Intrinsic factors affecting incidence of urolithiasis in diabetic patients –A preliminary case-control study

Kalpesh Saswade[1], Maria Tom[2], Lekshmi Hareendran[2], Vishnu Kamalasanan[2], Ganesh Sonawane[1], Rohan Kumar[1], Praveen Singh[1], Biju S Pillai[3], Krishna Moorthy H[4]

[1]Resident, Department of urology, Lourdes Hospital, Kochi, Kerala, India; [2]Department of Pharmacy Practice, St. Joseph's college of pharmacy, Cherthala, Kerala,India; [3]Consultant, Department of urology, Lourdes Hospital, Kochi, Kerala, India; [4]Senior Consultant and Head, Department of urology, Lourdes Hospital, Kochi, Kerala, India

ABSTRACT

There has been a steep rise in incidence of urolithiasis in recent years. Recent studies have revealed an increased prevalence of urolithiasis in patients with Diabetes Mellitus (DM). The role of various intrinsic factors of diabetic patients such as Body Mass Index (BMI), level of glycemic control, baseline kidney function and mode of treatment of DM which can influence incidence of urolithiasis still remains uninvestigated. This case control study was taken up to evaluate these intrinsic factors affecting the incidence of urolithiasis in patients with DM. The case group included diabetic patients with urolithiasis and the control group included age matched diabetic patients without urolithiasis. We concluded that Higher BMI and higher serum creatinine level in diabetic patients were associated with increased incidence of urolithiasis whereas other intrinsic factors such as age, sex, duration of DM and the level of glycemic control did not have any influence on it.

Keywords: Diabetes mellitus, Urolithiasis, BMI, Intrinsic factors

*Correspondence to Author:
Krishna Moorthy H
Senior Consultant and Head, Department of urology, Lourdes Hospital, Kochi, Kerala, India

Introduction

There has been a steep rise in incidence of urolithiasis in recent years and approximately 10% of men and 5% of women are expected to experience symptomatic urinary calculus by the age of 75 years. Concurrently, the incidence of systemic diseases like Diabetes Mellitus (DM), Hypertension, and Obesity has also seen similar rise all over world[1-3]. Recent epidemiologic studies have demonstrated a significant association between dietary and lifestyle factors leading to both DM and kidney stone disease[4].

The identification of common systemic diseases that increase the risk of urolithiasis may help in the prevention of incident and recurrent stones. Two recent studies have revealed an increased prevalence of urolithiasis in patients with DM[5]. Insulin resistance, which constitutes the fundamental metabolic disorder that is associated with DM results in defective renal ammonia genesis and low urine pH thus favoring urolithiasis[6-10]. However, there is not much data available on the role of various intrinsic factors such as Body Mass Index (BMI), level of glycemic control, baseline kidney function and mode of treatment of DM which can influence the risk of urolithiasis. This study was to evaluate these intrinsic factors in DM patients which can influence incidence of urolithiasis.

Materials and Methods

This was a case – control study, the case group included diabetic patients admitted under Urology Department with urolithiasis and control group included age matched patients with DM admitted under General Medicine Department for health check up with no other co-morbidities. Both groups had patients belonging to age 30-80 years. Both case and control group included patients with DM of duration 1 to 10 years. Approval from Institutional Ethics Committee was obtained for procuring and processing the patient data.

Patient with previous history of urolithiasis, hyperuricemia, chronic kidney disease, urinary tract infection, associated urological structural abnormalities; co-morbidities such as hypertension and hypothyroidism were excluded from the study. Detailed history and complete physical examination were done in both groups with collection of demographic data such as Age, Sex, Height and Weight. Body Mass Index [BMI = mass (kg)/(height (m)2] was calculated. All the patients in both the groups were categorized as underweight (BMI < 18), normal weight (BMI 18-22.9), overweight (BMI 23-24.9), obese (BMI > 25). Patients were evaluated with blood sugar levels and HbA1c to determine control of DM and serum creatinine. Urine routine tests and urine culture were done to rule out urinary tract infection. Ultrasound scan of abdomen and Xray KUB were done in all the patients in the two groups to identify the presence of urolithiasis. Patients in case group were treated for their urolithiasis according to institutional protocols. 30 patients in case group and 40 patients in control group satisfied their criteria and were included for the study.

Results

Sex distribution

The case group comprised of 70 % (21) male and 30 % (9) female patients where as control group comprised of 65 % (26) male and 35 % (14) female patients. Fisher's exact test was applied to compare the proportion of males and females in both the groups which showed a p value of 0.982 (insignificant).

Age distribution

The youngest patient in case group was 38 years old and oldest patient was 76 years old where as in control group youngest patient was 30 years old and oldest patient was 80 years old. The mean age was 59.63 years in case group and 61.95 years in control group (p value 0.37; not significant). This also highlighted that age in diabetic patient did not influence incidence of urolithiasis.

BMI

Among 30 patients in case group 10% (3) patients were having normal, 33.33% (10) were overweight and 56.66% (17) were obese. In

control group, 0.25% (1) patient was underweight, 40% (16) were normal weight, 20% (8) were overweight and 37.5% (15) were obese. The mean BMI was 26.26 in case group and 23.93 in control group (p value 0.005; significant). This also highlighted that higher BMI in diabetic patients was associated with increased Incidence of Urolithiasis.

