Asymptomatic Bacteriuria in Type II Diabetic Women in Ramadi City

Khalid M. Al-Dulaimi[1] *, Huda R. Al-Alwani*[2] *, Faze'a E. Al-Tarboli*[3]

Abstract

Background: Urinary tract in diabetics is one of the most common site for infection, not infrequently associated with serious complications. This study was conducted to evaluate the prevalence of asymptomatic bacteriuria in type 2 diabetic women of Al-Anbar population.

Objective: The aim of this study was to assess the prevalence of asymptomatic bacteriuria and associated risk factors in type 2 diabetic women.

Methods: A total of 108 non-pregnant type 2 diabetic women (32 years to 100 years old) with no abnormalities of the urinary tract system were studied from March to November 2007. All the participants were symptoms free regarding urinary tract infection. Pyuria, macroalbuminuria glucosuria ,Age, and, duration of diabetes were assessed and compared in participants with and without bacteriuria. Bacteriuria was defined as the presence of at least 105 colony forming units/ml of 1 or 2 bacterial species in a culture of clean-voided midstream urine confirmed by a second culture.

Results: The prevalence of ASB (Asymptomatic bacteriuria) was 33.3%. *Escherichia coli* was the most prevalent microorganism responsible for positive urine culture (61.1%) . Most of the isolated microorganisms were sensitive to Amikacin, Norfloxacin and Ciprofloxacin. Pyuria, macroalbuminuria and glucosuria had a meaningful relationship with ASB but no associations were found between age, duration of diabetes and the presence of ASB.

Conclusion: Type 2 diabetic women suffering from pyuria, macroalbuminuria and glucosuria had higher prevalence of ASB. Urine culture can be recommended for diabetic women even when they are symptoms free regarding UTI.

Key words: Asymptomatic bacteriuria, Type 2 diabetic women, Ramadi-Iraq.

[1] M.B.Ch.B. D.M. F.I.C.M.S. College of Medicine, Al-Anbar University
[2] Lec. Microbiology College of Medicine, Al-Anbar University
[3] M.B.Ch.B. Diploma in Medicine

Introduction

Patients with diabetes mellitus are more predisposed to infections [1, 2]. The urinary tract is the most common site for infection [2,3]. This predisposition is due to a combination of angiopathy, neuropathy and hyperglycemia[4]. The prevalence of symptomatic urinary tract infections [UTI] and/or asymptomatic bacteriuria in female diabetic patients has been reported as increased[5,6] or unchanged[7, 8, 9] compared to non-diabetic subjects. Up to date reported data on the prevalence and various risk factors for ASB appear to be conflicting[10].

Impaired host defense mechanisms such as impaired wound healing, impaired granulocyte function, decreased cellular immunity, impaired complement function, decreased antibacterial activity of the urine as a result of dilution of inhibitory substances such as urea and decreased lymphokine response may be influenced by glycemic control[11, 12, 13] and increased adhesive capacity of bladder epithelium[14, 6].

Complications from UTI frequently seen in diabetics include acute lobar nephronia, intrarenal abscess, perinephric abscess, emphysematous cystitis, emphysematous pyelonephritis, papillary necrosis and metastatic infections; bacteria and yeast are the major pathogens[15]. When the organism is isolated from the urine culture, the physician must decide whether to treat the bacteriuria or funguria; enteric bacteria are common pathogens especially *Escherichia coli* and *Klebsiella*[15] . Many Urinary Tract Infections (UTIs) are asymptomatic and whether the symptomatic UTIs are preceded by asymptomatic bacteriuria (ASB) is not known[16, 17]. Development of ASB in diabetic women is much more common than in nondiabetic women[3, 17, 18]. Various risk factors for ASB in women with diabetes have been suggested including sexual intercourse, age, duration of diabetes, degree of metabolic control and complications of diabetes[19, 20, 21].

Univariate and Multivariate analysis performed for the group of women revealed sexual intercourse and pyuria as the only risk factor associated with the frequency of bacteriuria, and it was conducted that ASB may be associated with sexual activity in women with NIDDM[19, 22]. Other studies found that patient with previous experience of antimicrobial therapy have high risk for UTIs[20].

