Original Research Article

Prevalence Some Pathogenic Bacteria Causing UTI in Diabetic Patients In / Specialized Center For Endocrinology and Diabetes of Baghdad City–Iraq

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Abstract

Urinary tract infections (UTIs) are caused by microorganisms but Bacteria are the most common cause when they overcome the natural defenses and causing infection, especially in patients with diabetes mellitus and its may present as asymptomatic bacteriuria, leading more serious infections. The aim of this study was to assess the prevalence of bacteria causing UTIs among diabetic patients.

Collected one hundred and seventy five samples of sera and urine form diabetic patients with & without UTIs were studied from the specialized center for Endocrinology and diabetes All urine samples were tested by General urine examination (G.U.E) in addition to urine culture. On MacConkey and blood agar then identify the presence of the bacteria.

Urinary tract infection increased with aging and increase percentage of UTI among individuals above 40 years so, high incidence of UTI among diabetic females (75%) rather that in diabetic males (25%). prominent UTI among females (68.8%) rather than males (31.1%) either diabetic or non-diabetic patients, as well as prevalence of smoking among males (74 %) than females (26%), So, *Escherichia coli* (15 isolates) most of them (13 isolates) in the urine sample of type II D.M particulary, the elderly ≥40 years females (11 isolates), and conclude from this study the duration of diabetes can affect the development of complication especially UTI complications, where their prevalence increases with longer duration of disease,Women with diabetes have more frequent and more sever UTI, and *Escherichia.coli* was the most common pathogen isolated in both groups.

Key Words : Urinary tract infections, Diabetes Mellitus, bacteria, *Escherichia coli.*

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الخلاصة

ان التهابات المسالك البولية بسبب الاصابة بالكائنات المجهرية المرضية (الفطريات والفيروسات والبكتيريا) الا ان البكتيريا هي الأكثر شيوعا في هذه اصابات لاسيما لدى مرضى السكري ، فقد تؤدي الاصابة بهذة البكتريا إلى التهابات أكثر خطورة، لذا فان الهدف من هذه الدراسة هو تقييم انتشار هذه البكتيريا الأكثر شيوعا المسببة لاصابات التهاب المسالك البولية لدى مرضى السكري ومدى تاثر انتشارها بعوامل عديده كالعمر والجنس .

وقد جمعت مائة وخمسة وسبعون عينة من البول ومصل الدم لمرضى السكري المصابين و غير المصابين بالتهابات المسالك البولية المراجعين لمركز المتخصص للغدد الصم والسكري وقد تم اجراء الفحص العام للادرار بالاضافة الى زراعة كل العينات على وسطي الدم والمكونكي للتعرف على وجود البكتيريا. وقد اظهرت النتائج الدراسة ان التهابات المسالك البولية تزداد بزيادة العمر حيث كانت مرتفعة بين المرضى اللذين كانت اعمارهم فوق ٤٠ سنة، وايضا كانت نسبة التهاب المسالك البولية بين الإناث السكري (٧٥٪) اعلى مما هو علية في الذكور مقارنه بالمرضى غير المصابين بالسكري.

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وقد بينت نتائج الدراسة ان انتشار التدخين بين الذكور (٧٤٪) اعلى من الإناث (٢٦٪)، اما البكتريا الاكثر عزلا من عينات البول فقد احتلت بكتريا الاشريشيا القولونية (١٥ عزلة) المركز الاول ، حيث كانت (١٣ عزلة) منها من بول مرضى السكري نوع الثاني ، وقد استنتج من هذه الدراسة أن مدة مرض السكري تلعب دورا فعالا في تطور مضاعفات السكري ، خاصة التهابات المسالك البولية ، حيث تزداد بزيادة مدة الاصابة بالسكري، والنساء المصابات بمرض السكري أكثر عرضة للاصابة من الذكور وايضا فان بكتريا *Escherichia.coli* هي الأكثر شيوعا في كلتا المجموعتين.

الكلمات المفتاحية: التهابات المسالك البولية، مرض السكري، بكتيريا القولون المعوية.

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Introduction

Urinary tract infection (UTI) is one of the most common bacterial infections in Iraqi population[1]. However, it is common in many diabetic patients [2]. UTI is common in Iraqi population, and its prevalence rate is 23% from all infections [3].

