

Serum Parathyroid Hormone and Serum Ionised Calcium in Patients of Renal Stone: A Observational Study**Mrityunjay Kumar Rai¹, Kamal Nayan Raghav², Khurshed Alam³, Sunil Kumar Ranjan⁴, Ashok Kumar⁵**¹Senior Resident, Department of Surgery, Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India²Senior Resident, Department of Surgery, Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India³Assistant Professor, Department of Surgery, Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India⁴Associate Professor and HOD, Department of Surgery, Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India⁵Assistant Professor, Department of Surgery, Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India

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Conflict of interest: Nil

Abstract**Background:** According to estimates, the lifetime prevalence of renal stones ranges from 1% to 15%. Renal calculi with symptoms present a major health risk to patients and raise global economic costs. The study's objective is to measure the levels of serum ionized calcium and parathyroid hormone in patients who have kidney stones.**Methods:** Serum parathyroid hormone and serum ionized calcium levels were assessed in 50 patients with a diagnosis of renal stone who visited Government Medical College and Hospital in Bettiah, West Champaran, and Bihar.**Results:** Phosphate, salt, potassium, creatinine, and blood urea were all greater than normal, and two out of fifty patients had elevated serum parathyroid hormone and twelve had abnormal serum calcium levels. The majority of the urine parameters were consistent with earlier research showing their significant impact in the development of renal stones.**Conclusion:** Despite the fact that kidney stones have a complex etiology, metabolic variables do contribute significantly to their development in both first-time and recurring stone formers. To determine the precise pathophysiology, the amount of parathyroid hormone should be evaluated in conjunction with other metabolic parameters such as serum calcium, phosphate, uric acid, and others. In addition to detecting abnormalities, the assessment aids in therapy selection.**Keywords:** Hyperparathyroidism, Calcium, Renal Stone.**DOI:** 10.25258/ijcpr.18.2.234

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Introduction

According to estimates, the lifetime prevalence of renal stones ranges from 1 to 15% and varies by age, sex, race, and geographic location.[1]

Men are three times more likely than women to get renal stones.

The condition is uncommon before the second decade of life, but its frequency rises quickly and peaks between the ages of 40 and 59.

According to estimates, the mean rate of recurrence might reach 30% after five years, 50% after ten,

and 80% after twenty.[2]According to their chemistry, renal stones can be classified as calcium oxalate (60%) phosphate (30%), uric acid and urate (5–10%), cystine (1-3%), xanthine, silicate, and matrix. The various risk factors for the formation of renal stones are;

Risk Factors: 1. Non-dietary, 2. Dietary, 3. Urinary

A. Non-dietary

1. **Family history:** In patients with positive family history there is risk of more than 2.5 times to form the renal stones.[3]
2. **Systematic diseases:**
 - a. Primary hyperparathyroidism, renal tubular acidosis and Crohn’s disease are associated with high risks of renal stone formation.
 - b. Patients suffering from Gout may have 2 times more risks of renal stone formation.
 - c. Increased body mass index is associated with increased renal stone formation
3. **Environmental factors:** There is higher incidence of renal stone formation among the people living in hot environment.

B. Dietary Factors

Higher intake of calcium, oxalate, sodium, magnesium, animal protein and potassium, reduced intake of fluid and deficiency of vitamin A and B6 are associated with renal stone formation.[4]

C. Urinary Factors

- a) **Hypercalciuria:** Urinary calcium excretion equal to or more than 300mg/dl in men and 250 mg /dl in women on 1000 mg/day calcium diet is defined as hypercalciuria.[5]
- b) **Hyperoxaluria:** It is defined as urinary oxalate excretion greater than 45 mg/day[6].
- c) **Hyperuricosuria:** It is defined as urinary excretion of uric acid more than 800mg/day in men or 750 mg/day in women⁷.
- d) **Hypocitraturia:** It is defined as urinary excretion of citrate equal to or less than 320 mg/day.[6]
- e) **Low urine output:** Low urine output defined as volume less than 1 L/day, seen in up to 25 % of first-time renal stone formation.[6]

Material and Methods

Between June 2025 and November 2025, a prospective study was conducted on 50 patients with renal calculi who visited Government Medical College and Hospital in Bettiah, West Champaran, and Bihar. Patients of age group 15 to 70, first time stone formers as well as recurrent stone formers and willing to give consent for research work were included in this study. Patients with known malignancy, anatomical anomalies of urogenital system, chronic renal failure and not willing to take part in the study were excluded in this study.