Patients and Methods

This was a prospective, descriptive and analytic study of 108 asymptomatic type 2 diabetic women , conducted at Al- Ramadi General Hospital in Al-Ramadi city, between March to November 2007 year. The mean age was (54.3±11.1) with a distribution between 32–100 years. The mean duration of the disease was (7.6±6.2) with a distribution between 1–27 years.

Included criteria considered as women with type 2 diabetes mellitus. Excluded criteria was pregnancy, recent hospitalization or surgery (<4 month), known urinary tract abnormalities (including cystopathy or recent urinary tract instrumentation), symptoms of UTI (including dysuria, fever, urgency, abdominal discomfort, etc) or the use of antimicrobial drugs in the last 14 days.

All patients were interviewed and their medical histories were obtained using a standardized questionnaire. Also laboratory values such as blood urea, serum creatinine, glucose were obtained in fasting patients. Urine samples were checked for macroalbuminuria, glucosuria by dip stick. Midstream clean voiding urinary specimens were collected for urinalysis, microscopy, culture and sensitivity. The specimens were refrigerated immediately and cultured within two hours. All urine samples were cultured on blood and MacConkey agar plates. The plates were incubated at 37°C aerobically for 48 hours.

Bacteriuria was defined as the presence of at least 10^5 colony forming units/ml of 1 or 2 bacterial species in a culture of clean-voided midstream urine confirmed by a second culture. Presence of at least three different microorganisms in a urine specimen was considered as contamination. According to the 2000 WHO criteria, Diabetes mellitus was defined as fasting glucose concentration of ≥7.0 mmol/ l (≥126 mg/dl) or a two-hour post prandial glucose concentration of ≥11.1 m mol (≥200 mg/dl) or the use of glucose-lowering medication (tablets or insulin) [23].

Type 2 diabetes was defined as the combination of resistance to insulin action and an inadequate compensatory insulin secretory response[24]. Differences between patients with and without ASB were obtained through *t* test for continuous variables (age, duration of diabetes). For nominal variables we used *chi* squared test and Binominal test for proportion (albuminuria, glucosuria and pyuria). Data were categorized by Microsoft Exel 2003, and analyzed by SPSS statistical software for windows (version 10). P value of <0.05 was considered statistically significant. Mean values are reported as mean ± standard deviation.

Results

Thirty-six (33.3%) of 108 patients enrolled in this study showed (ASB). Seven types of microorganisms were isolated from urine cultures. E. coli was the leading cause of ASB (61.1%) followed by *Klebsiellae* spp, *Pseudomonas aeruginosa*, *Citrobacter* and so on as represented in the following figure.

The sensitivity of isolated bacteria to the various antibiotics (10drugs), are shown in fig-2. Amikacin seems to be the most effective drug against large types of bacteria (35.8%).

Out of (36) patients with (ASB); 29 (80.6%), 15 (41.7%) and 26 (72%) had pyuria, macroalbuminuria and glucosuria respectively as shown in table -3 and fig -3. The parameters, age of the patient, duration of the diabetes, pyuria, macroalbuminuria and glucosuria were correlated with the (positive versus negative) results of (ASB) as shown in table -3 and fig-3.. It was found statistically significant correlation between the ASB and the pyuria, macroalbuminuria and glcosuria (P <0.05), but age of the patiens and the duration of the diabetes has no correlation (P >0.05).

Fig. 1: Shows the isolated microorganisms from the urine cultures of 36 type II diabetic women with ASB.

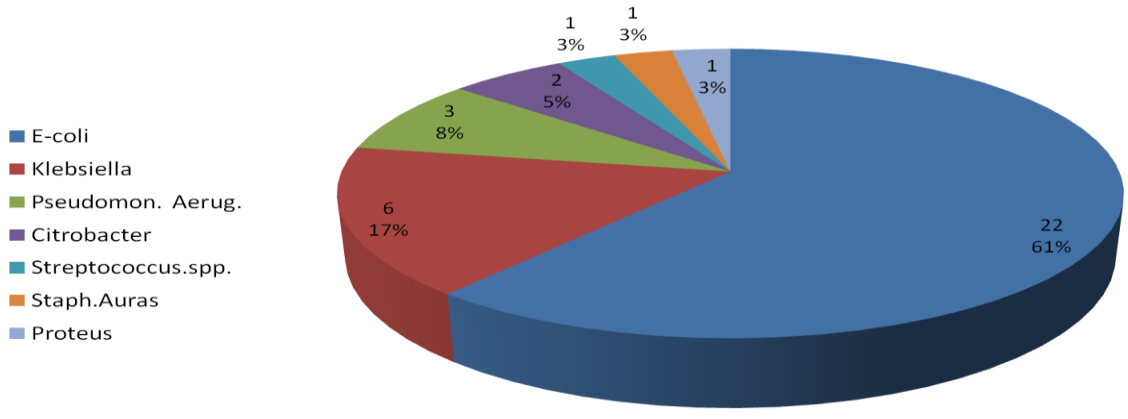

Fig. 3: Shows the statistical analysis of different risk factors in ASB type II diabetic patients.