Urinary tract infection is defined as the presence of both significant bacteriuria (10^5 CFU/ml) and symptoms [4]. Microorganisms which are known to involve in UTI are bacteria, mycoplasma in addition to fungi. The Bacteria that can live in the digestive tract, vagina or around the urethra , can enter the urinary tract . The most often these bacteria enter the urethra and travel to the bladder and kidney [5], enteric bacteria are common pathogens especially *proteus sp.*, *E. coli*, *Klebsiella* and *Pseudomonas aeruginosa*. These bacteria are found in patients with previous experience of antimicrobial therapy [6]. While *Streptococcus agalactiae* (group B Streptococcus) may be found in diabetic patients with poor glycemic control. Chlamydia and Mycoplasma may also cause UTIs, but these infections tend to remain limited to the urethra and reproductive system, due to sexually transmitted, and infections require treatment of both partners [7].

Studies revealed that people with diabetes have a higher risk of UTI because of changes in the immune system, immune defenses prevent infection, but despite these safe guards, infections still occurs.

There are two important aspects of host defense against UTIs; First the innate immune response to an infection in the bladder or kidneys, so the second , a UTI will be spontaneously resolved in most cases, children and women who don't get UTIs are more likely to have normal levels of immunoglobulins in their genital and urinary tract [8].

There are two types of diabetes: Type I, when the pancreas is not able to make insulin while Type II occur when pancreas does not make enough insulin or the cells ignore it [9].

The urinary tract infections can be defined as a significant bacteriuria in the presence of symptoms [7], According to Pingle, UTI: is an inflammatory response of the urothelium to bacteria, invasion that is usually associated with bacteriuria and pyuria [10], as well as UTIs are caused by microorganisms – usually bacteria that enter the urethra and bladder, causing inflammation and infection. The bacteria also may travel up the ureters and infect the kidneys [7].

Careful diagnosis and treatment result in successful resolution of infections in most instances. It was reported that UTIs are occurring in two out of every 100 people in America [11], It was noticed that most organisms cause urinary tract infections are bowel commensals and the bacteria can reach the bladder via the urethra from the lower bowel or the perineum [12].

The aim of this study was to study the correlated between UTIs and diabetes mellitus, study many important factors that may play important role in incident the UTIs in diabetes and non- diabetic patients.

Materials and Methods

Study Design

This study includes one hundred and seventy five diabetic Iraqi patients,(one hundred of them are with of Urinary

Tract Infections and seventy five without UTI) compared with seventy non-diabetes have UTI as a patient controls, were admitted to specialized center for Endocrinology and diabetes, at period from August 2013-May 2014.

Collection of Urine Specimens

The urine specimens were collected as aseptic technique as possible in a sterile tubes. After preliminary cleaning of the genitalia, Mid-stream urine (MSU) was taken from the patients and the control individuals [10].

The collected specimens were transported to the laboratory within 30 minutes of collection [13].

If we could not, then the urine specimen were stored at 4˚C to prevent the bacterial multiplication in the urine outside the body [14, 15].

Laboratory Testing

Routine urinalysis was carried out for each specimen to determine the Colour; Turbidity; Reaction; Specific gravity; Albumin; Sugar and Keton bodies.

Sugar In Urine was detected using standard method [16].

Keton Bodies In Urine

Keton bodies in urine were detected by using a dipstick [16].

Microscopical Examination of urine sample was also carried out to identify the components of the urinary sediment [16].

Urine Culture

The urine specimens were inoculated on both blood and sterilized standard MacConkey's agar plates by direct streaking method [14].

Identification of Isolated Bacteria

Cultural Characteristics including Colony size, color, elevation, edges, haemolysis, were determined. Gram Stain and API 20 E strips was used for confirm bacterial identification [16].

Statistical Analysis:

Analysis of the data were performed by measuring percentage and means value, according to [17].

Results and Discussion

Table 1: Distribution of the study groups (Diabetic &non- Diabetic patients with UTI & without UTI) according to age patients.

Age groups (years)	Diabetic patients with UTI No. (%)	Diabetic patients without UTI No. (%)	Non- Diabetic patients with UTI No. (%)	Total
< 20	4 (4)	0(0.0)	10(14)	14(5.7)
20-39	8(8)	20(27)	15(22)	43(17.5)
≥ 40	88(88)	55(73)	45(64)	188(76.7)
Total	100(100)	75(100)	70(100)	245(100)

Table (1) shows an increase in UTI with aging & according to the age group it is observed that UTI is predominate among individuals at age ≥40 years (76.7%) in both diabetic and non-diabetic.

