

Genitourinary tract infection in diabetic women: Bacteriological study

Yasmeen J. Al-Bayaa* BSc Biology, MSc Bacteriology

Summary:

Background: The influence of glucose metabolism is seen in many infectious diseases, making diabetic patients more vulnerable to sepsis and other serious sequelae of bacterial invasion such as UTI and vaginitis.

Patients and method: sixty two patients (women) were suffering from GUTIs consulting Al-Elwya hospital from November- 2009 to March -2010. Two samples were taken from those patients (urine samples and vaginal swabs); these samples were cultured on Blood, Chocolate, and MacConkey's agar for isolation of bacteria.

Results: The study group consists of sixty two women suffering from (GUTI), their ages range from 18-55 years. Thirty eight of them were diabetic women and twenty four of them were non- diabetic women. Twenty two of diabetic women were pregnant and sixteen of them were non- pregnant. Fifteen of non-diabetic women were pregnant and nine of them were non- pregnant.

Conclusion: Diabetes and pregnancy is a significant predisposing factor for GUTIs in women.

Keywords: genitourinary tract infection (GUTI), urinary tract infection (UTI), aerobic bacterial vaginitis, diabetes, pregnant.

Fac Med Baghdad
2010; Vol. 52, No. 3
Received Apr. 2010
Accepted May 2010

Introduction:

The genitourinary system is one of the portals of entry for many pathogens (1). Urinary tract infection (UTI) is defined as a significant bacteriuria in the presence of symptoms (2). The bacteria most often seen in UTIs are of fecal origin. Strict anaerobic bacteria rarely cause UTIs (2), (3). Women constitute the majority of the cases seen in the out patients clinic (30:1 female: male ratio) mainly when they were become sexually active (2), (3). This is due to shorter urethra and the much closer association of the urethra to the anus (3), (4). In addition to that, aerobic bacterial vaginitis (endogenous infections) is a term proposed to describe purulent vaginal discharge with predominance of abnormal aerobic flora. Aerobic vaginitis, which may be severe, has been reported as the cause of 5% of cases in a series from a specialty vaginitis clinic and it's common in women (5), (6). Because of the composition of vaginal fluid of glycoprotein's and carbohydrates which is important in vaginal colonization by bacteria (7). Diabetes mellitus is a major health problem in human; frequently associated with metabolic disorders (8). Bacteriuria is more common in diabetic than in non-diabetic women because women with diabetes have high sugar levels in their urine and vaginal secretions and this may contribute to infection by being nutrient to bacteria (9). It had been found also that diabetic women will be immunocompromised so increase susceptibility to UTI because decreased antibacterial activity due to the 'sweet urine', defects in neutrophil function, and increased adherence to uroepithelial cells. (10), (11), (12), (13), (14). Thus in this study we try to investigate the association

between diabetes and pregnancy for genitourinary tract infection (GUTI) and isolation of bacteria from infected women.

Patients and methods:

The study included sixty two women who were suffering from GUTIs and attended Al-Elwya hospital from November-2009 to March-2010. Urine sample and two sterile vaginal swabs were obtained from thirty eight diabetic and twenty four non-diabetic women and examined macroscopically (color, clarity, odor of urine) and (presence of white creamy or purulent discharge of vagina) and then examined directly under light microscope for urine after centrifugation, and wet mount preparation for one of the vaginal swabs (cocci or coarse rods). General urine examination, gram stain, routine urine analysis with urine strips, and culture of urine and the second vaginal swab on Blood, Chocolate, and MacConkey's agar and biochemical tests (API-20E and API-Staph kits) for identification of bacteria were done for bacteriological study (5), (8), (15), (16).

Statistical analysis:

Data were analyzed by mini tab software; descriptive statistics was used to illustrated tables frequency and percentages. Inferential statistics was used to find any association between variables. Fishers' exact test was used to find the probability. (P-value ≤ 0.05) considered statistically significant.

Results:

This study included sixty two women who were suffering from GUTIs. Their ages range from 18-55 years. Out of sixty two women; (61.3%) of them were diabetic and (38.7%) were non-diabetic,

* Dept. of microbiology, college of medicine, Baghdad University.