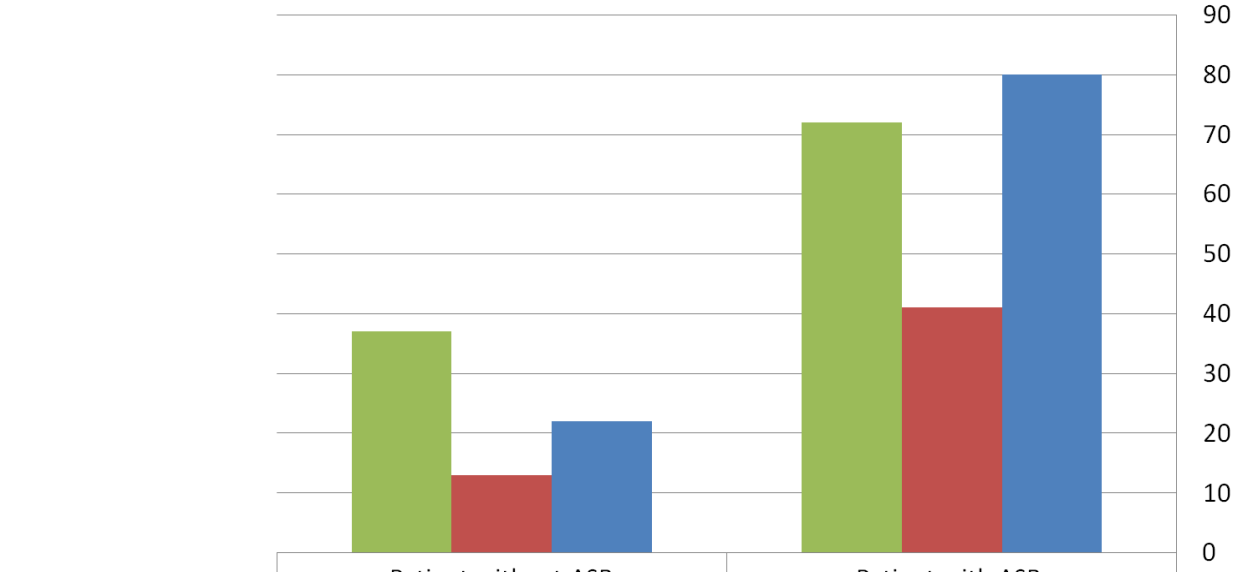

Table 3 Shows the statistical analysis of different risk factors in ASB type II diabetic patients.

Parameters (risk factors)	Patient with ASB	Patient without ASB	P-values
No & %	36 (33)	72 (67)	< 0.001
Age (year) mean±SD	54.8±12.1	54.1±10.7	> 0.05
Duration of diabetes (years) mean±SD	8.11 ± 6.4	7.4 ± 6.1	> 0.05
Pyuria (No. & %)	29 (80)	16 (22)	< 0.001
Macroalbuminuria (No. & %)	15 (41)	10 (13)	< 0.001
Glucosuria (No. & %)	26 (72)	27 (37)	< 0.01

