | 24 (35.8%) |
| Diabetes Mellitus | 4 | 11 | 15 (22.4%) |
| Hypertension | 1 | 4 | 5 (7.5%) |
| Both | 4 | 10 | 10 (14.9%) |
| Total | 22 | 45 | 67 |

The data in the present study shows that Anemia (35.8%) and Diabetes Mellitus (22.4%) are the major comorbid condition that resulted in urinary tract infection. Graphically presented in figure: 9

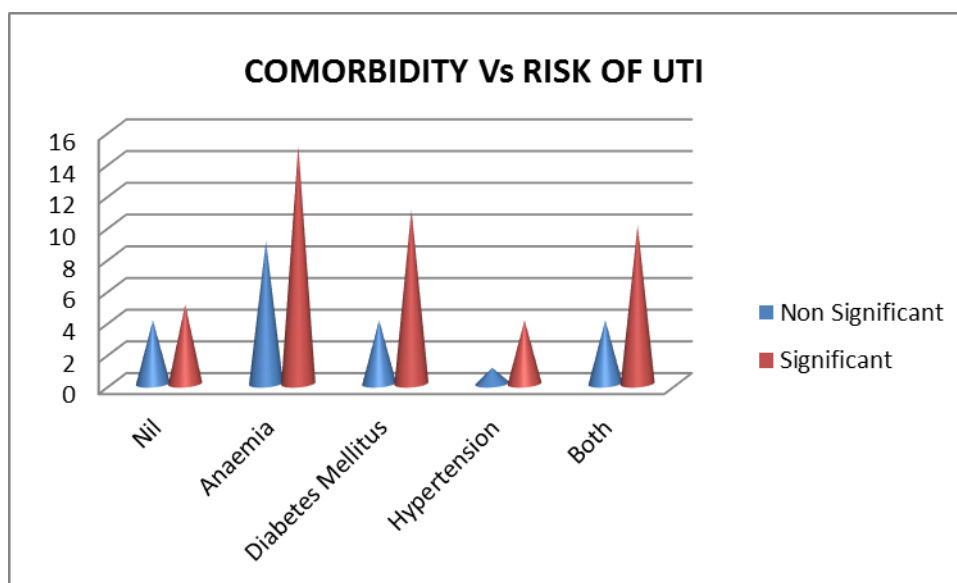


FIGURE:9

10. PREGNANCY Vs RISK OF UTI

Table.10

| | UTI | NON UTI |
|--------------------|-----|---------|
| Number of Patients | 67 | 23 |
| Total (%) | 67% | 23% |

The present study depicts that urinary tract infection is a major clinical presentation during pregnancy. It may be due to the physiological changes occurring during the stages of pregnancy. In the present study, about 67% of pregnant women are susceptible to urinary tract infection. The data graphically represented in figure:10