(59.7%) of them were pregnant and (40.3%) were non-pregnant. (35.5%) of diabetic women were pregnant and (25.8%) of them were non-pregnant. (24.2%) of non-diabetic women were pregnant and (14.5%) of them were non-pregnant as shown in table-1-.

Table -1- : The number and percentages of women studying groups.

Women groups	Pregnant (No.) (%)	Non-pregnant (No.) (%)	Total
Diabetic (No.) (%)	22 (35.5%)	16 (25.8%)	38 (61.3%)
Non-diabetic (No.) (%)	15 (24.2%)	9 (14.5%)	24 (38.7%)
Total	37 (59.7%)	25 (40.3%)	62

Table -2- and -3- showed the positive result of bacteriological urine culture and vaginal swab culture; from diabetic pregnant women were (90.9%), (95.4%); from diabetic non-pregnant women were (43.7%), (37.5%); from non-diabetic pregnant women were (13.3%), (20%); and from non-diabetic non-pregnant women were (55.5%), (66.7%).

Table -2- : Distribution of positive urine culture in relation to diabetes and pregnancy.

Table -3- : Distribution of positive vaginal swabs culture in relation to diabetes and pregnancy.

Positive urine culture		Pregnancy N=34		Total	P-value
		Pregnant (No.) (%)	Non-pregnant (No.) (%)		
Diabetes N=34	diabetic (No.) (%)	20 (90.9%)	7 (43.7%)	27 (71%)	0.0379
	Non-diabetic (No.) (%)	2 (13.3%)	5 (55.5%)	7 (29.2%)	
Total		22 (59.4%)	12 (48%)	34 (54.8%)	

Positive vaginal Swabs culture		Pregnancy N=36		Total	P-value
		Pregnant (No.) (%)	Non-pregnant (No.) (%)		
Diabetes N=36	Diabetic (No.) (%)	21 (95.4%)	6 (37.5%)	27 (71%)	0.022
	Non-diabetic (No.) (%)	3 (20%)	6 (66.7%)	9 (37.5%)	
Total		24 (64.9%)	12 (48%)	36 (58.1%)	

The result showed that the isolated bacteria from urinary tract infection and aerobic bacterial vaginitis in diabetic and non-diabetic women were belonged to 8 different species. The most common bacteria isolated from urine and vagina of diabetic and non-diabetic women was *Escherichia coli* (44.1%), (44.4%) , followed by *Staphylococcus aureus* (23.5%), (22.2%) , then *Klebsiella pneumonia* (11.8%), (10.8%) respectively and others as shown in table -4- and -5-. In this study the association between pregnancy and diabetes was significant for GUTI at ($P \leq 0.05$), while regarding presence of *E. coli*, *S. aureus*, *K. pneumonia* was non- significant for GUTI at ($P \leq 0.05$).

Table-4- : Types of bacteria isolated from 62 cultured urine samples.

Type of bacteria isolated	Diabetic		Non-diabetic		Total	p-value
	pregnant women N=20	non-pregnant women N=7	pregnant women N=2	non-pregnant women N=5		
<i>Escherichia coli</i>	11(55%)	2(28.6%)	1(50%)	1(20%)	15(44.1%)	0.371
<i>Staphylococcus aureus</i>	5(25%)	2(28.6%)	1(50%)	—	8(23.5%)	0.75
<i>Klebsiella pneumonia</i>	1(5%)	1(14.3%)	—	1(20%)	3(8.8%)	0.66
<i>Pseudomonas aeruginosa</i>	—	1(14.3%)	—	1(20%)	2(5.9%)	—
Coagulase negative Staphylococci	1(5%)	1(14.3%)	—	—	2(5.9%)	—
<i>Enterococcus faecalis</i>	1(5%)	—	—	1(20%)	2(5.9%)	—
<i>Proteus mirabilis</i>	1(5%)	—	—	—	1(2.9%)	—
<i>Citrobacter sp.</i>	—	—	—	1(20%)	1(2.9%)	—
Total	20	7	2	5	34	—

Table -5- : Types of bacteria isolated from 62 cultured vaginal swabs.

