

Original Research Article

To Study the Prevalence of Asymptomatic Bacteriuria and other uropathogens in diabetic patients in a tertiary care hospital-A Prospective study

Aneesha Rawat^{1*}, Neelima Singh², P.Sreekanth Reddy³

¹Junior Resident 3rd year, Department of Medicine, Gajra Raja Medical College, Gwalior, Madhya Pradesh, India

²Associate Professor, Department of Medicine, Gajra Raja Medical College, Gwalior, Madhya Pradesh, India

³Senior Resident, Department of Medicine, Gajra Raja Medical College, Gwalior, Madhya Pradesh, India

Received: 24-11-2021 / Revised: 28-12-2021 / Accepted: 2-01-2022

Abstract

Introduction: Asymptomatic bacteriuria (ASB) is defined as the presence of at least $>10^5$ colony forming units (CFU) per ml of 1 or 2 bacterial species in clean-voided midstream urine sample from an individual without symptoms of a urinary tract infection like dysuria, frequency, urgency, abdominal distention or fever. *E.coli*, *K. pneumonia*, *P.mirabilis*, *P.aeruginosa*, *S. saprophyticus*, *E.faecalis* are the leading cause of ASB. **Aims and objectives:** To study the prevalence of bacteriuria and other uropathogens in patients of diabetes mellitus, association of ASB with age, gender, duration and complications of diabetes. **Materials and method:** 120 diabetic patients were studied. There urinalysis, FBS, PPBS, AST, routine investigations and USG abdomen were analysed. Data analysis using SPSS software. **Result:** Prevalence of ASB amongst diabetic patients was found to be 25.83% (31/120). Most of the participants were in the age group of 41-50 years. Female and males were 56.66% and 43.33% respectively. Maximum participants were having >10 yrs duration of diabetes. There was significant correlation of ASB with nephropathy with p value 0.002. Proteinuria, leucocyturia and glucosuria were also significant, tested by fisher exact test. There was no significant correlation of ASB with age, gender, duration of diabetes and type of diabetes. *E.coli* was the uropathogen isolated in our study followed by *Klebsiella* and *Candida*. **Conclusion:** The prevalence of ASB in diabetes was 25.83%. *E.coli*, *Klebsiella* and *Candida* were the pathogens commonly identified. There was significant association with glucosuria, proteinuria, leukocyturia and nephropathy with ASB.

Keywords: Asymptomatic bacteriuria, Diabetes, Uropathogens.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Asymptomatic bacteriuria (ASB) is defined as the presence of at least $>10^5$ colony forming units (CFU) per ml of 1 or 2 bacterial species in clean-voided midstream urine sample from an individual without symptoms of a urinary tract infection, like dysuria, frequency, urgency, strangury, abdominal discomfort or fever [1]. The spectrum ranges from Asymptomatic bacteriuria (ASB) to lower UTI (cystitis), pyelonephritis, and severe urosepsis. *E.coli*, *K.pneumonia*, *P.mirabilis*, *P.aeruginosa*, *S.saprophyticus*, *E.faecalis*, and *S.agalactiae* are the leading cause of ASB/UTI. Studies reported that diabetic patients with ASB tends to have more symptomatic UTI than those without it. In various studies the prevalence varies from 9-27%.

Bacteriuria is the presence of microbial pathogens in the urethra, bladder, ureter, and pelvis of the kidney [2,3]. *Escherichia coli*, *Klebsiella pneumonia*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Staphylococcus saprophyticus*, *Enterococcus faecalis*, and *Streptococcus agalactiae* are the leading cause of urinary tract infections [4,5]. The spectrum of UTI in patients of diabetes ranges from Asymptomatic bacteriuria (ASB) to lower UTI (cystitis), pyelonephritis, and severe urosepsis. Serious complications of UTI, such as emphysematous cystitis and pyelonephritis, renal abscesses and renal papillary necrosis, are all encountered frequently in type 2 DM [6,7]. The objectives of this study were to study the prevalence of asymptomatic bacteriuria and other uropathogens in patients with diabetes mellitus and its association with age, gender, duration, control and complications of diabetes [1-5].

*Correspondence

Dr. Aneesha Rawat

Junior Resident 3rd year, Department of Medicine, Gajra Raja Medical College, Gwalior, Madhya Pradesh, India.

E-mail: aneeshal12rawat@gmail.com

Material and methods

Source of data

Department of General Medicine, G.R. Medical College, Gwalior (M.P.) from Jan 2021 - Jun 2022.

