prevalence of urinary tract infections (UTIs) in Iraqi women with gestational diabetes mellitus (GDM)

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Abstract:

Background: Pregnancy-related gestational diabetes mellitus is regarded as a significant risk factor for UTIs. the aim of current study is prevalence of urinary tract infections (UTIs) in Iraqi women with and without gestational diabetes mellitus. **Patients and Methods:** One hundred and five diabetic Iraqi patients- thirty-five of whom have urinary tract infections and twenty-five of whom do not—as well as thirty-one non-diabetic individuals who have UTIs and fourteen healthy individuals who do not have UTIs-were admitted to a specialized center for endocrinology and diabetes between February and August of 2023 , the patients' and the controls' , urine specimens were inoculated on both blood and sterilized standard MacConkey's agar plates , cultural characteristics of isolated bacteria, such as the size, color, elevation, edges, and hemolysis of the colony, were identified. The Vitek technique was employed to verify the identification of bacteria. **Results:** current study showed positive bacterial cultural were (No.= 35, 33.4%) among diabetes mellitus pregnant women compare to pregnant women without D.M, Also the age range of (16- 20 and 26- 30) years had the highest rate of cultural positive (12.1%), followed by the 36-40 age group as (10.6%) comparative to UTIs among pregnant women without UTIs, Highest incidence in multigravida (49.5%) and lowest incidence in primigravida (23.9%), so highest incidence in multigravida with and without D.M (15.2, 9.4)% respectively lowest incidence primigravida with and without D.M (7.7 , 10.4) % respectively, As well as bacterial isolations was 10%, with *E.coli* recording the highest rate at 18.9%, followed by *S. aureus* at 16.5% and *Klebsiella sp.13.6%, ,* whilst 4.5% for *Staphylococcus saprophyticus.* **Conclusion:** positive bacterial cultural in diabetes mellitus pregnant women more than pregnant women without D.M, also prevalence of UTIs by age range of (16- 30) years had the highest rate of cultural positive (12.1%), comparative to UTIs among pregnant women without UTIs ,as well as highest incidence of UTIs in multigravida with and without D.M more than primigravida with and without D.M. and *E. Coli* recording highest rate, followed by *S.aureus* and *Klebsiella sp.*

keywords: Urinary tract infection (UTI), Gestational diabetes mellitus (GDM); positive bacterial cultural; multigravida ; *E. Coli*
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Introduction:

A group of metabolic diseases collectively known as diabetes mellitus (DM) are typified by elevated serum glucose levels, which are brought on by abnormalities in the secretion or function of insulin [1]. About 8% of pregnancies result in a urinary tract infection (UTI), one of the more frequent postnatal problems [2], UTIs represent one of the most prevalent long-term problems associated with diabetic mellitus (DM). In addition, a number of variables, including body mass index (BMI), type of diabetes, fasting blood glucose, frequent diabetes monitoring, concomitant chronic conditions, HbA1c, and length of DM, are assumed to make people more susceptible to getting UTIs while they have the disease[3] , Compared to individuals without diabetes, patients with diabetes have an increased chance of developing any infection, including lower respiratory tract infections, urinary tract infections, sepsis, endocarditis, skin, bone, joint, and mucous membrane infections [2] ,The rising global prevalence of diabetes mellitus and the heightened risk of urinary tract infections (UTIs) among individuals with diabetes could put a substantial financial strain on healthcare[4] **,** Data available to date suggest that UTIs are the most prevalent bacterial infection among diabetes individuals[5].

Pregnant women with co-morbid conditions such diabetes, polycystic kidney disease, sickle cell disease, congenital anomalies, and a history of recurrent UTIs are typically at increased risk of developing a UTI. Seventy to eighty percent of UTI infections in pregnant women are caused by *E.coli* and gram-negative bacteria (*Klebsiella, Acinetobacter baumannii, Proteus mirabilis*), whereas ten percent of cases are caused by gram-positive organisms (*Enterococcus faecalis* and group *B Streptococcus*) [6 &7].

The most frequent reason for admission to obstetrical wards is UTI, which has been observed in 20% of pregnant women [8].

Patients and Methods:

Study Design:

One hundred and five diabetic Iraqi patients—thirty-five of whom have urinary tract infections and twenty-five of whom do not—as well as thirty-one non-diabetic individuals

who have UTIs and fourteen healthy individuals who do not have UTIs-were admitted to a specialized center for endocrinology and diabetes between February and August of 2023.

