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Incidence of distal urethral stenosis among female diabetic patients with lower urinary tract symptoms (LUTS): A multicentre study

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ABSTRACT

***Background**: A lower urinary tract symptom (LUTS) especially with distal urethral stenosis is one of the most embarrassing situations for female patients. Patients with diabetes mellitus (DM), the urethral immune defensive mechanism are compromised. Female patients with DM are more prone to attack of recurrent urinary tract infection (UTI) and that is one of the causes of distal urethral stenosis. **Methods**: Total 90 female patients with LUTS were enrolled in this study after fulfillment of inclusion criteria from July 2016 to July 2018. Among 90 patients with LUTS, 45 patients had DM and another 45 patients did not have DM. LUTS were analyzed in both groups and compared by 'Z', ^{2} tests whereas required. **Results:** In female diabetic patients with LUTS, 19 (42.2%) had distal urethral stenosis, 10 (22.2%) had descended anterior pelvic compartment/cystocele and remaining patients had the other causes of LUTS. In non diabetic female patients with LUTS, the identified causes were 7 (15.5%) distal urethral stenosis, cystocele was 13 (28.9%) and the rest had LUTS due to other causes. Statistical analysis was done and was found that there was a significant difference present between diabetic and non diabetic groups regarding distal urethral stenosis. **Conclusion**: In this study it was concluded that in female diabetic patients with LUTS, the distal urethral stenosis were more common.*

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INTRODUCTION

A lower urinary tract symptom (LUTS) is one of the embarrassing conditions in female patients. It includes both obstructive and irritative symptoms. There are varieties of causes of obstructive LUTS and one of the common causes is the distal urethral stenosis/stricture. There are other many causes

of LUTS in female patients like cystocele/ descended anterior pelvic compartment, over active bladder(OAB), foreign body in urinary bladder, stone, specific infection like TB of urinary bladder, urinary bladder dysfunction, carcinoma in situ (CIS), interstitial cystitis, bladder neck hypertrophy, neurogenic bladder etc.[1] Urethral stricture is the fibrotic narrowing composed of dense collagen and fibroblast.[2] The female urethra is about 4 cm long passing from the neck of the bladder at the lower angle of trigone to the external urethral meatus.[3] The distal urethral stenosis is uncommon in female than male and the reason might include the shorter urethra, anatomical mobility, straighter in course, more degree of protection provided by bony pelvis over its entire length.[4] Many physicians have been reluctant to accept a diagnosis of meatal or distal urethral stenosis in the female.[5,6] In past, this may be due to greater difficulties in examining and calibrating the female urethra. Now-a –days, we can easily examine and calibrate the female urethra with a bougie. Distal urethral stenosis usually involve the last one cm of female urethra.[7] Distal urethral stenosis is a real entity and that its correction may play a significant role in managing female of all ages with symptoms of recurrent UTI. Normally distal urethral ring in female calibrated 14 French scale (Fr.) at age 2 years and 16Fr. between the ages 4–10 years.[8] In this study, distal urethral ring in female, less than 10 Fr., are considered to be narrowed. When distal urethra is stenosed, it may increase the intraurethral pressure up to 200 cm of H_2O (normally up to 100 cm of H_2O) at resting stage, thus attempts of voiding causes intravesical pressure as high as 225 cm of H_2O (normally 30-40 cm of H_2O).[9] This may lead to LUTS. Mcaninch has shown that a high percentage of girls with distal urethral stenosis have increased intravesical pressure on voiding cinecystography.[10] According to Salam, urethral caliber less than 11 Fr. causes flow abnormality.[11] Any degree of urethral obstruction in female leads to an increased lateral intraluminal pressure as a result of straining to void also leads to LUTS. A study conducted by Wyatt- among 72 female patients of different ages with LUTS, 26 patients had distal urethral stenosis.[7] In diabetes mellitus, the immune-defensive system of urethra is weak and is prone to repeated infection. This is due to decreased phygocytosis, leukocyte adhesion, chemotaxis and opsonisation.[12] As a result of repeated infection and healing, stenosis/ stricture of distal urethra and proximal urethra may escape somehow due to sphincter contraction and relaxation of urinary bladder neck. Urethral stricture/stenosis is uncommon in women and the common cause of urethral stricture is one of the common complications of diabetes mellitus is UTI.[13] In presence of UTI, the recurrence rate of distal urethral stenosis in girl is high (about 60%) within one year.[14] So, recurrent UTI of female diabetic patients may play a vital role in the development of distal urethral stenosis. Distal urethral stenosis is rarely congenital in female and ammonia dermatitis is another cause which associated with decreased mucosal immunity in diabetic patient.[2] The present study was carried out to observe urethral stenosis among female patients with diabetes mellitus and LUTS.

