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Original Article

Incidence of Kidney Stones in Diabetic and Non-Diabetic Patients on Ultrasound

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ABSTRACT

The incidence of urinary stone disease has shown a steep rise in recent decades in all industrialized countries, as did the incidence of obesity, the metabolic syndrome, and type 2 diabetes. **Objective:** To determine the incidence of nephrolithiasis in diabetic and non-diabetic patients. **Methods:** A descriptive study was conducted at University of Lahore's Ultrasound Centre. 300 patients of age group 19 to 85 were enrolled in this study with convenient sampling technique. Out of 300 patients 184 were males and 116 were females and half of them were with the history of diabetes and remaining were normal. **Results:** Out of 300 patients 150 (50%) patients were with the history of diabetes and 150 (50%) were normal. 184 (61.3%) males and 116 (38.7%) females were enrolled in this study. Out of 300 patients 177(59.0%) patients were obese and 113 (41%) were normal. In this study different age groups were selected. Mean ± SD value of age was 40.796 ± 16.110. Out of 150 diabetic patients, 120 (80.0%) were diagnosed with renal stones. **Conclusions:** It is concluded that the patients with the history of diabetes are more likely to develop kidneys stones as compared to non-diabetic patients. Males are more likely to develop kidney stones than females.

INTRODUCTION

Nephrolithiasis means formation of urinary track crystals called stones and calculi [1]. It occurs due to low fluid intake, frequent urinary tract infections and medicines that may crystallize within the urine. Ureteric calculi are mostly composed of calcium which crystallizes in the kidney and moves down to ureter causing obstruction [2]. Acute ureteric colic is one of the worst pain a patient ever experiences in his/her life [3-5]. These patients require intermittent imaging studies to screen the stone position and to survey for hydronephrosis. There is high changeability in deciding the decision of imaging conventions to notice the movement of ureteral calculi for following up [6-10]. Nephrolithiasis is an intensely difficult, frequently intermittent, condition that influences all ages, sexes and races [11]. Nephrolithiasis is a typical condition with critical related grimness and cost to society. Nephrolithiasis present with intense flank or stomach torment with sickness and retching. Hematuria is available with 90% of the cases yet its nonattendance doesn't preclude nephrolithiasis [12, 13]. Diabetes Mellitus It is a metabolic heterogeneous problem that hoists the sugar level in the circulatory system. The seriousness of diabetes can fluctuate from one individual to another. Certain individuals require long clinical treatment to control their diabetes while others simply roll out certain improvements in their way of life in the wake of being analyzed, for example, unreasonable activity and little weight reduction assist them with dealing with their diabetes. Rather than the diabetes mellitus, individuals experiencing produce the insulin by their pancreases however their body cells really lose the capacity to assimilate the insulin. Subsequently, insulin becomes safe to carry out its role which is the

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bringing down of blood glucose level and eventually hyperglycemia occurs [14-18]. Diabetes is considerably more typical in individuals. It was likewise alluded to as 'grown-up beginning' since it is typically analyzed further down the road. As indicated by the new review, it has been referenced that around 90% individuals who are experiencing diabetes have diabetes. The family member or as well as outright lack of insulin cause the raised degree of glucose in the blood which is named as hyperglycemia. Most often the lack of insulin is made by the powerlessness reasonably repay the insulin resistance.37 Metabolic as well as acquired highlights are engaged with the improvement of insulin opposition. Stoutness is considered as a significant etiologic component of insulin resistance. According to the ADA, it is the most regular type of diabetes and it happens with expanding age, besides, generally related with the insulin obstruction [19]. Diabetes is ordered as a metabolic problem brought about by the obstruction of insulin and at last upgrades the dangers related with the development of stones in the kidney. The ammonium renal creation is utilized to get weakened by the opposition of insulin and it has affirmed by different preliminaries already and for this reason rather than the non-diabetic individuals, the patients with diabetes are more inclined to these stones [20]. To feature the rate of these boundaries, the review was directed by gaining sonographic evaluation.

METHODS

A descriptive study was conducted at University of Lahore Ultrasound Centre Lahore. 300 patients of age group 19 to 85 were enrolled in this study with convenient sampling technique. Out of 300 patients 184 were males and 116 were females and half of them were with the history of diabetes and remaining were normal. All patients visiting the ultrasound clinic for abdominal ultrasound due to any complaint were included this study. Ultrasound Machine, Toshiba Xario Convex probe frequency 3.5 to 7.5 MHz was used. The sonographer received and reviewed consent form prior to meeting participant. For TAS a full bladder was used as an acoustic window to achieve better imaging of the uterus and adnexa. Sonographer instructed the patient to drink 1 Liter of water, 1 hour prior to their appointment. Patient was asked to lie in supine position on the couch. A curvilinear 3-6 MHz probe with low dynamic range was used for the scan. The sonographer scanned the patient sagitally in the midline immediately above the pubis.