Study Type

Prospective Study

Sample size

120 patients

Sample size calculated using the formula :

$$n = \frac{Z^2 \alpha_2 P Q}{d^2}$$

$Z^2 \alpha_2 = 1.96$ (at 5% level of significance), $P = 27\%$, $Q = 73\%$, $d = 8\%$

Required sample size $n = 118.30 \sim 120$

Inclusion criteria

All Diabetic patients asymptomatic for Urinary Tract Infections were included as subjects.

Exclusion criteria

Pregnancy

Patients with indwelling urinary catheter.

Pts with symptoms of UTI.

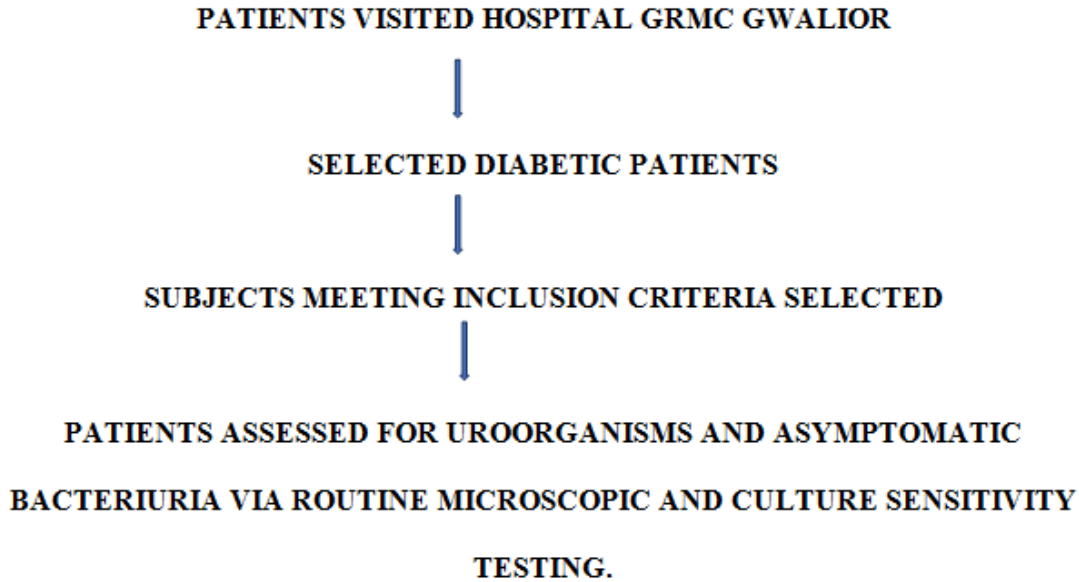
Patients on antibiotics within last 14 days.

Critically ill patients were excluded.

A hospital based prospective study in which all diabetic patients included as subjects after collection of sociodemographic data by pre designed questionnaire, history taking and clinical examination were subjected to routine biochemical, microbiological and radiological investigations including ultrasound abdomen. Also following laboratory data were included: fasting plasma glucose, blood urea,

serum creatinine, albuminuria, glucosuria and leucocyturia. These patients were evaluated for microvascular and macrovascular complications of diabetes. Urine routine microscopy and culture sensitivity testing were done. Urine sample collected were clean voiding, midstream, without touching the surroundings of container. Urine culture was considered significant bacteriuria when colony forming units $\geq 10^5$ /mL of voided urine and a single pure

colony suspended in nutrient broth were obtained and then subcultured onto a blood agar plate and MacConkey agar plate, incubated at 37°C for 24 hours for identification. Clinical examination for diabetic neuropathy, retinopathy and nephropathy were thoroughly done to look for these complications. Data collection will be analysed by SPSS statistical software.



Statistical analysis

Statistical analysis was done using SPSS 2.0 and graphs were generated by Microsoft excel and word. A p value of less than 0.05 was considered significant.

Result

Among the males in the age group 61-70 years, ASB positivity was observed as 62.5% while in the females in the age group 31-40 years, 75% ASB positivity was found. There was no association observed for age and gender with ASB. Duration of diabetes was not found significant with ASB prevalence. For the duration > 10 years, maximum ASB +ve cases were observed (33%). Nephropathy 55.5%

ASB prevalence was found, significantly associated with ASB prevalence (P value 0.002). Proteinuria, glucosuria and leucocyturia was found to be significantly associated with the ASB with p value 0.001 each respectively. Klebsiella were found more among males (71%), candida were found more among females (67%). E.coli were found to have good sensitivity for Amikacin (88%), Piptaz (80%), Amoxyclav (66%) and Nitrofurantoin (60%); while it was found more resistant towards Nalidixic acid (80%) and ciprofloxacin (66%). Klebsiella were found to have good sensitivity for Amikacin (86%), Gentamycin (71%), ceftriaxone (71%) and 100% with Nitrofurantoin while it was most resistant towards Amoxyclav (71%).