All admitted patients done laboratory investigation like routine blood examination including CBC, LFT, RBS and RFT, Serum PTH and serum Calcium, Serum sodium, potassium, uric acid and phosphate and evaluation of 24 hour urine sample for daily volume, pH, RBC, WBC, calcium, phosphate, uric acid and culture and sensitivity for bacteria. At the time of presentation, blood was drawn and sent for different investigations. Hospital laboratory normal ranges were used for all the investigations and results analysed. After thorough history and examination, to confirm the diagnosis and plan of management a series of radiological investigation was conducted. It included X ray KUB, USG abdomen and pelvis and IVP. These helped in confirming the exact site of stone, the anatomy of urinary system and physiology of kidneys.

This study has been based upon descriptive statistical analysis results on continuous measurements are presented on mean ± SD and results on categorical measurements are presented in number (%).

Results

Age and sex distribution.

Table 1: Age distribution

Sl. NO	Age group	No. of patients
1	<20	10
2	21-30	13
3	31-40	15
4	41-50	06
5	51-60	06

Out of 50 patients, 24 were males and 26 were females.

Table 2: Serum parameters of patients

Sl. No.	Lab. investigation	Criteria	No. of patient	Percentage
1.	S. PTH (pg/ml)	<8.7	00	00%
		8.7-79.6	48	96%
		>79.6	02	4%
2.	S. Ca (mg/dl)	<8.4	05	10%
		8.4-10.2	33	66%
		>10.2	12	24%
3.	S. Po ₄ (mg/dl)	<2.7	05	10%
		2.7-4.5	42	84%
		>4.5	03	06%
4.	B. Urea(mg/dl)	15-38.0	45	90%
		>38.0	05	10%
5.	S. Creatinine (mg/dl)	<1.2	42	84%
		>1.2	08	16%
6.	S. Na ⁺ (mEq/l)	<133	02	04%
		135-145	45	90%
		>145	03	06%
7.	S. K ⁺ (mEq/l)	<3.5	02	04%
		3.5-5.3	44	88%
		>5.3	04	08%
8.	S. Uric acid (mg/dl)	M < 3.5; F < 2.6	02	04%
		M 3.5-7.2 F 2.6-6.0	44	88%
		M > 7.2 F >6.0	04	08%

Table 3. Urinary Parameters of Patients.

Sl. No.	Variable	Criteria	No. of Patient	Percentage
1.	Volume (ml/d)	<1200	26	52%
		1200-1800	21	42%
		>1800	03	06%
2.	PH	<4.6	02	04%
		4.6-8.0	38	76%
		>8.0	10	20%
3.	Ca (mg/dl)	<100	01	02%
		100-300	33	66%
		>300	16	32%
4.	Po ₄ (mg/dl)	<400	08	16%
		400-1300	41	82%
		>1300	01	02%
5.	Uric acid(mg/d)	<250	01	02%
		250-750	44	88%
		>750	05	10%

The study shows that 8 patients (16%) had episode of recurrent renal calculi. 5 of them (62.5%) developed within 5 years and 3 patients (37.5%) developed after 5 years. 6 out of 8 patients who had recurrent calculi had undergone open surgical procedure for stone removal while 2 patients were treated with ESWL.

Co-morbidities: In the study, 4% had diabetes mellitus and 8% had hypertension.

Discussion

The study showed that parathyroid hormone level was raised in only 2 patients (4%). These patients

were referred to the department of endocrinology for further evaluation and management.