RESULTS

Out of 300 patients, 150 (50%) patients were with the history of diabetes and 150 (50%) were normal. 184 (61.3%) males and 116 (38.7%) females were enrolled in this study. Out of 300 patients, 177(59.0%) patients were obese and 113 (41%) were normal. In this study, different age groups were selected. Mean ± SD value of age was 40.796 ± 16.110. Out of 150 diabetic patients, 120 (80.0%) were diagnosed with renal stones, Table 1.

Diabetes		Stones		Total	p-value
		No	Yes		
No	150	108	42	150	0.001
	100.0%	72.0%	28.0%	100.0%	
Yes	150	30	120	150	
	100.0%	20.0%	80.0%	100.0%	
Total	Count%	300	162	300	
	within Diabetes	100.0%	54.0%	100.0%	

Table 1: Crosstab between diabetes and stones

Out of 150 diabetic patients, 34.7% had no stone, 52.7% had 1 stone, 8.7% had 2 stones, 2.0% had 3 stones and 2.0% had 4 stones. By using chi square method, a signification association was found between diabetes and kidney stones, Table 2.

Diabetes		No. of Stones					Total	p-value
		.00	1.00	2.00	3.00	4.00		
No	Count%	84	56	8	1	1	150	0.001
	Within Diabetes	56.0%	37.3%	5.3%	0.7%	0.7%	100%	
Yes	Count%	52	79	13	3	3	150	
	Within Diabetes	34.7%	52.7%	8.7%	2.0%	2.0%	100%	
Total	Count%	136	135	21	4	4		
	Within Diabetes	45.3%	45.0%	7.0%	1.3%	1.3%		

Table 2: Crosstab between diabetes and number of stones

The mean ± SD value of stone size was 3.768 ± 3.03, Table 3.

Size of stone (mm)	N	Mean + SD	Std. Error Mean
Diabetic	150	3.7687 + 3.03	.24743
Non-Diabetic	150	2.5120 + 3.04	.24835

Table 4: Group Statistics

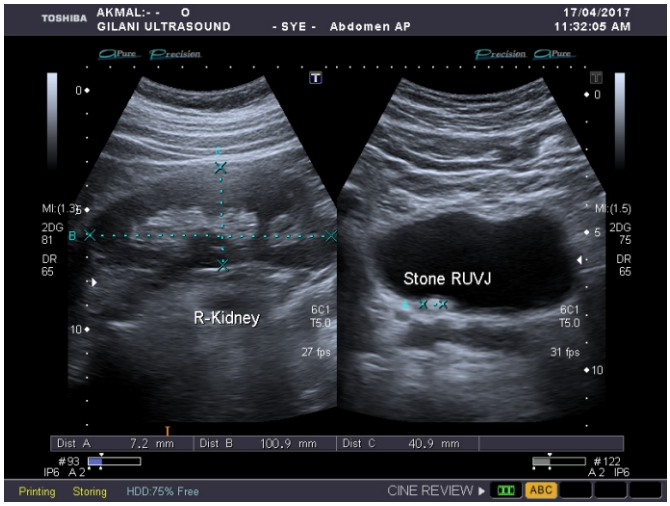

Figure 1: Right Sided Mild Hydronephrosis with Ureteric Stone

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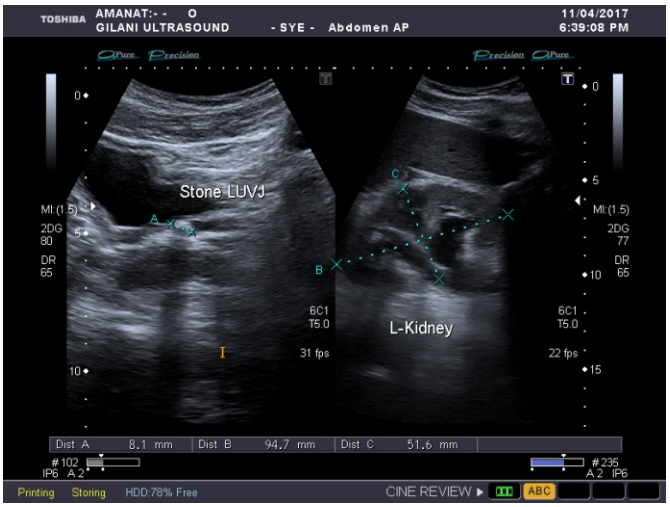

