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Assessment of Increased Risk of Incident Kidney Stone Formation in Dyslipidemia

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ABSTRACT

Background: To assess the increased risk of Incident Kidney Stone Formation in persons with Dyslipidemia.

Material and Methods: Group I comprised of Nephrolithiasis patients and group II had Healthy controls. Parameters such as height, weight, Blood pressure and BMI were recorded. About 5 mL of fasting venous blood sample was drawn for measurement of Total cholesterol (TC), Triglycerides (TG), High-density lipoprotein cholesterol (HDL-C), and Low-density lipoprotein cholesterol (LDL-C). Estimated Glomerular filtration rate (eGFR) was estimated using the 4-variable Modification of Diet in Renal Disease study equation.

Results: Group I had 40 males and 30 females and group II had 35 males and 35 females. Diabetes was seen in 4 in group I and 3 in group II, Hypertension in 14 in group I and 8 in group II, Alcohol history was positive in 16 in group I and 7 in group II and Smoking history was positive in 20 in group I and 11 in group II. The difference was significant ($P< 0.05$). The mean TC level in group I was 172.4 mg/dl and in group II was 186.2 mg/dl. TG level was 130.5 mg/dl in group I and 116.4 mg/dl in group II, HDL- C was 44.1 mg/dl in group I and 56.2 mg/dl in group II and LDL- C was 94.4 mg/dl in group I and 104.6 mg/dl in group II. The difference was significant ($P< 0.05$). Hypertriglyceridemia was seen in 32 % in group I and 20% in group II, Hypercholesterolemia was seen in 28% group I and 21% in group II, low HDL-cholesterolemia was common in group I seen in 56% in group I and 18% in group II and high LDL-cholesterolemia was seen in 14% in group II and 10% in group I. The differences were significant ($P< 0.05$).

Conclusion: Nephrolithiasis patients had high prevalence of Dyslipidemia. Hence, results showed that Dyslipidemia was associated with an increased risk of Kidney Stone Disease.

Keywords: Kidney Stone Disease, Hypercholesterolemia, Dyslipidemia.

INTRODUCTION

Kidney Stone Disease (KSD) is an increasing healthcare problem worldwide. KSD often recurs, with relapse rates of 50% in 5–10 years and 75% in 20 years.[1] The etiology of KSD is multifactorial and is associated with genetic predisposition, dietary habits, climate change, recurrent urinary infections, anatomical abnormalities, dyslipidemia, obesity, diabetes mellitus, hypertension, metabolic syndrome and other medical conditions. Among the medical conditions, Metabolic syndrome has been associated with an increased risk of KSD.[2] Lifestyle and Anatomical abnormalities are all possible factors contributing to stone formation. There is growing evidence showing that Dyslipidemia is associated with an increased risk of Kidney stone formation, and that this association is independent of other components of Metabolic syndrome.[3]

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The etiology of Nephrolithiasis is multifactorial and recently metabolic diseases have been implicated as causative factors.[4] Hypertension (HTN) and Obesity are associated with stone disease and increasing evidence also shows Diabetes Mellitus to have an association. Dyslipidemia (DL) has also begun to receive attention and may have an association with stone disease.[5] Dyslipidemia is a well-established risk factor for cardiovascular diseases, including cerebrovascular accident and coronary heart disease. Despite the discrepancies in the trends of lipid profiles between different studies, their results raise the possibility of 'another modifiable factor' to prevent KSD.[6] We performed this study to assess increased risk of Incident Kidney Stone formation in Dyslipidemia.

MATERIAL & METHODS

After considering the utility of the study and obtaining approval from ethical review committee, we selected seventy patients of Nephrolithiasis of both genders. Patient consents were obtained before starting the study.

Data such as name, age, gender etc. were recorded. Group I comprised of Nephrolithiasis patients and group II had Healthy controls. Parameters such as height, weight, Blood pressure and BMI were recorded. About 5 mL of fasting venous blood sample was drawn for measurement of Total cholesterol(TC), Triglycerides(TG), High-density lipoprotein cholesterol(HDL-C), and Low-density lipoprotein cholesterol(LDL-C). Estimated glomerular filtration rate (eGFR) was estimated using the 4-variable Modification of Diet in Renal Disease study equation. The results were compiled and subjected for Statistical analysis using Mann Whitney U- test. P value less than 0.05 was set as significant.

RESULTS

Table I: Patients distribution

Groups	Group I	Group II
Status	Nephrolithiasis	Control
M:F	40:30	35:35

Group I had 40 males and 30 females and group II had 35 males and 35 females (Table I).

Table II: Baseline characteristics

Parameters	Group I	Group II	P value
Diabetes	4	3	0.81
Hypertension	14	8	0.04
Alcohol history	16	7	0.02
Smoking history	20	11	0.05

Diabetes was seen in 4 in group I and 3 in group II, Hypertension in 14 in group I and 8 in group II, Alcohol history was positive in 16 in group I and 7 in group II and Smoking history was positive in 20 in group I and 11 in group II. The difference was significant ($P< 0.05$) (Table II).

