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Original Article

A Study of Asymptomatic Bacteriuria among Pregnant Women with and Without Gestational Diabetes Mellitus in Al-Jalla Gynecology Hospital, Tripoli, Libya

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ABSTRACT

Background. The infection of the urinary tract is one of the most significant reasons for seeking medical attention among individuals, and is one of the most widely common nosocomial infections. Gestational diabetes mellitus during pregnancy is considered an important risk factor for urinary tract infections. This study aims to investigate the prevalence of asymptomatic bacteriuria and the incidence of urinary tract infections in pregnant women with and without gestational diabetes mellitus and their antibiotic sensitivity patterns. **Methods.** Total of one hundred consecutive pregnant women with a clinical diagnosis of gestational diabetes mellitus (n=50) and non-diabetic pregnant women (n=50) were included in the study at Gynecology Hospital Tripoli, Libya. Mid-stream urine samples were obtained for a full urine examination. All samples and isolates were investigated by standard laboratory procedures. Asymptomatic bacteriuria was described as at least 105 CFU / ml growth isolated from a woman's urine without complaints about urinary tract infections. **Result.** A total of 60 (60%) samples showed significant growth. No significant difference among the culture positivity rate was noted between gestational diabetic and non-diabetic patients (30% Vs 30%). Escherichia coli was the most frequent organism (50% in gestational diabetes mellitus and 43% non-diabetic) followed by staphylococcus aureus (27% in diabetic and 40% in non-diabetic). Ciprofloxacin (80%) was highly sensitive to infected bacteria. **Conclusion.** No significant differences in the prevalence of asymptomatic bacteriuria or incidence of urinary tract infections were found between pregnant women with and without gestational diabetes mellitus.

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INTRODUCTION

Bacterial infection is the most common cause of urinary tract infections (UTI), and is considered one of the global health problems, especially in developing countries, including Libya [1]. UTIs are relatively common problems during pregnancy. Asymptomatic bacteriuria (ASB) is bacteriuria without apparent symptoms of the urinary tract and is higher in females than in males [2]. Physiologic women are susceptible to complications such as asymptomatic and symptomatic UTIs. [3] In contrast to males, UTI is a common health issue among women because of the shortened urethra, closer proximity to the vagina, and sexually assisted disease entry [4].

The significance of ASB is a common risk factor for UTI development [5,6]. Earlier studies showed that cystitis and pyelonephritis occurred in 30 to 40 percent of pregnant women with untreated ASB [7]. This can result in transient renal failure, acute respiratory distress, sepsis, and shock during pregnancy [8]. Women with urinary infection may develop symptoms or maybe remaining asymptomatic. The existence of bacteria in urine with the quantitative counts of 105 colony forms units / mL is characterized as asymptomatic bacteriuria in pregnancy, without any signs or symptoms of urinary tract infection. [9]. During pregnancy, there are several conditions associated with an increased prevalence of UTI. Gestational Diabetes Mellitus (GDM) and a history of UTI may increase the risk of UTI in pregnant women [10].

In comparison to women without bacteriuria, women with ASB are more likely to give birth to preterm with an increased risk of developing pyelonephritis during pregnancy [11]. Asymptomatic bacteria (ASB) and UTI can lead to adverse pregnancy outcomes. Besides during pregnancy, diabetes mellitus (DM) including gestational diabetes mellitus (GDM) is known as an additional significant risk factor during pregnancy for asymptomatic bacteriuria ASB and UTI [12,13]. In pregnancy, UTI without antibiotic treatment may result in serious complications [14]. UTI treatment can reduce the risk of pregnancy complications. So, screening for early diagnosis and treatment of UTI in pregnant women is essential to avoid its complications [15]. This study was planned to evaluate the prevalence of asymptomatic bacteriuria, isolation of bacterial agents, and antibiotic susceptibility trends in pregnant women with and without GDM.

METHODS

This prospective study was conducted from July to September 2020, among 50 gestational diabetes mellitus and 50 non-diabetic patients attending gynecology hospitals in Tripoli, Libya. The pregnant women that were recruited for the study were clinically identified to have no history of urinary tract symptoms and their gestational age was in early trimesters. A predesigned protocol was administered to the subjects. The protocol covered questions on signs and symptoms of UTI, number of pregnancies, number of children, pregnancy week, and age.

Clean voided midstream of early morning urine samples were collected in a sterile screw-capped container (approximately 10-20 ml) after giving proper instructions. Besides, to reduce the risk of contamination, pregnant women were also informed to clean their urethral region.