Figure 2: Left Sided Moderate Hydronephrosis with Ureteric Stone

DISCUSSION

Out of 300 patients, 150 (50%) patients were with the history of diabetes and 150 (50%) were normal. 184 (61.3%) males and 116 (38.7%) females were enrolled in this study. Out of 300 patients 177(59.0%) patients were obese and 113 (41%) were normal. In this study different age groups were selected. Mean ± SD value of age was 40.796 ± 16.110. Out of 150 diabetic patients 120 (80.0%) were diagnosed renal stones. Zulfiqar *et al.*, conducted a study to rule out the sonographic assessment of kidney stones in diabetic patients of age, ranging from 30-50 years. To evaluate the kidney stones in diabetic patients, a descriptive study was conducted comprised of two groups including 200 participants. The questionnaire was used as a primary data collection tool. Their age and gender were evaluated and with the help of ultrasound, the number of stones and their location in kidney of diabetic patients was examined. 66 out of a total of 200 diabetic patients had shown the kidney stones in them. Kidney stones of size 20 mm, 22 mm causing obstruction were detected in the diabetic patients while sonographic assessment. On the other hand, stones of size 6 mm, 14 mm, 11 mm which were non-obstructive were also observed. The stones of 22 mm and 14 mm were leading mild to moderate hydronephrosis. 73 stones were detected in patients. Majority of them possessed single stone whereas, two out them contained four stones individually. There is a presence of kidney stones among diabetic patients. According to the present literature, kidney gets affected due to impaired insulin production and accumulation of excessive glucose, but there is a requirement to conduct additional studies to identify the biochemistry behind it as this present study is only concerned with the assessment of stones among the patients who are diabetic [21]. Jastaniah *et al.*, conducted a study in which they stated that "Nephropathy was non-significantly correlated to the patients' gender, but to their age." Increased patients' age was associated with increased renal echogenicity. Non-diabetes-related renal abnormalities were detected in 39% of patients. The most common of non-diabetes-related renal abnormalities was simple renal cyst followed by renal stones (25% and 23%) respectively. Renal US for patients with type 2 DM has a great role in diagnosing and grading diabetic nephropathy, selecting cases with non-diabetic nephropathy for renal biopsy, and detecting associated renal abnormalities. Due to the high prevalence of DM in Saudi Arabia, we recommend future expanding study of the underlying possible genetic relation between DM and renal cysts and also the relation between renal stones and type 2 DM [22]. Khan *et al.*, concluded that In course of eight months, sixty patients with renal stones were studied. 43 (72%) of them were males and 17 (18%) were females. According to demographical data, 39 (65%) of them were from the urban population and 21 (35%) were from the rural population. Out of 60 patients, 22 (37%) were diabetic. Out of these 22 diabetic patients, 16 (75%) had uric acid stones and remaining 6 (25%) had calcium oxalate stones. There is a strong correlation between diabetes and kidney stones. Patients with type II diabetes are more likely to have calcium oxalate and uric acid renal stones. Uric acid stones are more common in diabetic individuals [23]. Spivacow *et al.*, resulted that Urinary pH was lower in diabetic patients than in non-diabetic patients. Metabolic abnormalities were detected in 95.2% and 81.5% of diabetic and non-diabetic, respectively. Unduly acidic urine pH was the most frequent abnormality in diabetic patients while hyperuricosuria was the second more common abnormality. On the other hand, in non-diabetics patients idiopathic hypercalciuria was the most common metabolic abnormality followed by hyperuricosuria. The main risk factor for lithogenesis in type 2 diabetes is unduly acidic urine pH, followed by hyperuricosuria and idiopathic hypercalciuria [24].

CONCLUSIONS

It is concluded that the patients with the history of diabetes are more likely to develop kidneys stones as compared to non-diabetic patients. Males are more likely to develop kidney stones than females.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

[1] Weinberg AE, Patel CJ, Chertow GM, Leppert JT. Diabetic severity and risk of kidney stone disease.

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European Urology. 2014 Jan; 65(1):242-7. doi: 10.1016/j.eururo.2013.03.026

[2] Worcester EM and Coe FL. Nephrolithiasis. Primary Care: Clinics in Office Practice. 2008 Jun; 35(2):369-91. doi: 10.1016/j.pop.2008.01.005

[3] Stamatelou KK, Francis ME, Jones CA, Nyberg LM, Curhan GC. Time trends in reported prevalence of kidney stones in the United States: 1976-1994. Kidney International. 2003 May; 63(5):1817-23. doi: 10.1046/j.1523-1755.2003.00917.x.