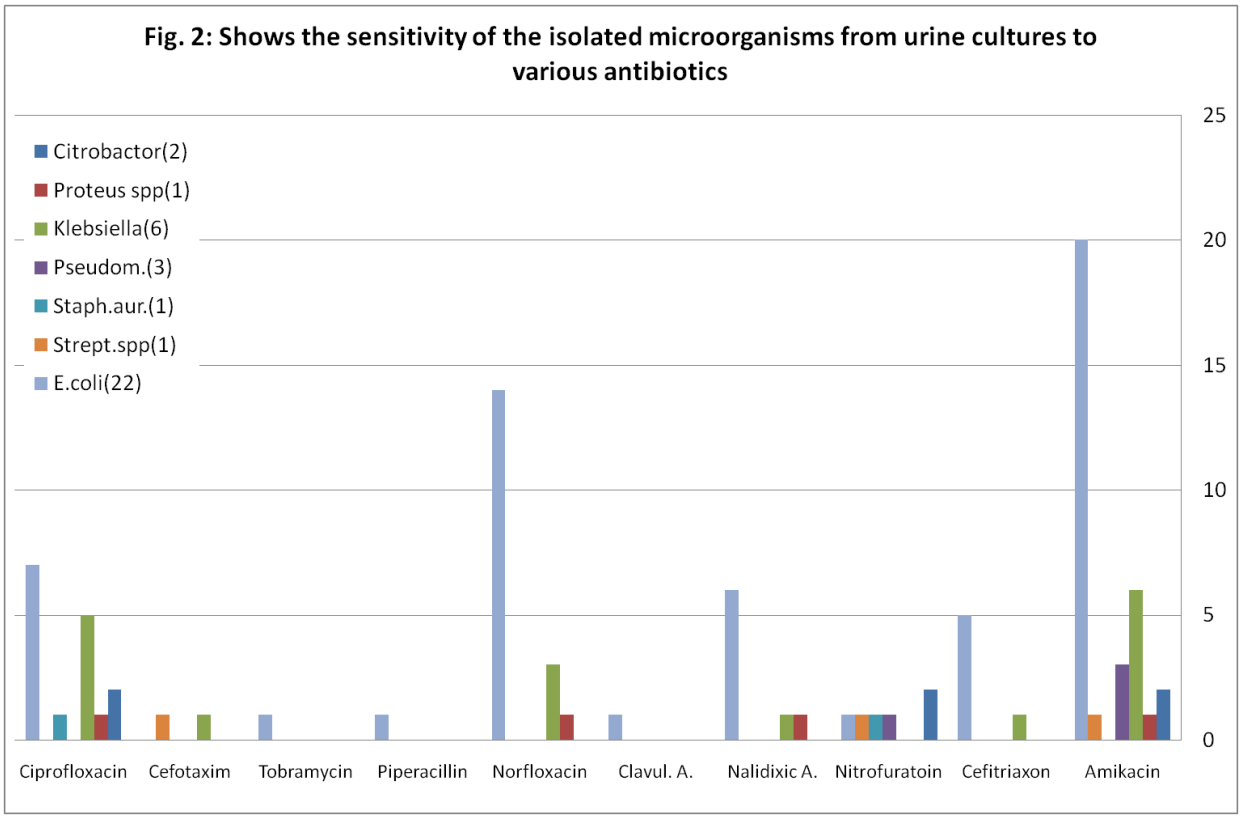

Fig. 2: Shows the sensitivity of the isolated microorganisms from urine cultures to various antibiotics

Discussion

In this study out of 108 type 2 diabetic women 36 (33.3%) had ASB. This is mildly higher than that reported (32%) by Mendoza[25] in 2002 and (29%) by Hoepelman[26] in 2000. Lower prevalence was reported (11.2%) by Kayima[27] in 1996 and (7.9%) by Zhanel[20] in 1995, 26% in Geerlings[28] study in 2000 , and 26.6% in Alebiosu[29]report in 2003. The high prevelance of ASB in our study may be explained by the miss use of antimicrobials in our society or may be of increased water and air pollution or may be of increased number of diabetic women as a result of high stress factor of the war in Iraq.

In the present study, the most prevalent microorganism isolated from urine cultures was *E. coli* (61.1%). This was higher than (42%) that reported by Geerlings[28] study in 2000, and higher than the percentage reported by Lye[30] in 1992 and than (55%) that reported by Mendoza[25] In 2002.

In a few studies, the type of isolated microorganisms was different, For example *Klebsiella* was the most common microorganism in the Alebiosu[29] study in 2003 and (10%) reported by Mendoza et al. In the study of Mendoza[25] showed that isolated microorganisms were 10% coagulase negative Staphylococcus, 10% Enterococcus spp, and 5% *Pseudomonas aeruginosa*. As fig -2 show that (35.8%) of isolated microorganisms from the urine of participants in our study were sensitive to Amikacin. Among them a leading bacteria was *E .Coli* (90.9%).