Collection of Urine Specimens :

The urine samples were taken in sterile tubes using the most aseptic method available. Following a preliminary cleaning of the genitalia, the patients' and the controls' mid-stream urine (MSU) was collected[9] .

Laboratory Testing Every specimen underwent a standard urinalysis to ascertain the following parameters: color, turbidity, reaction, specific gravity, albumin, sugar, and keton bodies. A conventional technique was used to detect sugar in urine.

Urine Culture Using the direct streaking approach, the urine specimens were inoculated on both blood and sterilized standard MacConkey's agar plates[10] . The cultural characteristics of isolated bacteria, such as the size, color, elevation, edges, and hemolysis of the colony, were identified. The Vitek technique was employed to verify the identification of bacteria.

Statistical Analysis: The data were analyzed by calculating the mean value and percentage.

Results:

Table (1): Relationship between D.M and UTIs in pregnant women.

Bacterial culture	pregnant patients			
	With DM		**Without DM**	
	NO.	%	NO.	%
Positive	35	33.4	31	29.5
Negative	25	23.8	14	13.3
Total (105)	60	57.0	45	43.0

Current results in table -1 showed positive bacterial cultural were (No.= 35, 33.4%) among diabetes mellitus pregnant women compare to pregnant women without diabetes mellitus (No.= 31,29.5%), whilst Negative results for bacterial cultural (23.8,13.3) % respectively for both groups pregnant women with and without diabetes mellitus.

Table (2): Distribution of UTIs in Pregnant Women with and without D.M according to age.

Age Groups (Years)	Positive Bacterial culture (No., %)	
	With DM	**Without DM**
16-20	8 (12.1 %)	7(10.6 %)
21-25	6 (9.1%)	5(7.5 %)
26-30	8 (12.2 %)	10(15.2 %)
31-35	6 (9.1%)	4(6.1 %)
36-40	7(10.6 %)	5(7.5 %)
Total (66)	35 (53.1%)	31(46.9%)

Table-2 displays the prevalence of UTIs by age group among pregnant women gestational diabetes mellitus and those without the disease, the age range of (16- 20 and 26- 30) years had the highest rate of cultural positive (12.1%), followed by the 36-40 age group as (10.6%) comparative to UTIs among pregnant women without UTIs

Table (3): Distribution of UTIs in Pregnant Women with and without D.M according to Gravid

Gravidity	Number Examined		Number Positive (%)		Number negative (%)
	No.	**%**	**With D.M**	**Without D.M**	
Primi gravid	25	23.9	8 (7.7%)	11(10.4%)	6 (5.7%)
Second gravid	28	26.6	11(10.5%)	12(11.3%)	5 (4.7%)
Multi gravid	52	49.5	16(15.2%)	10(9.4 %)	26(24.7%)
Total	105	100	35(33.4 %)	31(29.5 %)	39(37.1%)

The prevalence of infection relation to gravida is shown in (table 3), Highest incidence is seen in multigravida 52/105 (49.5%) and lowest incidence is seen in primigravida 25/105 (23.9%), so highest incidence is seen in multigravida with and without D.M (15.2, 9.4) % respectively lowest incidence is seen in primigravida with and without D.M (7.7 , 10.4) % respectively .

Table (4): isolate of pathogenic bacterial isolated from diabetic Pregnant Women

Pathogens	Number Isolated	%
E.coli	12	18.9
S. aureus	11	16.5
Enterococcus	4	6.0
Klebsiella sp.	9	13.6
Pseudomonas	7	10.5
Proteus mirabilis	7	10.5
Proteus vulgaris	6	9.0
Staphylococcus epidermidis	7	10.5
Staphylococcus saprophyticus	3	4.5
Total	66	100

Results in table-4 showed, the percentage of study group that had bacterial isolations was 10%, with *E. Coli* recording the highest rate at 18.9%, followed by S. aureus at 16.5% and *Klebsiella sp.13.6%, and only* 10.5 for all Pseudomonas; *Proteus mirabilis; Staphylococcus epidermidis, whilst* 4.5% for *Staphylococcus saprophyticus.*

Discussion:

Urinary tract infections have long been thought to be predisposed by diabetes mellitus[11] ,Pregnant women who have diabetes mellitus (DM) or gestational diabetes (GDM) are thought to have an increased risk of UTI[12] , It has long been believed that diabetes mellitus increases the risk of urinary tract infections[11] .