[4] Taylor EN, Stampfer MJ, Curhan GC. Obesity, weight gain, and the risk of kidney stones. JAMA. 2005 Jan; 293(4):455-62. doi: 10.1001/jama.293.4.455

[5] Coe FL, Evan A, Worcester E. Kidney stone disease. Journal of Clinical Investigation. 2005 Oct; 115(10):2598-608. doi: 10.1172/JCI26662

[6] Goldfarb DS, Fischer ME, Keich Y, Goldberg J. A twin study of genetic and dietary influences on nephrolithiasis: a report from the Vietnam Era Twin (VET) Registry. Kidney International. 2005 Mar; 67(3):1053-61. doi: 10.1111/j.1523-1755.2005.00170.x

[7] Curhan GC, Willett WC, Rimm EB, Stampfer MJ. A prospective study of dietary calcium and other nutrients and the risk of symptomatic kidney stones. The New England Journal of Medicine. 1993 Mar; 328(12):833-8. doi: 10.1056/NEJM199303253281203

[8] Daudon M and Jungers P. Drug-induced renal calculi: epidemiology, prevention and management. Drugs. 2004; 64(3):245-75. doi: 10.2165/00003495-200464030-00003

[9] Gillen DL, Coe FL, Worcester EM. Nephrolithiasis and increased blood pressure among females with high body mass index. American Journal of Kidney Diseases. 2005 Aug; 46(2):263-9. doi: 10.1053/j.ajkd.2005.04.030

[10] Worcester EM, Parks JH, Evan AP, Coe FL. Renal function in patients with nephrolithiasis. The Journal of Urology. 2006 Aug; 176(2):600-3. doi: 10.1016/j.juro.2006.03.095

[11] Devuyst O and Pirson Y. Genetics of hypercalciuric stone forming diseases. Kidney International. 2007 Nov; 72(9):1065-72. doi: 10.1038/sj.ki.5002441

[12] Daudon M, Traxer O, Conort P, Lacour B, Jungers P. Type 2 diabetes increases the risk for uric acid stones. Journal of the American Society of Nephrology. 2006 Jul; 17(7):2026-33. doi: 10.1681/ASN.2006030262

[13] Trinchieri A and Montanari E. Prevalence of renal uric acid stones in the adult. Urolithiasis. 2017 Dec; 45(6):553-562. doi: 10.1007/s00240-017-0962-5

[14] Nerli R, Jali M, Guntaka AK, Patne P, Patil S, Hiremath MB. Type 2 diabetes mellitus and renal stones. Advanced Biomedical Research. 2015 Aug; 4:180. doi: 10.4103/2277-9175.164012

[15] Weinberg AE, Patel CJ, Chertow GM, Leppert JT. Diabetic severity and risk of kidney stone disease. European Urology. 2014 Jan; 65(1):242-7. doi: 10.1016/j.eururo.2013.03.026

[16] Pak CY, Sakhaee K, Moe O, Preminger GM, Poindexter JR, Peterson RD, et al. Biochemical profile of stone-forming patients with diabetes mellitus. Urology. 2003 Mar; 61(3):523-7. doi: 10.1016/s0090-4295(02)02421-4

[17] Low RK and Stoller ML. Uric acid-related nephrolithiasis. Urology Clinic of North America. 1997 Feb; 24(1):135-48. doi: 10.1016/s0094-0143(05)70359-1

[18] Daudon M and Jungers P. Diabetes and nephrolithiasis. Current Diabetes Reports. 2007 Dec; 7(6):443-8. doi: 10.1007/s11892-007-0075-6

[19] Cetin N, Gencler A, Kavaz Tufan A. Risk factors for development of urinary tract infection in children with nephrolithiasis. Journal of Paediatrics and Child Health. 2020 Jan; 56(1):76-80. doi: 10.1111/jpc.14495

[20] Abrahamian FM, Krishnadasan A, Mower WR, Moran GJ, Talan DA. Association of pyuria and clinical characteristics with the presence of urinary tract infection among patients with acute nephrolithiasis. Annals of Emergency Medicine. 2013 Nov; 62(5):526-533. doi: 10.1016/j.annemergmed.2013.06.006

[21] Zulfiqar M, Shabbir H, Kanwal I, Zafar F, Taj A, Nadeem M, et al. Sonographic Assessment of Nephrolithiasis in Patients of Type II Diabetes in the 30 to 50 Year Age Group. Journal of Health and Medical Sciences. 2019 Dec 30; 2(4). doi: 10.31014/aior.1994.02.04.85

[22] Jastaniah SD, Alsayed NM, Awad IA, Fida HR, Elniel HH. Evaluation of renal disorders in type 2 diabetic patients using ultrsonography. Open Journal of Medical Imaging. 2013 Dec; 2013. doi: 10.4236/ojmi.2013.34024

[23] Khan BB, Qureshi KA, Ahmed A, Kumar A, Hashami U. Incidence of Renal Stones In Diabetic Patients. Turkish Journal of Physiotherapy and Rehabilitation. 32:3.

[24] Spivacow F, Del Valle E, Boailchuk J, Allo PM, Pailler M. Metabolic Risk Factors in Patients with Kidney Stones with and without Type 2 Diabetes. Research Square. doi: 10.21203/rs.3.rs-855238/v1.