Table III: Estimation of lipid levels in both groups

Parameters	Group I	Group II	P value
TC(mg/dl)	172.4	186.2	0.05
TG(mg/dl)	130.5	116.4	0.02
HDL- C(mg/dl)	44.1	56.2	0.01

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LDL- C(mg/dl)	94.4	104.6	0.05

The mean TC level in group I was 172.4 mg/dl and in group II was 186.2mg/dl. TG level was 130.5 mg/dl in group I and 116.4 mg/dl in group II, HDL- C was 44.1 mg/dl in group I and 56.2mg/dl in group II and LDL- C was 94.4 mg/dl in group I and 104.6 mg/dl in group II. The difference was significant (P< 0.05) (Table III).

Table IV: Dyslipidemia and their associations with Nephrolithiasis risk

Parameters (mg/dl)	Group I	Group II	Adjusted OR	P value
Hypertriglyceridemia	32%	20%	0.64	0.03
Hypercholesterolemia	28%	21%	1.34	0.05
Low HDL-cholesterolemia	56%	18%	7.40	0.02
High LDL-cholesterolemia	10%	14%	0.64	0.04

Hypertriglyceridemia was seen in 32% in group I and 20% in group II, Hypercholesterolemia was seen in 28% group I and 21% in group II, low HDL-cholesterolemia was common in group I seen in 56% in group I and 18% in group II and high LDL-cholesterolemia was seen in 14% in group II and 10% in group I. The difference was significant (P< 0.05) (Table IV).

DISCUSSION

Kidney stone is a common disease with an increasing incidence and prevalence worldwide. However, the exact pathogenesis and pathophysiology of stone formation is not completely understood, even today.[7] The complications of KSD include urinary obstruction, hydronephrosis, and pyelonephritis, which can lead to urosepsis; the leading cause of KSD-related mortality.[8] KSD is also associated with many comorbidities and increased risks of Metabolic bone disease, Chronic kidney disease, and Cardiovascular events. Hence, determining the risk factors for KSD is vital so that clinicians can optimally manage patients and prevent these complications.[9]

Group I had 40 males and 30 females and group II had 35 males and 35 females. Masterson et al[10] found that the average age was 31.0 ± 15.2 years. Dyslipidemia (DL) was associated with Nephrolithiasis. Low-density lipoprotein and triglycerides had no association with stone disease. Patients with high-density lipoprotein (HDL) values <45 for men and <60 for women had an high risk (HR) of 1.4 on univariate analysis and on multivariate analysis; HR = 1.27 for Nephrolithiasis. DL was associated with an increased risk of stone disease though the only specific lipid panel associated with lower Nephrolithiasis was HDL.

Diabetes was seen in 4 in group I and 3 in group II, Hypertension in 14 in group I and 8 in group II, Alcohol history was positive in 16 in group I and 7 in group II and Smoking history was positive in 20 in group I and 11 in group II. Liu et al[11] in their study, had a total of 78 patients and 30 controls were included. Higher-risk patients had significantly higher urine Uric acid and Calcium levels than lower-risk patients. After Atorvastatin treatment for 12 weeks, urine Citrate significantly increased (P < 0.001) accompanied with increased urine pH (P < 0.001), whereas urine Uric acid significantly decreased after treatment. Although urine Oxalate significantly increased after treatment (P = 0.037); they did not find any significant difference in urine calcium, ion activity product of calcium oxalate and ion activity product of calcium phosphate.

The mean TC level in group I was 172.4 mg/dl and in group II was 186.2 mg/dl. TG level was 130.5 mg/dl in group I and 116.4 mg/dl in group II, HDL- C was 44.1 mg/dl in group I and 56.2 mg/dl in group II and LDL- C was 94.4 mg/dl in group I and 104.6 mg/dl in group

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II. Hypertriglyceridemia was seen in 32 % in group I and 20% in group II, Hypercholesterolemia was seen in 28% group I and 21% in group II, low HDL-cholesterolemia was common in group I seen in 56% in group I and 18% in group II and high LDL-cholesterolemia was seen in 14% in group II and 10% in group I. Hung et al[12] assessed the association between lipid profile with baseline and incident KSD. Patients were classified into two groups according to whether they had KSD (n = 1813; 6.7%) or did not have KSD (n = 25,189; 93.3%) at baseline. Patients were classified into two groups consisting of those who had (n = 640; 2.5%) or did not have (n = 24,549; 97.5%) incident KSD. After multivariable analysis, compared to quartile 1 of lipid profile, the participants in quartile 4 of triglycerides, quartiles 3 and 4 of high-density lipoprotein cholesterol (HDL-C), and quartile 4 of Total cholesterol to HDL-C ratio (TC/HDL-C) were significantly associated with baseline KSD. In the follow-up study, the participants in quartiles 2, 3, and 4 of triglycerides; quartile 2 of Chol; quartile 4 of HDL-C; quartile 3 of LDL-C; and quartiles 3 and 4 of TC/HDL-C ratio were significantly associated with incident KSD. Results showed that hypertriglyceridemia (67–93 mg/dL) was associated with a 1.463-fold increased risk of incident KSD and that high HDL-C (>63 mg/dL) protected against incident KSD formation. In addition, a Total Chol/HDL-C ratio greater than 3.64% was associated with a 1.381-fold increased risk of incident KSD.

CONCLUSION

Nephrolithiasis patients had high prevalence of Dyslipidemia. Hence, results showed that Dyslipidemia was associated with an increased risk of Kidney Stone Disease.

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ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 01, 2023

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