Positive bacterial cultural in current results were (No.= 35, 33.4%) among diabetes mellitus pregnant women compare to pregnant women without diabetes mellitus (No.= 31,29.5%), whilst Negative results for bacterial cultural (23.8,13.3) % respectively for both groups pregnant women with and without diabetes mellitus but results of Tektook *etal.,* 2017, showed high incidence of type I and type II UTIs in female diabetics is 44.2 and 67.4%, respectively [13] .

prevalence of UTIs by age group among pregnant women gestational diabetes mellitus and those without the disease, the age range of (16- 20 and 26- 30) years had the highest rate of cultural positive (12.1%), followed by the 36-40 age group as (10.6%)

The age group of 26–30 years old is known to have the highest prevalence of urinary tract infections in pregnant women, followed by 21-25 and 31-35 years old. The study's youngest participant was eighteen, while the oldest was forty-five[14].

The prevalence of infection relation to gravida is shown in (table 3), Highest incidence is seen in multigravida 52/105 (49.5%) and lowest incidence is seen in primigravida 25/105 (23.9%), so highest incidence is seen in multigravida with and without D.M (15.2, 9.4) % respectively lowest incidence is seen in primigravida with and without D.M (7.7 , 10.4) % respectively.

Numerous studies have shown that multigravida pregnant women are more likely to have bacteriuria. According to our study, Primigravida has the highest occurrence (60%) and Multigravida has the lowest rate (19%). Our study's conclusion is not significant at (p<0.05), indicating that there is no correlation between gravidity and the incidence of UTIs during pregnancy.

According to the findings of our investigation, Primigravida has the highest occurrence (60%) and Multigravida has the lowest rate (19%). Our study's findings are not significant at (p<0.05), indicating that there is no correlation between gravidity and the frequency of UTIs during pregnancy[15] .

The percentage of study group that had bacterial isolations was 10%, with *E. Coli* recording the highest rate at 18.9%, followed by S. aureus at 16.5% and *Klebsiella sp.13.6%, and only* 10.5 for all Pseudomonas; *Proteus mirabilis; Staphylococcus epidermidis,* this result is most in line with several earlier investigations that found *E. coli* to be the most prevalent bacteria linked to urinary tract infections[16]. The most common uropathogen found was *E. coli,* accounting for 36 cases (45.6%), followed by *K. pneumoniae* at 16 cases (20.3%). It is commonly known that Gram-negative bacteria, such as *E. coli* and Klebsiella spp., are the primary cause of most UTIs. Particularly*, E. Coli* is unquestionably the most

frequent bacteria isolated from urine samples in both inpatient and outpatient settings for patients of both sexes, and this conclusion is consistent with previous research as well[17] .

Previous research has shown that during pregnancy, changes in the mother's body habitat microbiota and hormonal levels might impact the immune system and raise the risk of infections[18&19] , so one theory regarding the higher risk of infections in women with gestational diabetes mellitus is that the immune system may be weakened by the condition, making women more vulnerable to infections, so Geerlings ,2014 showed women with diabetes are more likely to get UTIs; this tendency is caused by a variety of causes, including immunological system malfunction, uroepithelial bacterial adhesion, and glycosuria[20], as well as pregnancy related anatomical and physiological changes are thought to promote bacterial growth and the ascent of germs toward the kidneys, which is the theory behind urinary tract infections and pregnancy. Previously, it was believed that gestational diabetes mellitus would increase the incidence of urinary tract infections [21] , in keeping with the prevalence rates published by Rizk in 2002 for both diabetic and nondiabetic pregnant women, the total prevalence of UTI in diabetic pregnant women was 6.7%[22].

Conclusion: Current study concluded that:

1) positive bacterial cultural in diabetes mellitus pregnant women more than pregnant women without D.M.

2) prevalence of UTIs by age range of (16- 30) years had the highest rate of cultural positive (12.1%), followed by the 36-40 age group as (10.6%) comparative to UTIs among pregnant women without UTIs.

3) Highest incidence of UTIs in multigravida compare to primigravida , so highest incidence of UTIs in multigravida with and without D.M more than primigravida with and without D.M**.**

4) *E. Coli* recording highest rate, followed by *S.aureus* and *Klebsiella sp.*

Conflict of Interest: None to declare.

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