METHODS

This was a multicentre observational type of cross- sectional study, enrolling female patients, (both with DM and without DM) suffering from lower urinary tract symptoms (LUTS) for six months or more. The cases were referred from out-patient department of Pabna Medical College and Hospital and from local private health institutions (clinics and laboratories). After ethical clearance from local ethical review committee, total 90 female patients were enrolled and

divided into two groups, group A with DM, and group B without DM. They were selected first by non purposive sampling and after selection were assessed by randomization. The major causes of LUTS of both groups were observed and assessed by history, clinical examinations and examination of urethra and urinary bladder with a bougie and vaginal speculum. Investigation included USG of KUB region. The distal urethral caliber less than 10 Fr. were taken as stenosed in this study. The vaginal speculum was used to assess the anterior pelvic compartment for presence or absence of cystocele. In group A, 45 female patients with LUTS for 6 months or more with DM were divided into three sub-groups according to investigation and clinical examinations as, (i) LUTS with distal urethral stenosis, (ii) LUTS with cystoele or descended anterior pelvic compartment and (iii) LUTS with other causes. The other causes include urinary bladder dysfunctions, foreign body in urinary bladder, interstitial cystitis, over active bladder (OAB), carcinoma in situ (CIS), stone, TB of urinary bladder, bladder neck hypertrophy, neurogenic bladder etc. Those patients having no distal urethral stenosis were sub divided into either LUTS with cystocele (if cystocele were present) or LUTS with other causes. In group B, 45 female patients, with LUTS for 6 months or more without DM, were also divided into three sub groups according to history, clinical examination and investigation as (i) LUTS with distal urethral stenosis, (ii) LUTS with cystocele and (iii) LUTS with other causes (as in group A). Findings of sub groups of both A and B groups were assessed and statistical analyses were done with 'Z' test and χ^2 test.

RESULTS

In group A, maximum age was 45 years and minimum age was 25 years. The mean age and standard deviation were 35.4 ± 5.3. In group B, the maximum and minimum ages were 46 years and 26 years respectively and mean was 37.5± 5.0. The age of patients in both groups were compared and found that there was no significant difference (*p*> 0.05) (Table I).

Table I: Age distribution of patients in both diabetic and non diabetic group

Group A (Diabetic)			Group B (Non diabetic)				
Age group in years	**Number of patients**	**Mean ± SD**	**Age group in years**	**Number of patients**	**Mean± SD**	**Z value**	***p* value**
25 or less	1		25 or less	0			
26 to 30	8		26 to 30	4			
31 to 35	3	35.4 ± 5.3	31 to 35	10	37.5± 5.0	-1.5	>0.05
36 to 40	12		36 to 40	19			
41 to 45	21		41 to 46	10			
46 to 50	0		46 to 50	2			
Total	**45**			**45**			

(calculated Z value was-1.50 and Z value of 5% level of significance was Z 0.05 = 1.96).

The duration of symptoms of LUTS for 6 months or more than 6 months were taken in this study. In group A, the maximum duration of symptoms was 60 months and minimum was 6 months. In group B, the maximum and minimum duration of symptoms of LUTS were 48 months and 6 months respectively. Statistical analysis was done and the result was not significant (*p* > 0.05) (Table II).

Table II: Duration of symptoms distribution of both groups of the study

Group	Maximum duration of symptoms (months)	Minimum duration of symptom (months)	Mean ± SD	Calculated Z value	*p* value
A (Diabetic)	60	6	20 ± 13.3	0.310	> 0.05
B (Non diabetic)	48	6	18.8 ± 12.6		

Z 0.05 = 1.96

In group A, total 19 (42.2%) patients had distal urethral stenosis after examination in operation theater (OT) with a urethral bougie. In group B, 7 (15.5%) patients had distal urethral stenosis. Statistical analysis was done and calculated ^{2} was 10.817. It was more than tabulated value at 5% level of significance ($p< 0.05$). So, there was significant difference between diabetic and non diabetic groups regarding the distribution of distal urethral stenosis (Table III).