Type of bacteria isolated	Diabetic		Non-diabetic		Total	p-value
	pregnant women N=21	non-pregnant women N=6	pregnant women N=3	non-pregnant women N=6		
<i>Escherichia coli</i>	10(47.6%)	3(50%)	1(33.3%)	2(33.3%)	16(44.4%)	0.214
<i>Staphylococcus aureus</i>	4(19%)	2(33.3%)	1(33.3%)	1(16.7%)	8(22.2%)	0.642
<i>Klebsiella pneumonia</i>	2(9.5%)	1(16.7%)	—	1(16.7%)	4(11.1%)	0.5
<i>Pseudomonas aeruginosa</i>	2 (9.5%)	—	1(33.3%)	—	3(8.3%)	—
Coagulase negative Staphylococci	1(4.8%)	—	—	1(16.7%)	2(5.6%)	—
<i>Enterococcus faecalis</i>	—	—	—	1(16.7%)	1(2.8%)	—
<i>Proteus mirabilis</i>	1(4.8%)	—	—	—	1(2.8%)	—
<i>Citrobacter</i> sp.	(4.8%) 1	—	—	—	1(2.8%)	—
Total	21	6	3	6	36	—

Discussion:

Culture of vaginal discharge is the golden standard test for aerobic vaginitis (5). Bacterial infections constitute (58.1%) for aerobic bacterial vaginitis as shown in Table-3-. The result was differ to those reported by Abas (2001) that bacterial infections constitute (75.2%) for aerobic bacterial vaginitis. The difference in the results may be attributed to the variation in the place and size of samples and the age of patients. The association between pregnancy and diabetes was significant for GUTI at ($P \leq 0.05$); that mean the pregnancy and diabetes represent the major risk factors for GUTI. The results agreed with those reported by Al-Musawi (2001) that diabetes is a significant predisposing for GUTI at ($P \leq 0.05$). Jennifer et. al., (2004) reported that UTI are the most common bacterial infections during pregnancy as shown in the table-2- that twenty two (59.4%) of thirty seven pregnant women were infected with UTI. *Escherichia coli* was predominate pathogen in urine and vagina of diabetic and non-diabetic women (44.1%), (44.4%) respectively. This result was similar to those reported by Al-Hamidawy (2005) that *E. coli* was predominant pathogen in urinary tract infections of diabetic and non-diabetic women and constitute (40.1%). Other results (7) showed that *E. coli* was the predominant organism in UTIs. Also the result was similar to Al-Jammaly (2005) who reported that *E. coli* dominates among the UTI infections and bacterial vaginosis. The presence of this bacteria in large percent in UTI and aerobic bacterial vaginitis might be attributed to the fact that this bacteria is part of normal fecal flora and different virulence factors attributing to their pathogenesis, and the composition of vaginal fluid in terms of glycoproteins and free carbohydrates is important in vaginal colonization by bacteria (7), (22). The second most common bacteria isolated from UTI and aerobic bacterial vaginitis is *Staphylococcus aureus* (23.5%), (22.2%) respectively. These results were similar to those reported by Mohammad (2000) that frequency of *S. aureus* isolated from urine (15.88%) and from

Vagina (23.65%) respectively. The presence of these bacteria in urine and vaginal samples may be due to that *Staphylococci* are normal flora of intestine and vagina (24). Al-Jammaly (2005) reported that the percentage of *Klebsiella pneumonia* in UTI and aerobic bacterial vaginitis were (11.8%), (10.8%) respectively. These results were similar to our results that *K. pneumonia* constitute (8.8%), (11.1%) in UTI and aerobic bacterial vaginitis in diabetic and non-diabetic women. The results showed that the association between diabetic and pregnancy regarding presence of *E. coli*, *S. aureus*, *K. pneumonia* was non- significant for GUTI at ($P \leq 0.05$); that mean these three types of bacteria were present in four groups nearly same proportion. Other species of bacteria isolated from women suffering from GUTI were shown in table -3- and -4-. These results were similar with other results (8), (14) that *Escherichia coli*, *Klebsiella*, *Staphylococcus* spp., *Proteus* spp., *Enterococcus faecalis* were the causes of UTI and lower genital tract infection in diabetic women. In this study there was no significant difference in microbiological features causing UTI in diabetic and non-diabetic women. These results were in agreement with others (8), (25).