These observations are compatible with those of [1] as (95%). The increase percentage of UTI among individuals

above 40 years is due to hormonal change in the case of females which affect the immune response after menopause [18], While most of the males complain of prostate problems after the 50 age of years which enhances UTI [19], Moreover the natural killer cells NK & the phagocytic activities remarkably

decrease with aging resulting in recurrent infections frequently in old people [20],

Similar results were reported by [21,7].

Table 2: Frequency of UTI in Diabetic & non-Diabetic patients according to sex .

UTI	Diabetic patients				Non-Diabetic patients		Total
	Type I		Type II				
	M 19(100)	F 34(100)	M 33(100)	F 89(100)	M 28(100)	F 42(100)	
UTI	8(42.1)	15(44.2)	17(51.5)	60(67.4)	28(100)	42(100)	**170(100)**
Without UTI	11(57.9)	19(55.8)	16(48.5)	29(32.6)	0(0.0)	0(0.0)	**75(100)**
Total	19(100)	34(100)	33(100)	89(100)	28(100)	42(100)	245(100)

M=Male ;F=Female ; D.M=Diabetes Mellitus

Table (2) Shows frequency of UTI in diabetic and non-diabetic patients according to sex.

High incidence of UTI among diabetic females for both type I and II as (44.2 and 67.4) % respectively rather that in diabetic males for both type I and II as (42.1 and 51.5)% respectively, which is quite compatible with other local study [22].

The above Table reveals high prevalence of UTI among type II diabetic patients, The explanations of these results related to the nature of type II diabetes mellitus since it is mainly metabolic disorder under missed control and to some extent an autoimmune disease has been reported [12], whose majority patients are females due to the role of hormones increasing the chance for autoimmune disease appearance as a result of the activation [23, 20].

Also these results are in agreement with El-Ali et.al. who reported that the percentage of this disease in Tunisian was higher in women (8.6%) then that of men (7.1%) [22].

Evan showed in his study that women with diabetes are about 2-3 times more likely to have UTI than non diabetic women, because of the combination of host and local risk factors [12], and to some extent an autoimmune

Table 3: Effect of smoking on the patients and patients controls.

Patients Status	Smokers	No. of patients	Sex		Type of D.M		Age in years (%)		
			M (%)	F (%)	I (%)	II (%)	<20	39- 20	40≤
Diabetic patient with UTI	27 (27)	100	19 (70)	8 (30)	9 (33)	18 (67)	0 (0.0)	7 (26)	20 (74)
Diabetic patient without UTI	20 (27)	75	14 (70)	6)30(	7 (35)	13 (65)	0 (0.0)	5 (25)	15 (75)
non -Diabetic patient with UTI	18 (26)	70	15 (83)	3 (17)	0 (0)	0 (0.0)	0 (0.0)	8 (44)	10 (56)
Total (%)	65 (5. 26)	245 (100)	48 (74)	17 (26)	16 (25)	31 (48)	0.0 (0.0)	20 (31)	45 (69)

that incidence of type II of D.M (48%) more than type I (25%) which is due to the effect of nicotine on the hepatocyte and pancreatic cells results, an metabolic disorder leads to hyperglycemia, this interprets the higher incidence of type II than type I of D.M,

Generally in Iraq the smoking habit is prevalent among the adults rather than the younger aged individuals so table (3) reveals that incidence of smoking increases by aging, thus (0.0%) for age <20 years elevated to (31%) at (20-39) years and (69%) at the age ≥40 years.

The effect of smoking on the incidence of UTI is little ,since the incidence of diabetic smoker with UTI is (27%), which is relatively comparable to some extent with those without UTI.

In this table It is clear that prevalence of smoking among males (74%) than females (26%) for socio-economical difference between sexes . This finding is common in Iraq and most Arab countries while the prevalence of smoking is almost unique in European and American populations.

This table revealed the effect of smoking on the incidence with D.M. It is observed that smoking increases the risk for developing D.M since among 65 smoker the percentage as (27%) have developed diabetes mellitus. Prisco showed that sugars in tobacco seems to be markedly aggravate insulin resistance in patients with D.M particularly in those who are chronic smokers [24].

