URINARY TRACT INFECTION IN DIABETICS

Pages with reference to book, From 2 To 5

Rukhsana Naseer, Surraiya Obaidullah, Zulfiqar Haider (PMRC Research Centre, Fatima Jinnah Medical College, Lahore.)

Abstract

Two hundred ambulant diabetic patients (152 females and 48 males) were screened for significant bacteriuria by bacterial colony count method. Significant bacteriuria was found in 13% (24 females and 2 males). E.coli was the predominant organism isolated in 17 out of 28 cases. A higher relative frequency of past history of renal disorders and hypertension was seen in the group with significant bacteriuria. The degree of pyuria was generally related to the frequency of bacteriuria but 3 patients with unremarkable sediment had evidence of significant infection. The antibiotic sensitivity pattern showed that more than 50% of the E. coli strains were resistant to some of the commonly used antibiotics (JPMA 30: 2, 1980).

Introduction

The patients suffering from diabetes mellitus are generally more susceptible to infections and these infections are likely to be more severe than in the non-diabetics. Urinary tract infections are by far the most common infections encountered in the diabetics. Autopsy studies suggest that chronic pyelonephritis is much more common in diabetics than in the non-diabetics (Joslin et al., 1959; Robbins and Tucker, 1944). Diabetes is a common condition and the current observation shows that its profile in Pakistan is just beginning to emerge. In the present study the frequency of bacteriuria in diabetic patients attending the outpatient clinic has been studied- The main objectives were to study the quantum and incidence of urinary tract infection in diabetic patients, and to evaluate the various factors which predispose to its development.

Material & Methods

Two hundred (newly registered) patients suffering from diabetes mellitus attending the Diabetic Clinic of PMRC Research Centre during 1978-79 were investigated. Each patienthad full documentation of history and physical examination. Patients with previous history of recent hospitalization, surgical operations and those with a history of antibiotic intake during the preceding 3 months as well as pregnant females were excluded. The routine investigations included blood sugar, blood urea, urine analysis, serum cholesterol, electrocardiography and fundoscopy.

For investigation of urinary tract infection bacterial counts of midstream 'clean catch' specimens of morning urine were done using the standard method described by Frankel et al (1970).

Bacterial counts of 10s/ml or above, were considered as indicative of significant infection. Antibiotic sensitivity pattern was also performed on cases showing significant bacteriuria. Bacterial counts were also done on 25 normal healthy volunteers (13 males and 12 females) to serve as a check on the technique used in the study. In all these controls the urine specimen were sterile on culture.

Results

Table I: Age and Sex Distribution of 200 Diabetics with and without Significant Bacteriuria

Age groups (Years)	*Bacteriuria*		*Normal urine*	
	M	*F*	*M*	*F*
10 — 19	—	—	—	1
20 — 29	—	1	1	4
30 — 39	—	4	5	18
40 — 49	—	8	20	47
50 — 59	—	8	13	41
60 & above	2	3	7	17
Total	2	24	46	128

Table I shows age and sex distribution in 200 diabetics with and without bacteriuria. The patients comprised of 48 (24%) males and 152 (76%) females. Most of these patients were in the age group between 30-59 years. Significant bacteriuria was recorded in 26 (13%) of the cases (24 females and 2 males). In the rest of the 174 patients no significant bacteriuria (count < 10s/ml) was detected.

Table II: Bacterial Isolates in 26 Patients Showing Significant Bacteriuria

Organism	*M*	*F*
E. Coli	—	17
Proteus mirabilis	2	4
Klebsiella aerogenes	—	2
Staphylococcus aureus	—	1

Table II shows the bacterial isolates in 26 patients with bacteriuria. Of 26 cases showing bacteriuria E. coli was isolated in 17 (65.38%), Proteus mirabilis in 6 (2307%), Klebsiella aerogenes in 2 (7.69%) and Staphylococcus aureus in one patient (3.84%). In cases showing bacterial infection other than E. Coli no clinically apparent predisposing cause was noted.