Duration of diabetes

Among the case group, duration of diabetes was less than 1 year in 10% (3) patient, 1- 5 years in 26.66% (8) patients and more than 5 years in 63.33% (19) patients whereas in control group, it was less than 1 year in 2.5% (1) patient, 1-5 years in 30% (12) patients and more than 5 years in 67.5% (27) patients. The mean duration of diabetes in case group was 9.44 years and in control group was 8.70 years (p value of 0.65; insignificant). This also highlighted that duration of DM did not influence incidence of urolithiasis.

Serum creatinine

In case group, serum creatinine level was less than 1.3 mg/dl in 46.66% (14) patients, 1.3-2 mg/dl in 30% (9) patients and more than 2 mg/dl in 23.33% (7) where as in control group, it was less than 1.3 mg in 80% (32), 1.3-2 mg/dl in 10% (4) patients and more than 2 mg/dl in 10% (4) patients. The mean serum creatinine value was 1.71 mg/dl in case group and 1.09 mg/dl in control group (p value 0.02; significant).This indicated that higher serum creatinine level in diabetic patients was associated with increased incidence of urolithiasis.

Diabetic status– controlled and uncontrolled DM

It was observed that, in case group 86.6 % (26) patients were with uncontrolled DM and 13.3 % (4) with controlled DM where as in control group 84.28 % (33) with uncontrolled DM and 15.71 % (7) with controlled DM (p value 0.7472; insignificant).

Table 1 Intrinsic factors affecting incidence of urolithiasis in case and control groups.

Intrinsic factor	Observed finding		P value
	Case group	Control group	
Sex distribution	Male 70% Female 30%	Male 65% Female 35%	0.982
Age distribution	Mean age 59.63 years	Mean age 61.95 years	0.37
BMI	Mean 26.26	Mean 23.93	**0.005**
Duration of DM	Mean 9.44 years	Mean 8.70 years	0.65
Serum creatinine	Mean 1.71 mg/dl	Mean 1.09 mg/dl	**0.02**
Diabetic status	Controlled 86.6% Uncontrolled 13.3%	Controlled 84.28% Uncontrolled 15.71%	0.747

Discussion

Urolithiasis can be a cause of significant morbidity in symptomatic patients. It is widely known that patients with DM are at increased risk of developing urolithiasis and its complications. Identification of various intrinsic factors in these diabetic patients influencing urolithiasis, can help in

prevention of urolithiasis and avoid subsequent occurrence of its complications.

Meydanet al.[5] reported that the prevalence of stone disease in subjects with diabetes was 21%, compared to8% (P < 0.05) in non-diabetic controls. Family history and male gender were significant risk factors for the development of urinary stones in the diabetic patients. Our study

did not exactly reflect the variations in incidence of DM in male and female population (probably because the sample size was small). However, majority of patients in our study with urolithiasis belonged to the male diabetic category.

Michel Daudon[11] reported that the mean age of patients with type 2 diabetes with urolithiasis was 59.4 years. Patients aged more than 70 years with urolithiasis were two times frequent among patients with type2 diabetes. In our study we also found that the mean age was 59.63 years in case group and 61.95 years in control group, but we did not find any increased risk of urolithiasis in all diabetic patients aged more than 70 years.

Michel Daudon[11]also reported that among patients with type 2 diabetes, the mean BMI was 31.2. His study concluded that proportion of urolithiasis rose gradually with BMI, from 27.8% inthenormal-BMI group to 40.3% in the obese group. In our study we found that the mean BMI was 26.26 in case group and 23.93 in control group with a conclusion that higher BMI in diabetic patient was associated with increased incidence of urolithiasis.

In our study we also observed that duration of DM did not influence incidence of urolithiasis. This observation has not been reported in other studies.

Meydan N[5] in his study reported that the mean serum creatinine level in diabetic patients with urolithiasis was 1.11 mg/dl whereas the mean creatinine level for nondiabetic patients with urolithiasis was 1.12 mg/dl and he did not find any significant correlation between serum creatinine level and incidence of urolithiasis. In our study the mean serum creatinine was 1.71 mg/dl in case group and 1.09 mg/dl in control group. However we noticed that higher serum creatinine level in diabetic patients was associated with increased incidence of urolithiasis.

Weinberga A[12]suggested that degree of glycemic control was also associated with the pathogenesis of stone disease. Hyperglycemia and its resultant glucosuria have been implicated in altered renal handling of calcium, phosphorus, and uric acid. Studies have demonstrated an increase in urinary calcium and phosphorus excretion in patients with DM. In our study, we found that in case group 86.6 % patients had uncontrolled DM and 13.3 % had controlled DM where as in control group 84.28 % had uncontrolled DM and 15.71 % had controlled DM. We did not find any statistical significance between the level of glycemic control and incidence of urolithiasis in diabetic patients.

Conclusion

Higher BMI and higher serum creatinine level in diabetic patients are associated with increased incidence of urolithiasis whereas other intrinsic factors such as age, sex, duration of DM and the level of glycemic control did not have any influence on it. However this is a preliminary study with a small sample size. Detailed studies are needed to confirm the results on a large sample.

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