These isolated microorganisms in our study displayed lower sensitivity to Norfloxacin ,Ciprofloxacin, Nalidixic acid, and Ceftriaxon, (19.6%), (17.4%), (8.7%) and (6.5%) respectevly. Most of these isolated bacteria showed resistance to Clavulonic acid, Pipracillin, Tobramycin and Cefotaxim, see fig-2.

Our result found that there is a significant relationship between ASB and pyuria, macroalbuminuria and glucosuria (P<0. 01) .

This is comparable with that reported by Geerlings[28] in 2000; Geerlings[31] in 2001, and with that reported in the study of Forland[32] in 1977 except for albuminuria.

Age is a well-known risk factor for bacteriuria in women without diabetes (Nordenstam[33] in 1986) and some studies have shown age as the most important risk factor for ASB in type 2 diabetic patients[19] in1992), but age had no significant relation with ASB in our study (p >0.05).

Some studies have shown that a longer duration of diabetes increases the risk of developing ASB[34, 20], while others could not confirm this notion[17, 19, 35 ,21]. In our study, duration of the diabetes mellitus could not be considered as an associate for ASB (p >0.05).

The study concluded that, the prevalence of ASB is high in women with type 2 diabetes, for which pyuria, macrolbuminuria and glucosuria can be considered as associates. Also, pyuria , macrolbuminuria and glucosuria may be a useful clinical predictors for the development or presence of ASB.

The study recommended that , urine culture is recommended for diabetic women even when there is no urinary symptoms. Further, frequent follow up of sensitivity of isolated microorganisms to regularly available or employed antibiotics in the treatment of urinary tract infection to evaluate there beneficial effect in diabetics women. Also, it is optional (controversial) whether to treat ASB or not.

References

1. Joshi N, Caputo GM,Weitekamp MR, Karchmer AW. Infections in patients with diabetes mellitus. N Engl J Med 1999:341.
2. MacFarlane IA, Brown RM, Smyth RW, Burdon DW, FitzGerald MG: Bactereamia in diabetics. J Infect 1986, 12:213-219.
3. Wheat LJ: Infection and diabetes mellitus. Diabets care 1980, 3:187-197.
4. Murphy DP, Tan JS, File TMJ. Infectious complications in diabetic patients. Primary Care 1981; 8: 695–714.
5. Ostenson CG.. Brauner A, Foldin U, Hylander B, Bacteriuria, bacterial virulence and host factors in diabetic patients. Diabetic Med 1993; 10: 550 -554.
6. Zhanel GG, Harding GKM, Guay DRP. Asymptomatic bacteriuria: Which patients should be treated? Arch Intern Med 1990; 150: 1389-1396.
7. McMahon MM, Bistrian BR. Host defenses and susceptibility to infection in patients with diabetes mellitus. Infect Dis Clin North Am 1995; 9: 1–9.
8. Geerlings SE, Stolk RP, Camps MJ, Netten PM, Collet JT, Schneeberger PM, Hoepelman AI: Consequence of asymptomatic bacteriuria in woman with diabetes mellitus. Arc Inter Med 2001,161:1412-1427.
9. Zhanel GG, Harding GKM, Nicolle LE. Asymptomatic bacteriuria in patients with diabetes mellitus. Rev Infect Dis. 1991; 13; 150-154.
10. Lye WC, Chan RKT, Lee EJC, Kumarasinghe G. Urinary tract infection in patients with diabetes mellitus. J Infect 1992; 24: 169-174.
11. Patterson JE, Andriole VT. Bacterial urinary tract infections in diabetes. Infect Dis Clin N Am 1997; 11: 735-750 .
12. Brauner A, Flodin U, Hylander B, Ostenson CG: Bacteriuria, bacterial virulence and host factors in diabetic patients. Diabet Med 1993, 10(6):550-554.
13. Pometta D, Rees SB, Younger D, Kass EH. Asymptomatic bacteriuria in diabetes mellitus. N Eng J Med 1967 ; 276: 1118-1121.
14. Forland M, Thomas V, Shelokov A. Urinary tract infections in patients with diabetes mellitus: studies on antibody coating of bacteria. J Am Med Assoc 1977; 238: 1924–6.
15. Diaa E.E. Rizk. The prevalence and complications of urinary tract infections in women with gestational diabetes mellitus: Facts and fantasies, Int. J Diabetes and metabolism 2002,10:29-32.
16. Leibovici L,Yehehzkelli Y, Porter A et al. Influence of diabetes mellitus and glycaemic control on the characteristics and outcome of common infections. Diabetic Med 1996; 13 : 457– 63.