References:

1. Nester EW, Aderson DG, Roberts CE, Pearsall NN, and Nester MT (2001). *Microbiology: a human perspective. Third edition. Mc Graw- Hill companies, Inc New York. P500-503.*
2. Wilson ML and Gaido L (2004). *Laboratory diagnosis of urinary tract infections in adult patients. Clin. Infec. Dis. 38:1150-1158.*
3. R. Orenstein and E.S. Wong (1999). *Urinary tract infections in adults. American Family Physician.*
4. Benson HJ (2002). *Microbiological application. Laboratory manual in general microbiology. Eighth edition. Mc Graw- Hill companies, Inc New York.*
5. French L, Horton J, and Matousek M (2004). *Abnormal vaginal discharge: using office diagnostic testing more effectively. 53(10):3-15.*

6. Jawetz ZM, Adel Berg EA, Brooks GF, Butel JS, and Worsie SA (2001). *Medical microbiology*. Second edition. McGraw-Hill company. New York.
7. Rajan N, Cao Q, Anderson B, Pruden DL, Sensibar J, Duncan JL, and Schaeffer AJ (1999). Roles of glycoproteins and oligosaccharides found in human vaginal fluid in bacterial adherence. *American society for microbiology*. 67(10): 5027-5032.
8. Rakshanda Baqai, Mubashir Aziz, and Ghulam Rasool (2008). Urinary tract infection in diabetic patients and biofilm formation of uropathogenes. Department of microbiology, university of Karachi, Pakistan DVM. 17(1):7-9.
9. Beus T (2001). Thrush in women. *Women's health*, 52 Featherstone Street, London. www.candida_society.org.uk.
10. Qarau M, Latorre A, and Alonso-sanz M (2001). Fosfomycin: an underrated antibiotic for UTI due to *E. coli*. *Enferm Infecc Microbiol Clin*. 19(10):462-466.
11. Stephan D.Fihn (2003). Acute uncomplicated urinary tract infection in women. 349(3): 259-266.
12. Hooton TM (2001). Recurrent urinary tract infection in women. *Int J*.
13. Hoepelman IM (1994). Urinary tract infection in patient with diabetes mellitus. 492: 113-116.
14. Donders GG (2002). Lower genital tract infections in diabetic women. *Current infectious disease reports*. 4:536-539.
15. Forbes BA, Sahm DF, and Weissfeld AS (2002). *Diagnostic microbiology*. 11th ed. Mosby.
16. Williams E (2006). Vaginitis – diagnosis and treatment. www.medschool.lsuhs.edu
17. عباس، فاطمة معين (2001). دراسة تشخيصية لبعض الأحياء المجهرية المسببة لالتهاب المهبل في النساء الحوامل في محافظة بابل. رسالة ماجستير كلية العلوم جامعة بابل.
18. Al-Musawi LHM (2001). Effect of glucose, PH and olive leaves extract on some type of bacteria isolated from diabetic and healthy individuals. MSc Thesis, College of Science, University of Mustansiriyah, Baghdad.
19. Jennifer LE, Brigges GG, Mckeown A, and Bustillo G (2004). Urinary tract infections during pregnancy. 38(10): 1692-1701.
20. Al-Hemidawy TF (2005). Hemolytic activity: *E. coli* isolated from UTIs and its resistance to antibiotic. PhD Thesis, College of Science, University of Mustansiriyah, Baghdad.
21. Al-Jammaly MM (2005). Genitourinary tract infection of women in Mosel city. MSc Thesis, College of Science, University of Mustansiriyah, Mosel.
22. Nester EW, Aderson DG, Roberts CE, Pearsall NN, and Nester MT (1998). *Microbiology: a human perspective*. 2nd edition. Mc Graw- Hill companies, Inc New York. P464.
- 23- Mohammad HH (2000). Prevalence of coagulase positive *Staphylococcus aureus* among patients, health care staff and equipment in general Azadi hospital MSc theses. College of medicine. University of Dohuk.
24. Prescott LM, Harley JP, and Klein DA (2002). *Microbiology*. Fifth edition. Mc Graw- Hill companies, Inc New York. P919.
25. Banadio M, Meini M, Gigli C, Longeo B, and Vigna A (1999). Urinary tract infection in diabetic patients. 63(4):215-9.