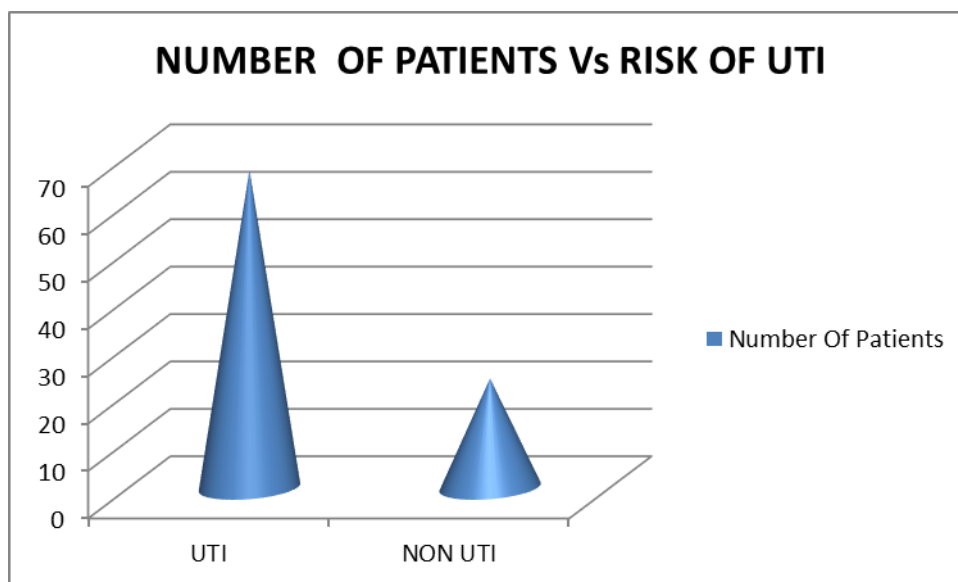


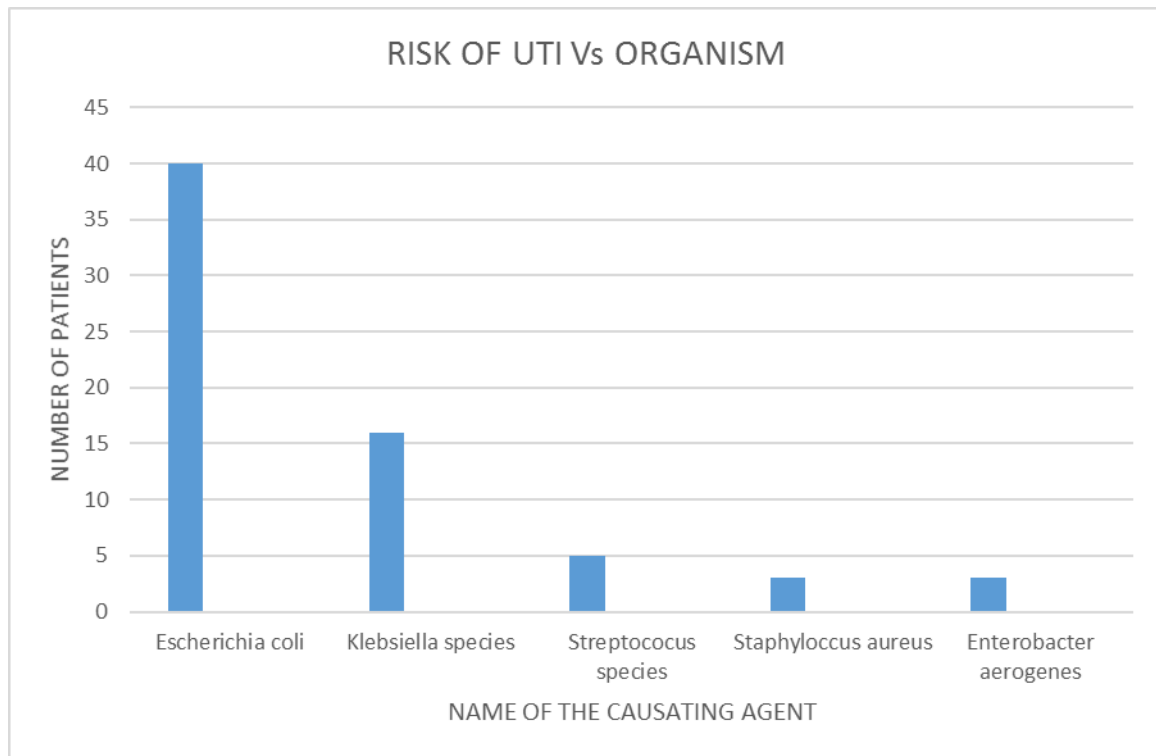
FIGURE:10

11.RISK OF UTI Vs BACTERIAL SPECIES

The highest rate of UTI in pregnant women (60%), due to the presence of *E. coli*. Bacterial agents causing UTI in pregnant women were different in number and percentage. *Escherichia coli* and *Klebsiella* species with the total number of 40 (60%) and 16(23.9%) were found as the most frequent types of bacteria, respectively. The frequency rates of *Streptococcus* species, *Staphylococcus aureus*, *Enterobacter aerogenes* were 5(7.46%), 3 (4.47%), 3(4.47%), cases respectively.

Table.11

| Name of the Organism | Number of Patients (n=67) (%) |
|-------------------------------|-------------------------------|
| <i>Escherichia coli</i> | 40 |
| <i>Klebsiella</i> species | 16 |
| <i>Streptococcus</i> species | 5 |
| <i>Staphylococcus aureus</i> | 3 |
| <i>Enterobacter aerogenes</i> | 3 |



CONCLUSION

In this study the chance of UTI was higher among pregnant women in the presence of associated risk factors such as anemia, low-income level, past history of UTI, multiparity, genitourinary abnormality and gestational age but there was no significant association between prevalence of UTI and risk factors such as, history of catheterization, maternal age, and educational status of pregnant women. Therefore pregnant women should be assessed for associated risk factors during their regular follow up. As it is clear from the study that E.coli is the most common microorganism that causing urinary tract infections in the study subjects, women must ensure their proper hygiene especially during gestational period, otherwise may result in the unwanted usage of antibiotics and other medications that may sometimes affect the fetus.

STUDY LIMITATION: Short period of time and less no.of patients found to be the study limitation.

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