All specimens were transported from the hospital to the laboratory within a cold box within 2 hours of collection. Macroscopy was performed to evaluate the color, turbidity, and the presence of blood. Microscopy was carried out and the urine deposits were examined for the presence of white blood cells, red blood cells, and bacteria.

Urine samples that were not cultured within 2 hours were stored at 4C. on the other hand all of the samples were cultured using standard bacteriological methods. Samples were cultured on dried plates of Cysteine lactose electrolyte-deficient (CLED) medium, MacConkey, and blood agar plates using a standard loop calibrated to hold 0.01 ml, and Inoculated plates were incubated at 37 degrees C aerobically for overnight incubation. Culture plates without visible growth were further incubated for additional 24 hours before being discarded. Colony count of 100 or more equals $\geqslant$ 105 CFU/ML & considered as significant bacteriuria. All the significant isolates were tested by standard microbiological methods using gram stain and biochemical tests. Various biochemical tests such as catalase test, coagulase test, oxidase test, mannitol test, triple sugar iron test, urease, and citrate test were performed to confirm the identity of the isolate's strains. Their antimicrobial sensitivities were done using Kirby-Bauer diffusion techniques. The bacteria were examined to determine the proper antibiotic use.

RESULTS

No differences were found in the prevalence of ASB between pregnant women with and women without GDM. Out of the 100 pregnant women examined, the overall incidence of UTI was 60 (60%), however, this percentage of asymptomatic bacteriuria was detected equally among pregnant women with and without GDM (30%,30%) respectively. This study also indicated biochemical tests adopted for re-identification of isolated strains and their results were tabulated in Table1

Table 1 Biochemical tests adopted for identification of bacterial isolates

Biochemical tests										*Organisms*
No	*Catalase*	*Coagulase*	*Oxidase*	*Mannitol*	*Indole*	*Urease*	*Citrate*	*TSI*		
								H2S	*Gas*	
1	+	-	-	+	+	-	-	-	+	***E. coli***
2	+	+	-	+	-	+	+	-	-	***Staph. aureus***
3	+	-	+	+	-	-	+	+	-	***P. aeruginosa***
4	+	-	-	+	-	+	-	-	+	***Klebsiella spp***

Table 2 shows the pattern of all the organisms isolated from pregnant women with & without GDM. however, no significate differences in the incidence of culture-confirmed UTI in both pregnant women, Escherichia coli was the most common causative organism of ASB at 28(47%) in both pregnant women, 15(50%) with GDM, and 13(43%) without GDM, followed by *staphylococcus aureus* 20(33.3%), in pregnant women without GDM was 8(27%) and with GDM 12(40%). *Pseudomonas aeruginosa* accounting 13 % in diabetic and 7% in non-diabetic pregnant women and *Klebsiella spp* with 10% were the least isolated pathogens.

Table 2 Frequency distribution of bacterial isolates among pregnant women with & without GDM.

Isolated bacteria	**No. n = 60(%)**	**GDM, No=30 (%)**	**Without GDM, No=30 (%)**
Escherichia coli	28(47%)	15(50%)	13(43%)
Staphylococcus aureus	20(33%)	8(27%)	12(40%)
Pseudomonas aeruginosa	6(10%)	4(13%)	2(7%)
Klebsiella spp	6(10%)	3(10%)	3(10%)

The distribution of ASB among the pregnant women according to age group as shown in Table 3. The percentage of cultural positivity was highest in the age group 35-39 years among both groups of pregnant women with gestational diabetes mellitus and non-diabetes Mellitus, followed by age 25-34 years. The lowest rate of infection was recorded among age 15-19 and 45-49 years.

Table 3 Frequency distribution of isolated ASB among pregnant women according to age.

Age	**No of bacteria isolates (%)**			
	E. coli	*S. aureus*	*P. aeruginosa*	*Klebsiella spp*
15-19	3(11%)	0(0%)	0(0%)	0(0%)
20-24	4(14%)	5(25%)	1(17%)	1(17%)
25-29	3(11%)	6(30%)	1(17%)	1(17%)
30-34	3(11%)	5(25%)	0(0%)	2(33%)
35-39	9(32%)	2(10%)	2(33%)	2(33%)
40-44	4(14%)	1(5%)	2(33%)	0(0%)
45-49	2(7%)	1(5%)	0(0%)	0(0%)
Total	28	20	6	6