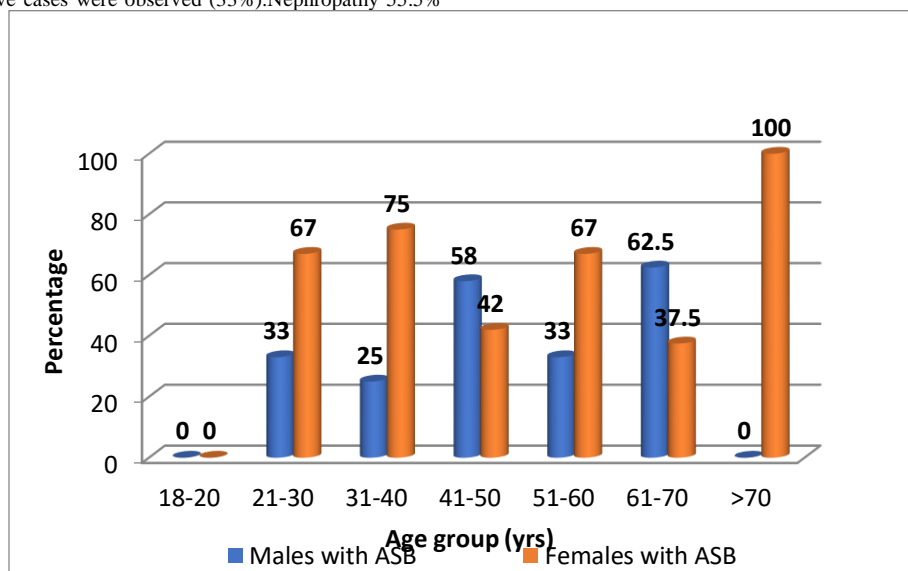


Fig. 1: Distribution of ASB in age wise and gender wise

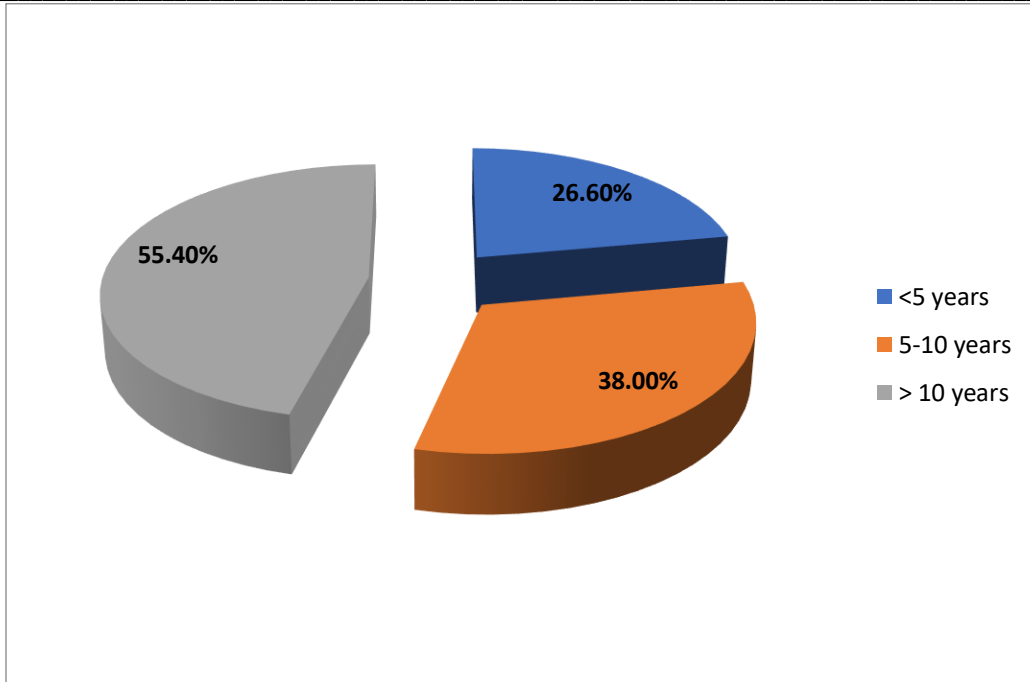


Fig.2: Duration of diabetes

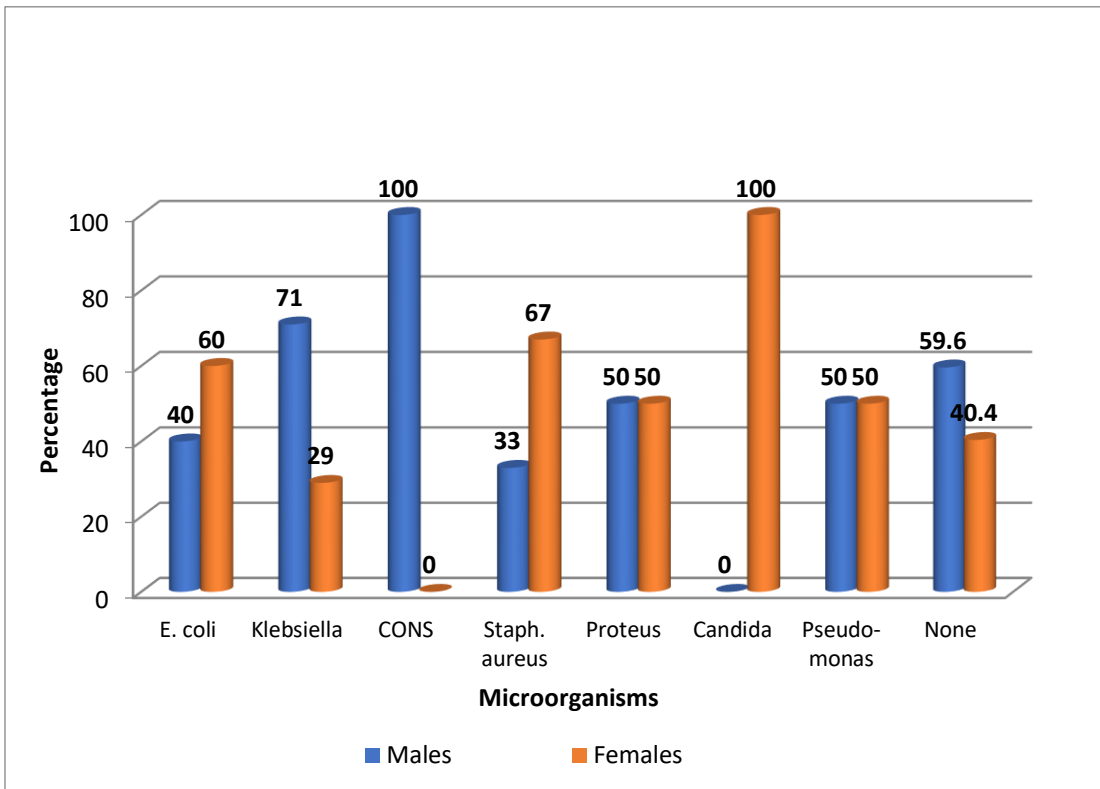


Fig. 3: Microorganism isolated amongst genders

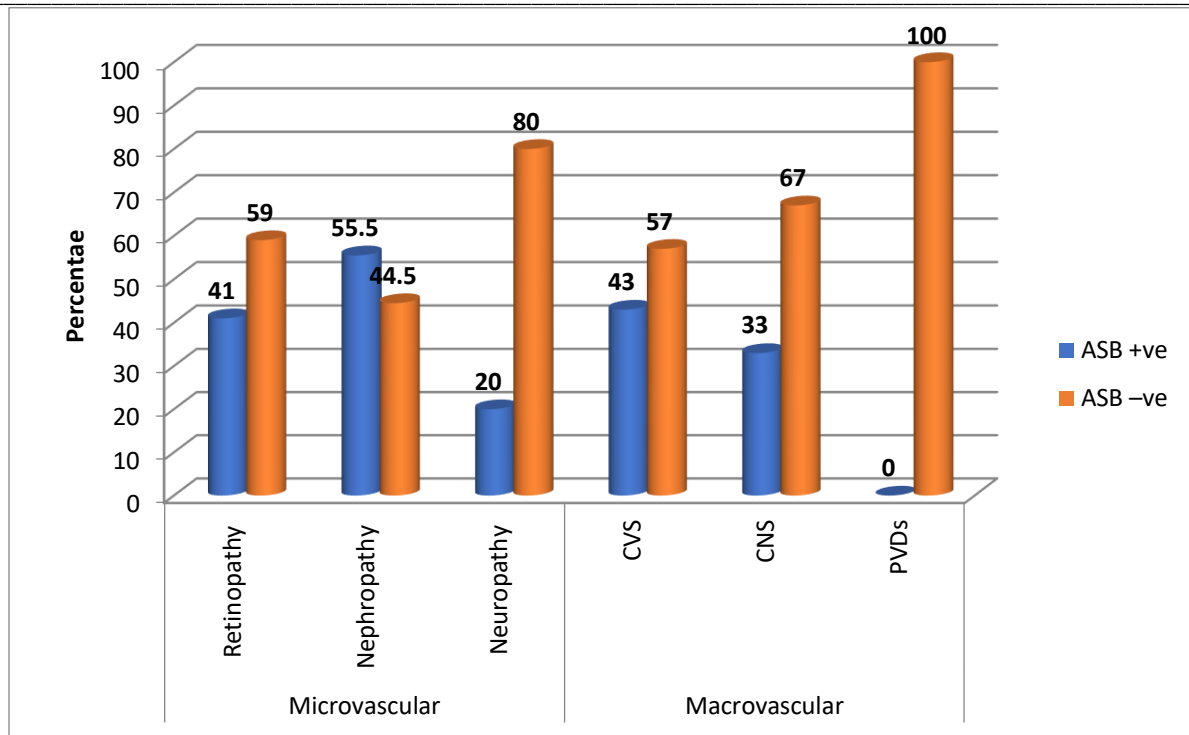


Fig. 4: Complications of diabetes mellitus with ASB

Table1 : Complications of diabetes mellitus with ASB

	Total	ASB +ve		ASB -ve		
		No.	%	No.	%	
Microvascular						
Retinopathy	22	09	41	13	59	$\chi^2=3.196$ P=0.074
Nephropathy	18	10	55.5	08	44.5	$\chi^2=9.764$ P=0.002*