The result of current study is compatible with [1], Moreover it is clearly appeared

Table 4 : Bacterial types causing UTIs in Diabetic patients

Type of Bacteria	No. of Isolates	Type of D.M	
		I	II
Escherichia coli	15 (28,5)	2	13
Klebsiella pneumoniae	13 (24,5)	1	12
Proteus mirabilis	(17) 9	2	7
Streptococcus agalactiae	(13) 7	2	5
Pseudomonas aeruginosa	(11) 6	2	4
Staphylococcus aureus	(6) 3	1	2
Total (%)	53 (100)	10 (19)	43 (81)

M=Male ;F=Female; DM=Diabetes Mellitus

All urine cultures were pure except (2) which showed mixed growth
Data presented in table 4 shows the description and frequency of each bacterial isolates. Among (100) MSU samples were obtained from diabetic patients complaining of urinary tract infection .six bacterial types have been diagnosed distributed among 53 isolates that have been recovered .

It is observed that *E. coli* (15 isolates) most of them (13 isolates) in the urine sample of type II D.M particulary, the elderly ≥40 years females (11 isolates). It was accepted that the immune response is reduced at the extremes of the life span (at infancy and elderly aged), which explains the high incidence of diseases at these periods [25].

These facts are compatible with the lab. findings which reveals arising in U.T.I by aging 3 cases (5.5%) at <20 years to 12 cases (22.5%) at 20-39 years increased to 38 (72%) above 40 years of age. Moreover the incidence among females 35 cases (66%) more than males18 cases (34%) due to anatomical & physiological differences between sexes, which encourage bacterial transmission from the rectal and genital area to the urinary tract [26].

The fact that most of the bacterial isolates are of Enterobacteriaceae family which inhabit the GIT agreed with the current results which revealed (13) isolates (42.5%) of *K. pneumoniae*, (9) isolates (17%) of *P. mirabilis*, in addition to *E. coli* as had been mentioned previously and (7) isolates (13%) of *Streptococcus agalcatiae* and (6) isolates (11%) of *P. aeruginosa* while *S. aureus* has been isolated just in three cases (6%), though it is considered as the skin normal flora which it may be easily transmitted to the urinary tract.

These results concurred with local study [27] and abroad [28-30]. Considering the type of D.M it is clear from the above table that U.T.Is are higher among type II diabetic patients (81%) rather than type I (19%); this is related to the differences in the aetio-pathogenecity of each; since type I is an autoimmune disease characterized by disregulation of the immune system and elevation of auto antibodies in addition to cellular infiltration at the ß-cells of langerhans cells. While type II is a metabolic disorder characterized by miss control of sugar which may facilitate the bacterial growth [31].

Al-Ammar in 1999 reported that smoking associated with premature development of microvascular compli-cations of D.M and may even have a role in the development of type II diabetes which concurred with this study[1], the current results are in contrast with those of Al-Fatlaway [31].

Conclusion

Women with diabetes have more frequent and more sever UTI . UTI is predominate among individuals above 40 years. smoker patients with diabetes mellitus more than in non- diabetes mellitus, *E..coli* was the most common pathogen isolated in both groups.

References

1. Al-Ammar, N.G. 1999. An Epi-demiological Profile of NIDDM in Baquba District. M.Sc thesis of Science in community medicine. College of medicine. Al-Mustansiriya university.
2. Goswami,-R;Bal, CS; Tejaswi- S; Punqabi, GV, Kapil, A; Kochupillqi, N., Prevalence of urinary tract infection and renal scars in patients with diabetes mellitus; Diabetes- Res Clin Pract., 2001, 53 (3): 181-6.
3. Al-Taha, NK. 2000. Role of gram negative bacteria in hospital infection M.Sc., Thesis. College of medicine. Al-Mustansiriya university.
4. Mueller T, Resinger, C; Ruffingshofer, D; Arbeiter,-K; Balzar, E; Aufricht, C., Urinary tract infection beyond the early post. transplant period in pediatric renal graft recipients; Wien-Klin Wockanschr, 2003, 24; 115(11): 385 – 8.
5. Robet, Scheier; Carl, Gottschalk. 1998.Diseases of the kidney .United states of America. 6th ed.V1, P.913.
6. Browen, B.J; Asinobi, A-O; Fatunde, OJ, Osinusi,-K; Fasina, -N-A;, antimicrobial sensitivity pattern of organisms causing urinary tract infection in children with sickle cell anemia in Ibadan, Nigeria. West Afr J Med., 2003, 22 (2) :110-3.
7. Dived S, Howes 2002. Urinary tract infection, femel, program director, section of emergency medicine, University of Chicago .
8. Hopkins WJ; Heisey DM; Lorentzen Df; Uehling DT. A comparative study of major histocompatibility complex and red blood cell antigen phonotypes as risk factors for recurrent urinary tract infections in Women. J Infect Dis,1998, 177 (5): 1296- 301.
9. Gibson, Lisa Marie, Diabetes and the older Adult, 2003, Ohio state University Extensions WWW Site.
10. Pingle, A. 1984. Urinary tract infection. In: Husain, I (ed). Tropical urology and renal disease. Churchill-Livingstone. Edinburgh.
11. Wilcox, R. Bruce.1999. High- yield biochemistry.1editor . United States of America .
12. Evan David Rosen, M.D. Diabetes and urinary tract infections: The case Against a preemptive strike, 2003, Harvard Medical School.