Table III : Distribution of Relevant Clinical & Biochemical Parameters in 200 Patients with and without Bacteriuria

Clinical and biochemical feature	*Normal urine (174 cases)*	*Urinary tract infection (26 cases)*
1. History of renal disorder (renal colic, stone or infection)	10 (5.75%)	3 (11.54%)
2.* History of abortion and gynaecological operation	96 (75.00%)	14 (58.33%)
3. Hypertension	21 (12.07%)	6 (23.08%)
4. Small vessel disease	37 (21.26%)	4 (15.38%)
5. Random blood sugar > 250 mg%	119 (68.39%)	20 (76.92%)
6. Blood urea > 40 mg%	9 (5.17%)	1 (3.85%)

* in 152 females (128 normal and 24 infected).

Table III shows the distribution of various predisposing causes. A history of renal disorders such as renal colic, stone, past history of infection was obtained in 10 (5.75%) patients with normal urine and in 3 (11.54%) with significant bacteriuria. A history of abortion, still birth and gynaecological operation in the past was obtained in 96 out of 128(75 %)females with normal urine and in 14 out of 24 (58.33%) females with urinary tract infection. Hypertension (B. P. above 150/90) was present in 21 (12.07%) patients with normal urine and 6 (23.08%) with significant bacteriuria. Small vessel disease (as judged by presence of retinopathy or nephropathy) was seen in 37 (21.26%) with normal urine and 4 (15.38%) with significant bacteriuria. A random blood glucose value of 250 mg% or above was seen in 119 (68-39%) patients with normal urine and 20 (76.92%) with bacteriuria. Blood urea above 40 mg% was noted in 9 (5.17%) patients in the group with normal urine, while in the group with infected urine there was only one patient (3.85%) with elevated blood urea.

Table IV: Relative Frequency of Bacteriuria in Relation to Duration of Clinical Diabetes Mellitus

Duration of clinical diabetes	*Total cases*	*Normal urine*	*Bacteriuria*	*Percentage with bacteriuria*
0 — 1 year	61	54	7	11.48
>1 — 5 years	60	54	6	10.0
>5 —10 years	56	44	12	21.43
Above 10 years	23	22	1	4.35

Table IV shows the frequency of urinary tract infection in relation to duration of diabetes mellitus. There was no consistent relationship between the frequency of urinary tract infection and the duration of diabetes.

Table V: Incidence of Pyuria in Relation to Bacteriuria

*Pyuria	*No. of cases*	*Bacteriuria* 10^5/ml	10^5/ml	*Percentage of total*
0 — 2	83	1	2	3.61
3 — 10	87	2	11	14.94
Above 10	30	2	8	33.33

* Number of pus cells per high power field in a centrifuged specimen of urine.

Table V shows relationship of pyuria with bacteriuria. There were 83 patients with nearly normal urinary sediment (0-2 pus cells/HPF in centrifuged specimen) of which 3 had significant bacteriuria. The frequency of significant bacteriuria increased in the groups with 3-10 and above 10 pus cells/HPF to 14.94% and 33.33% respectively.

Table VI : Antibiotic Sensitivity : Distribution of Bacterial Isolates Sensitive to Various Antibiotics

Antibiotics	*E. Coli* (*n*=17)	*Proteus mirabilis* (*n*=6)	*Klebsiella aerogenes* (*n*=2)	*Staphylo-coccuc aureus* (*n*=1)
Ampicillin	8 (47.06%)	4 (66.67%)	1 (50%)	R
Carbenicillin	11 (64.71%)	4 (66.67%)	1 (50%)	R
Erythromycin	R	3 (50%)	1 (50%)	R
Gentamycin	15 (88.24%)	4 (66.67%)	2 (100%)	1 (100%)
Lincomycin	4 (23.53%)	2 (33.33%)	1 (50%)	1 (100%)
Nalidixan	11 (64.71%)	3 (50%)	R	R
Peneillin High	2 (11.76%)	3 (50%)	R	R
Septran	7 (41.18%)	2 (33.33%)	R	R
Streptomycin	3 (17.65%)	2 (33.33%)	R	R
Tetracyclin	6 (35.29%)	2 (33.33%)	1 (50%)	R

R : Resistant

Table VI shows sensitivity of bacterial isolates to the commonly used antibiotics. Of 17 isolates of E. coli 15 (88.24%) were sensitive to Gentamicin. Eleven out of 17 (64.71%) isolates were sensitive to Carbenicillin and Nalidixan, while all the isolates of E. coli were resistant to Erythromycin. Less than 50% of the E- coli isolates were sensitive to Ampi-cillin or Septran. Two third (4 out of 6) isolates of Proteus mirabilis showed sensitivity for Ampicillin, Carbenicillin and Gentamicin. The two isolates of Klebsiella aerogenes were resistant to most of the antibiotics except Gentamicin. Staphylococcus aureus isolated in only one case was resistant to all the commonly used antibiotics except Gentamicin and Lincocin.