Table III: Distribution of distal urethral stenosis in both diabetic and non diabetic group

Group (Diabetic and non diabetic)	Number of patients	Patients with distal urethral stenosis	Patients without distal urethral stenosis	χ^2 value	*p* value
A (diabetic)	45	19 (42.2 %)	26 (57.7%)		
B (non diabetic)	45	7 (15.5%)	38 (84.5%)	10.817	< 0.05

χ^2 0.05, 1 = 3.84

In group A (diabetic), total 10 (22.2%) patients had cystocele after examination in OT and in group B (non diabetic), 13 (28.9%) patients had cystocele (Table IV). χ^2 test was done and found that calculated value was lesser than tabulated value. So, there was no significant difference between diabetic and non diabetic group for the distribution of cystocele ($p > 0.05$).

Table IV: Distribution of cystocele in both diabetic and non diabetic groups

Group (Diabetic and non diabetic)	Number of patients	Patients with cystocele	Patients without cystocele	χ^2 value	*p* value
A (diabetic)	45	10 (22.2%)	35 (77.8%)	0.523	> 0.05
B (non diabetic)	45	13 (28.9%)	32 (71.1%)		

χ^2 0.05, 1 = 3.84

In group A (diabetic) and in group B (non-diabetic), total 16 (35.5%) and 25 (55.5%) patients had LUTS due to other causes respectively (Table V). The test of significance was done and calculated χ^2 was 3.236. It was less than tabulated value at 5% level of significance ($p>0.05$). So, there was no significant difference between diabetic and non diabetic groups regarding distribution of LUTS due to other causes (over active bladder (OAB), interstitial cystitis. Foreign body in urinary bladder, bladder neck hypertrophy, stone, carcinoma in situ (CIS), specific infection like TB, neurogenic bladder, urinary bladder dysfunction etc.).

Table V: Distribution of patients with LUTS due to other causes

Group (Diabetic and non diabetic)	Number of patients	Patients with LUTS due to other causes	Patients with LUTS without other causes	χ^2 value	*p* value
A (diabetic)	45	16 (35.5%)	29 (64.4%)		
B (non diabetic)	45	25 (55.5%)	20 (44.4%)	3.236	> 0.05

χ^2 0.05, 1 = 3.84

In ultrasonography of KUB region in group A (38, 84.4%) patients had features of chronic cystitis and in group B, (36, 80%) patients had features of chronic cystitis. There was no significant difference between the groups (Table VI).

Table VI: Distribution features chronic cystitis in USG in both group

Group	No. of patients	Number of patients had features of chronic cystitis in USG	Percentage (%)
A (Diabetic)	45	38	84.4
B (Non diabetic)	45	36	80

DISCUSSION

By observing the values in two groups of patients with or without diabetes mellitus (DM), it can be inferred that diabetic female patients with LUTS had more distal urethral stenosis than non diabetic female patients with lower urinary tract symtoms (LUTS). A study conducted by Wyatt (reported in 1975), among 72 female patients without differentiating diabetic and non-diabetic groups of different ages with LUTS showed-that 26 (36.1%) patients had distal urethral stenosis.[7] But in this study, out of total 90 patients, 26 (28.9%) patients were affected by distal urethral stenosis in both groups. It was stated that diabetic patients have decreased urethral mucosal immunity, defective phygocytosis, opsonization and chemotaxis, these cause recurrent UTI leads to stenosis or stricture of urethra.[12] Any degree of urethral obstruction in female invites straining that also causes LUTS.[7] According to Chen et al,[15] UTI are more common (2 to 5 folds) in DM patients, that instigate the complicated course of recurrent UTI which leads to distal urethral stenosis. In diabetic women, asymptomatic bactireurea are more common which is nonresponsive to antimicrobial therapy, so there is more opportunity of UTI that may lead to distal urethral stenosis.[16] In our study, both diabetic group and non diabetic group had cystocele without significant difference. In addition to the above findings of this study, patients with LUTS due to other causes included (over-active bladder (OAB), interstitial cystitis etc (Table V).[1] The ultrasonographyic findings of chronic cystitis of this study showed no significant differences among the group (Table VI). In distal urethral stenosis, the proximal dilated urethra contains the infected urine that regurgitates into the urinary bladder after micturation and causes chronic cystitis.[8] This findings correlate with the findings of this study.

CONCLUSION

We conclude that in female diabetic patients with LUTS, the distal urethral stenosis were more prevalent and features of chronic cystitis were common finding in USG.

Conflict of interest: None.

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