13. Wilkie, M.E.; Almond , M.K. and Marsh, F.P. 1992. Diagnosis and management of UTI in adult. B.M.J. 305:1437-1440.

14. Lewis, D.A. 1989. Bacteriology of urine in: Medical microbiology a partial approach, P –1-20. Hawkey, P. M.; Lewis , DA.(eds.).

15. Gupta S. 1988. The short textbook of medical Microbiol.3rded. Daryagent. Indian.

16. Fischbach, Frances. 2001. B. A manual of Laboratory and Diagnostic Test. edition 7: 164 – 170 . Chapter 3.

17. McCall R.B. 1980. Fundamental statistics for psychology Harcourt brace Jovanovich, Inc. third edition.

18. Rostler, Suzanne, Diabetes may up urinary infections in older women, 2003, (Internet).

19. Patrick, X; Rajendran, T.; Salah, E.E., Acute renal failure. Oman medical Journal, 2000, Vol.16,No. 3.

20. Goldsby, RA., Kindt, TG. Osborne, BA. 2000. Immunology. 4th ed., W.H Freeman and company. New York. USA.

21. Herman W H et.al., Diabetes mellitus in Egypt: risk factors and prevalence. Diabetic medicine, 1995, 12: 1126 – 31.

22. El Ali, Jalila; Haddad, Samira; Cherif, Samia; Farhat, Amina; Danguir, Jaber, Risk factor of diabetes in Tunisian , Adults ,2002, The National Nutrition Survery Data.

23. Roitt I; Brostoff J., Male D. 1998. Immunology. 5th ed published by Mosby . London , UK.

24. Prisco P. Diabetes. Questions You have Answer you need, peoples medical society,1997, 22-24, Allertown, Pennsyl-vania (U.S.A).

25. Ali. Entisar Shaker. 2000. Immuno-status in diabetic patients .M.Sc thesis of science in microbiology. College of medicine, Al-Mustansiriya University.

26. Linda, T.; Frederiek, B., Cervico-vaginal antibody in the pathogenesis of recurrent urinary tract infection in women. journal infection and immunity. April,1999, p : 1287 – 1288.

27. Al- Khzrachi, Munim R. A; 2001: Genetic studies of some gram negative Bacilli resistance isolated from urinary tract infection to some antimicrobial agents. M.Sc. thesis of science in Biology/Microbiology. College of Sci, Univ. of Al-Mustnasiriyah.

28. Tan J.S; File J.r. TM., Urinary tract infections in Obstetrics and gynecology. Journal of reproductive medicine,1990,35 : 339 – 42 .

29. Andersen.B. Mphysematon-spyclonephritis. A serious complication of diabetes mellitus. Department of Health and Human Services,1992,11;154 (20): 1419 – 21.

30. Guyer – DM; Kao – JS; Mobley – H, Genomic analysis of a pathogenicity island in uropathogenic *Escherichia coli* CFTO 73: distribution of homologous sequences among isolates from patients with pyelonephritis ,Cystitis,and Catheter associated bacteriuria and from Fecal samples ,1989, 66 (9) : 4411 –7.

31. AL–Fatlaway, FAA. 2001. Urinary tract infections and their effects on Renal functions in diabetic and non – diabetic patients. M.Sc. Thesis of Science in Biology. College of Science, University of AL – Mustansiriya.