Discussion

It has been generally observed that patients with diabetes mellitus are more susceptible to infections. With regard to the frequency of urinary tract infections in diabetes, there have been conflicting reports. Some authors, claiming a higher frequency of urinary tract infection in diabetics have based their observations on hospital in-patients (Bernard et al., 1953) or autopsy studies (Robbin and Tucker, 1944; Baldwin and Root, 1940).

The introduction of bacterial colony count has added a new dimension and there is a general agreement that bacterial count of 105/ml are associated with infection (Kass 1960). Based on these observations Kass (1960) reported an increased frequency of bacteriuria in diabetics. In a comparative study of 150 ambulant diabetics and age and sex matched controls, O'Sullivan et al (1961) found significant bacteriuria in 13.3% of the diabetics and in 12% of the controls. There was a distinct female preponderance in those showing bacteriuria in both the patients and the control groups.

In the present study based on ambulant diabetics, the prevalence of bacteriuria was 13% and all except 2 were females. Escherichia coli was the predominant organism being isolated in 17 out of 26 patients. Infection with Proteus, Klebsiella and Staphylococcus aureus are not usually encountered except in those with instrumentation, operation, hospitalization or previous antibiotic exposure. Such patients were excluded from this study but it is possible that structural changes in the urinary tract as a result of past infection could predispose these patients to this type of infection. There was no evidence of apparent anatomical or functional disturbance such as outflow obstruction or neurogenic bladder in any of these patients. Of the conditions which could possibly predispose to urinary tract infection ie. hyperglycaemia, hypertension and past history of renal disease were seen in a relatively higher frequency amongst the group showing significant bacteriuria. However, due to the disparity in the

number of patients in the two groups, a valid statistical comparison is not meaningful.
This study shows that the presence of pyuria increases the chances of finding significant bacteriuria and of those showing high grade pyuria (more than 10 pus cells/HPF) the chances of finding significant bacteriuria were 1 in 3. However, it also draws attention to the fact that absence of pyuria does not always rule out significant infection and urine culture may be done if the clinical indication exists even if the urine sediment is unremarkable.
The antibiotic sensitivity pattern shows that more than 50% of the E. coli isolates were resistant to the commonly used antibiotics such as Ampicillin, Tetracyclin and Septran. Similarly a single isolate of Staphylococcus aureus was resistant to all antibiotics except Genta-micin and Lincocin. This picture is somewhat disconcerting and calls for more discriminate use of antibiotics in general and hospital practice.

Acknowledgement

We wish to thank the technical staff of the PMRC Research Centre, Fatima Jinnah Medical College, Lahore for the help throughout the study. Thanks are also due to Mr. Nasiruddin for typing the manuscript.

References

1. Baldwin, A.D. and Root, H.F. (1940) Infections of upper urinary tract in diabetic patients. N. Engl. J. Med., 223:244,
2. Barnard, D.M., Story, R.D. and Root, H.F. (1953) Urinary tract infections in diabetic women. N. Engl. J. Med., 248:136.
3. Gradwohl, R.B.H. Clinical laboratory methods and diagnosis; a textbook on laboratory procedures and their interpretation. Edited by Sam Frankel and Stanley Reitman. 7th ed. St. Louis, Mosby, 1970, pp. 1136-8.
4. Joslin, E.P. Diabetic manual for the patient, 10th ed. Philadelphia, Lea & Febiger, 1959.
5. Kass, E.H. The role of asymptomatic bacteriuria in the pathogenesis of pyelonephritis. Biology of pyelonephritis. Boston, Little Brown, 1960.
6. O'Sullivan, D.J., Fitz Gerald, M.G., Meynell, M.J. and Malins, J.M. (1961) Urinary tract infection: A comparative study in the diabetic and general populations. Br. Med. J., 1:786.
7. Robbins, S.L. and Tucker, A.W. Jr. (1944) The cause of death in diabetes. A report of 307 autopsied cases. N. Engl. J. Med., 231:865.