Neuropathy	30	06	20	24	80	$\chi^2=0.710$ P=0.399
Macrovascular						
CVS	07	03	43	04	57	$\chi^2=1.883$ P=0.597
CNS	03	01	33	02	67	
PVDs	02	00	0	02	100	

Table 2 : Analysis of urine with ASB

		ASB +ve		ASB -ve		Total	
		No.	%	No.	%		
Proteinuria	+nt	15	63	09	37	24	$\chi^2=21.051$ P=0.001*
	-nt	16	17	80	83	96	
Glucosuria	+nt	20	48	22	52	42	$\chi^2=16.006$ P=<0.001*
	-nt	11	14	67	86	78	
Leukocyturia	+nt	17	65	09	35	26	$\chi^2=27.099$ P=0.001*
	-nt	14	15	80	85	94	

Table 3 : Microorganisms isolated amongst genders

Microorganisms	Males		Females		Total	
	No.	%	No.	%		
E. coli	06	40	09	60	15	$\chi^2=5.429$ P=0.709
Klebsiella	05	71	02	29	07	
CONS	01	100	00	0	01	
Staph. aureus	01	33	02	67	03	
Proteus	01	50	01	50	02	
Candida	00	0	01	100	01	
Pseudomonas	01	50	01	50	02	
None	53	59.6	36	40.4	31	

Table 4: Characteristics of ASB +ve study subjects

Characteristics of ASB +ve study subjects (n=31)	Number	%
Duration of diabetes		
<5 years	05	16
5-10 years	12	39
>10 years	14	45
Complication of diabetes		
Retinopathy	09	29
Nephropathy	10	32
Neuropathy	06	19
CVS	03	46
CNS	01	32
PVDs	00	0
Urine analysis		
Glucosuria	20	64.5
Proteinuria	15	48.3
Leukocyturia	17	54.8