The antibiotic sensitivity pattern of various isolated strains in the present study is shown in Table 4. The susceptibility profile of isolates to commonly used antibiotics ranger between (0.0% to 80%). Escherichia coli indicated (89%) susceptibility to Ciprofloxacin. and least susceptible to Amoxil (21%). staphylococcus aureus was most susceptible to Ciprofloxacin (70%) and least susceptible to Amoxil (25%). Klebsiella spp was most susceptible to Ciprofloxacin and Cefotaxime (83%) and least susceptible to Nitrofurantoin and Amoxil (17 %). Pseudomonas aeruginosa was most

susceptible to Ciprofloxacin and Ampicillin Sulbactam (67%) and least susceptible to Ceftriaxone and Piperacillin (33.3%).

Most of the bacterial isolates were susceptible to CIP (80%). FM (65%) and SAM (65%) were the second most effective antibiotic, and the least option is AMI (20%).

Table 4 Antibiotic sensitivity pattern of isolated stains

Antibiotic	Bacterial isolates, No & (%)			
	E. coli (no=28)	*S. aureus* (no=20)	*Klebsiella spp* (no=6)	*P. aeruginosa* (no=6)
AMC	12(43%)	10(50%)	3(50%)	0(0%)
FM	23(82%)	12(60%)	1(17%)	3(50%)
AMI	6(21%)	5(25%)	1(17%)	0(0%)
CRO	18(64%)	12(60%)	4(67%)	2(33%)
PRI	16(57%)	7(35%)	3(50%)	2(33%)
CIP	25(89%)	14(70%)	5(83%)	4(67%)
CTX	19(68%)	11(55%)	5(83%)	0(0%)
SAM	20(71%)	11(55%)	4(67%)	4(67%)

Key: AMC- Augmentin, FM- Nitrofurantoin, AMI- Amoxil, CRO- Ceftriaxone, PRI- Piperacillin, CIP- Ciprofloxacin, CTX- Cefotaxime, SAM- Ampicillin Sulbactam

DISSCUSION

Asymptomatic bacteria are a common cause of severe maternal and perinatal morbidities during pregnancy and with appropriate screening and treatment, this morbidity can be reduced. In the present study, asymptomatic is highest in the older age group [19]. The result of this research showed that 60 out of 100 samples collected and screened for ASB yielded positive bacteria cultures. Pregnant women whether they are suffering from gestational diabetes or not are at risk of UTI but in many cases, infection remains asymptomatic. In this study, the total prevalence of asymptomatic ASB among pregnant women with and without GDM was (60%), which higher than previous work in the Netherlands [10]. Other studies reported ASB prevalence between 4.0%–18% in pregnant women with and 4.6%–8.2% without GDM [15–16] which considers very low compare with our study result.

The bacteria causing UTI in gestational diabetes mellitus patients are the same as in non-diabetic pregnant women and the predominant pathogens isolated in the present study were gram-negative enteric organisms that typically lead to UTI. Regarding the antimicrobial susceptibility pattern of the uropathogen, we observed that the isolated gram-negative enteric organisms were sensitive at similar rates in both pregnant women with and without GDM. in our study, the overall culture positivity rate was showed that the highest isolated organisms were E. coli 50 % and 43 % among diabetic and non-diabetic pregnant women respectively. This finding is most consistent with many of the previous studies which determined the E. coli are the most common urinary tract associated bacteria [17,18]. In another study, the most prevalent pathogen was Klebsiella among asymptomatic pregnant women [6]. The highest rate of ASB was reported in the age group (35-39) years and the lowest was in the age group (15-19) (45-49) years. It is noticeable that the infection of the urinary system is widespread among working women, and this can be explained that working women do not drink enough water during working hours. Similarly, higher to previous findings by Hawassa Referral Hospital in Southern Ethiopia [7].

In this study, the susceptibility of bacterial isolates against ciprofloxacin, Ampicillin Sulbactam, Nitrofurantoin, and Ceftriaxone was 80%, 65%,65%, 60% respectively. Screening for early diagnosis and treatment of UTI infection in pregnant women is essential to avoid its complication.

CONCLUSION

In summary, our study demonstrated that pregnant women with gestational diabetes mellitus do not have an increased risk for ASB or UTI which means that gestational diabetes mellitus was not associated with an increased risk of urinary tract infections. Our data courage for pregnant women to do a routine screen and treat policy in pregnant women with DM or GDM to helps analyze the associated factors and prevent its effects on pregnancy.

Disclaimer

This article has not been previously published, and is not part of a thesis project.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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