These two patients were also cases of recurrent renal stones, where the overall recurrent cases of renal stone were 8 (16%). In both the cases, recurrence occurred within first five years of diagnosis of the first renal stone. Both of these patients had elevated calcium level in serum as well as in urine. Uribarri et al found that recurrence rates without treatment for calcium oxalate stone are about 10% at 1 year, 35% at 5 years and 50% at 19 years.[8,9]

In our study there was no growth on urine culture in 42 patients (84%), while 06(12%) patients had E.coli and 3 (6%) patients had Proteus in urine culture. Griffith et al found proteus mirabilis (86%) as the most common organism present in urine culture associated with infection stones.[10] But in our study only 4% cases showed proteus in urine culture, so our study is not in concordance with this study.

The various serum parameters were as follows;

- Only 4% of patients had elevated serum parathyroid hormone.
- 24% patients had hypercalcemia and among 8 patients of recurrent stone formers, hypercalcemia was seen in 2 patients.
- S. Creatinine was raised in 16% and blood urea was raised in 10%.
- 6% patients had high S. PO4 level.
- 6% patients had hypernatremia and 8% had hyperkalemia.
- 4% had elevated serum uric acid level.
- Castle et al also advocated for single 24-hour urine collection for metabolic evaluation.[11] In our study, on 24-hour urine sample, the following observations were made.
- Low urine volume was the most common abnormality seen with 52% patients of low urine volume. 50% males and 53.8% females.
- 32 % had hypercalciuria in 24-hour urine sample. 37.5% males and 26.9% females had hypercalciuria. Curhan et al found hypercalciuria to be the commonest urine abnormality.
- Hyperphosphaturia is shown to be associated abnormality, more so ever in recurrent stones, but in our study it was insignificant.
- 10 % had hyperuricosuria, 12.5% males and 7.6% females. Stitchenrakul et al found that 7.2 % had hyperuricosuria.[12]

Conclusion

In order to properly identify the cause of renal stone formation, particularly in cases of recurrent renal stones, manage the underlying metabolic abnormalities, and reduce the likelihood of further renal stone recurrence, the study emphasizes the importance of evaluating serum parathyroid hormone, serum calcium level, and other metabolic factors.

References

1. Urinary lithiasis: origin, epidemiology, and pathophysiology Pearle MS, Lotan Y. Edited by Wein AJ, Kavousi LR, Novick AC, Partin AW, and Peters CA. Welsh-Campbell Urology. Saunders, Philadelphia, 21st ed., 2017: 1257-86.
2. Chandoke Asplin. The patient who is developing stone. In: Editor, Coe FL. Medical and surgical treatment for kidney stones. Lippincot Raven, Philadelphia, 2016: 335-7.
3. Kidney stone risk and family history (Curhan G, Willett W, Rimm E). J Am SocNephrol. 2017; 8:1568–73.
4. Guidelines for urolithiasis by Tiselius HG, Ackermann D, Alken P, Buck C, Conort P, and Gallucci M. Eur Urol. 2021; 40:362-71.
5. Hodgkinson, L. N. Pyrah. Calcium and inorganic phosphate excretion in the urine in 344 patients with renally derived calcium stones. Br J Surg. 2018;46(195):10–8;
6. Curhan GC, Willett WC, Speizer FE. Twenty fourhour urine chemistries and the risk of kidney stones among women and men. Kidney Int. 2001;59(6):2290-8.
7. Coe FL. Hyperuricosuric calcium oxalate nephrolithiasis. Kidney Int. 1978;13(5):418-26.
8. J.M. Suh, J. J. Corona and J. M. Monchik, "Primary Hyperparathroidism: Is there an increased prevalence of renal stone disease?" American Journal of Roentgenology, 2008; 191(3): 908-911.
9. Eng J. Sample size estimation: How many Individuals Should be Studied? Radiology. 2007; 227:309-13.
10. Griffith DP, Osborne CA. Infection (urease) stones. Miner Electrolyte Metab. 1987; 13: 278-85.
11. Parks JH, Goldfisher E, Asplin JR, Coe FL. A single 24-hour urine collection is inadequate for the medical evaluation of nephrolithiasis. J Urol. 2002; 167:1607-12.
12. Stitchenrakul W, Kochakarn W, Ruangraksa C, Domrongkitchaiporn S. Urinary risk factors for recurrent calcium stone formation in Thai stone formers. J Med Assoc Thai. 2007; 90:688-97.