17. Platt R, Polk BF, Murdock B, Rosner B. Risk factors for nosocomial urinary tract infection. Am J Epidemiol 1986; 124: 977– 85.
18. Vejlsgaard R: Studies on urinary Infection in diabetics. I. Bacteriuria in-patients with diabetes mellitus and in control subjects. *Acta Med scand* 1966, 179:173-182.
19. Storm BL,Collins M,West SL ,et al,sexual activity , contraceptive use and other risk factor for symptomatic and asymptomatic bacteriuria: a case-control stady , Ann Intern Med 1987; 107:816-23.
20. Osterby Hansen R: Bacteriuria in diabetic and non- diabetic out- patients. Acta Med Scand 1964, 176:721-730.
21. Schmitt JK, Fawcett CJ, Gullickson G: Asymptomatic bacteriuria and hemoglobin Al. Diabetes Care 1986, 9:518-520.
22. Keane EM, Boyko EJ, Reller LB, Hamman RF: Prevalence of asymptomatic bacteriuria in subjects with NIDDM in San Luis valley of Colorado. Diabetes care 1988, 11:708-712.
23. Peter G Colman, David W Thomas, Paul Z Zimmet, Timothy A Welborn, Peter Garcia-Webb and M Peter Moore New classification and criteria for diagnosis of diabetes mellitus MJA 1999; 170: 375-378.
24. Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Report of the expert committee on the diagnosis and classification of diabetes mellitus. Diabetes Care 2003, 26(Suppl 1):S5-20.
25. Mendoza T, García de los Ríos M, Lafourcade M, Soto C, Durruty P, Alvo M. Asymptomatic bacteriuria in type 2 diabetics women. Rev.Med Chil.2002;130(9):1001-7.
26. Hoepelman A. I. M. S.E.GeerlingsUrinary tract infections in patients with diabetes. CMAC-2000, volume 2, NO.2.
27. Kayima JK, Otieno LS, Twahir A, Njenga E: Asymptomatic bacteriuria among diabetics attending Kenyatta National Hospital. East African Medical Journal 1996, 73(8):524-6.
28. Geerlings SE, Stolk RP, Camps MJ, Netten PM, Hoekstra JB, Bouter PK, Braveboer B, Collet TJ, Jansz AR, Hoepelman AM: Asymptomatic bacteriuria may be considered a complication in women with diabetes. Diabetes Care 2000, 23(6):744-749.
29. Alebiosu CO, Osinupebi OA, Olajubu FA: Significant asymptomatic bacteriuria among Nigerian type 2 diabetics. J Natl Med Assoc 2003, 95:344-351.
30. Nordenstam GR, Brandberg CA, Oden AS, Svanborg Eden CM, Svanborg A: Bacteriuria and mortality in an elderly population. N Engl J Med 1986, 314(18):1152-1156.
31. Ishay A., Lavi I., Luboshitzky R. Prevalence and risk factors for asymptomatic bacteriuria in women with Type 2 diabetes mellitus Diabetic Medicine 2006, 23 (2), 185–188.
32. Mohammad Ali Boroumand, Leila Sam, Seyed Hesameddin Abbasi, Mojtaba Salarifar, Ebrahim Kassaian and Saeedeh Forghani: Asymptomatic bacteriuria in type 2 Iranian diabetic women: across sectional study. BMC women's Health 2006, 6:4 doi:10.1186 /1472-6874-6-4
33. O'Sullivan DJ, Fitzgerald MG, Meynell MJ, Malins JM. Urinary tract infection: A comparative study in the diabetic and general population. Br Med J 1961; 1: 786- 788 .
34. Zhanel GG, Nicolle LE, Harding GK: Prevalence of asymptomatic bacteriuria and associated host factors in women with diabetes mellitus. Clin Infect Dis 1995, 21:316-322.
35. Perez luque EL, de la luz Villalpando M, Malacra JM: Association of sexual activity and bactriuria in women with noninsulindependent diabetes mellitus. J Diabetes Complications 1992,6:254-257.