Discussion

In our study, prevalence of ASB amongst diabetic patients was found to be 25.83%, comparable with earlier studies by Alebiosu et al. where prevalence was 26.6% [8]. There was no significant association found between ASB and gender, since it was 30.76% in females and 22.10% in males with p value of 0.280 compared to Bahl et al [9]. The age distribution in our study showed that most of the participants were in the age group of 41-50 yrs followed by 31-40 yrs with mean age of 47±14.41 yrs compared to a study where prevalence of ASB was found to be 21.25% in type 2 DM with majority females over the age of 40 years. There was significant association of proteinuria, leucocyturia and glucosuria with ASB with p values 0.001, 0.001, <0.001 respectively. This was comparable to a second study which showed that the main risk factors for ASB in diabetic patients were female gender and urinary albumin excretion [10]. Altered host defence mechanism in diabetes aggravates the development of nephropathy and in turn increases the prevalence of ASB. In our study prevalence of neuropathy in diabetic patients was found to be highest (25%) followed by retinopathy (18%) and nephropathy (15%) respectively but significant with nephropathy (p value 0.002). Ramachandran A et al [11], evaluated 3010 patients in 1999 in Southern India and found rates of complications to be: Retinopathy (23.7%),

Nephropathy (19.7%) and Neuropathy (27.5%). E.coli was the predominant microorganism in ASBs in diabetic patients. In others like Alebiosu study klebsiella was predominant. About half of the patients with ASB had E.coli as microorganism in their urine culture compared to Lye et al [12], who observed that E.coli was the predominant microorganism in ASBs in diabetic patient. Gram negative organisms were more common than gram positive ones followed by candida.

Conclusion

To conclude, the prevalence of ASB in diabetes was 25.83%. E.coli, Klebsiella and Candida were the uropathogens commonly identified. Others were Coagulase negative staphylococcus aureus, pseudomonas and proteus. There was no correlation of ASB with age, gender and duration of diabetes. There was significant association with glucosuria, proteinuria, leukocyturia, nephropathy. Therefore, all diabetic patients should be screened for ASB irrespective of age, gender and duration. Leucocyturia is recommended as an early marker to pick up ASB even at PHC level. Strict glycemic control, genital hygiene and regular screening of ASB may go a long way to prevent progression to nephropathy and ESRD.

Conflict of Interest: Nil Source of support: Nil

References

- Sharma BD, Bansal R, Gupta B. Asymptomatic bacteriuria in diabetics. Journal, Indian Academy of Clinical Medicine. 2011;13:55-59.
- W. D. Seifu and A. D. Gebissa, "Prevalence and antibiotic susceptibility of Uropathogens from cases of urinary tract infections (UTI) in Shashemene referral hospital, Ethiopia," BMC Infectious Diseases, vol. 18, no. 1, p. 30, 2018.
- C. Manik and A. Amsath, "Prevalence and distribution of bacteria and fungi isolated from patients with urinary tract infections in pattukkottai, tamilnadu, India," International Journal of Pure and Applied Zoology, vol. 1, no. 3, 2013.
- E. B. Raad, "Prevalence and antibiotic susceptibility patterns of bacteria causing urinary tract infections in Youssef Hospital Center: first report from Akkar governorate, North Lebanon," The International Arabic Journal of Antimicrobial Agents, vol. 7, no. 1, 2017.
- L.M. Sun, C.L. Lin, J.A. Liang et al., "Urinary tract infection increases subsequent urinary tract cancer risk: A population-based cohort study," Cancer Science, vol. 104, no. 5, pp. 619-623, 2013.
- Kofteridis DP, Papadimitraki E, Mantadakis E, et al. Effect of diabetes mellitus on the clinical and microbiological features of hospitalized elderly patients with acute pyelonephritis. J Am Geriatr Soc. 2009;57(11):2125-2128.
- Mnif MF, Kamoun M, Kacem FH, et al. Complicated urinary tract infections associated with diabetes mellitus: pathogenesis, diagnosis and management. Indian J Endocrinol Metab. 2013;17(3):442-445.
- MacFarlane IA, Brown RM, Smyth RW, Burdon DW, Fitzgerald MG: Bacteremia in diabetics. J Infect. 1986, 12: 213-219.
- Bahl AL, Chugh RN, Sharma KB: Asymptomatic bacteriuria in diabetics attending a diabetic clinic. Indian Journal of Medical Science. 24: 1-6, 1970.
- Matteucci E, Troilo A, Leonetti P, Giampietro O.: Significant bacteriuria in outpatient diabetic and non-diabetic persons. Diabet Med. 2007;24:1455-1459.
- Ramachandran A, Snehalatha C, et al. Prevalence of vascular complications and their risk factors in type 2 diabetes. The Journal of the Association of Physicians of India. 01 Dec 1999, 47(12):1152.
- Ronald A, Ludwig E. Urinary tract infections in adults with diabetes. Int J Antimicrob Agents 2001;17:287-92.