



DEMOGRAPHIC CHARACTERISTICS & CLINICO-RADIOLOGICAL PROFILE OF RENAL COLIC: A PROSPECTIVE OBSERVATIONAL STUDY

Surgery

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ABSTRACT

Introduction: Renal calculi is one of the oldest disease. Kidney stones result from precipitation of substances within the urine. Multifactorial causes of Urolithiasis and diversity of current treatments complicate clinical management of patients and offer opportunities for fruitful research.

Materials & methods: Prospective observational study on patients with history, clinical & radiological features suggestive of renal colic were included in the study. Prestructured proforma was filled and relevant blood investigations were noted. Treatment was given case by case basis.

Results: Of 218 patients, 162 were male and 56 female. Renal colic was commonly observed in age group 20-30 (30.27%). 210 patients had mixed type of diet with 198 patients taking <3 litres of daily intake of water. Pain in the abdomen was the most common symptom present. Serum calcium levels were >9 in 128(58.71%) patients. Phosphorous and uric acid level were normal in the majority of patients. 78.0% cases were managed conservatively.

Conclusion: The demographic factors and the etiological factors associated with renal stone could be identified. Less water intake, mixed diet, raised serum calcium levels are commonly associated with renal colic.

KEYWORDS

Renal colic, Urolithiasis, Calcium, Phosphorous, Uric acid, Diet & kidney stones

1. Introduction

Renal calculi is one of the oldest disease known to human beings. It has been documented in various ancient cultures like Greeks, Egyptians and Romans. The disease has also been described in Hindu medicine while Muslim physicians like Razi and Avenenna have discussed the sign, symptoms and complications of the disease. The symptoms of urolithiasis were also described by Hippocrates.[1,2] In India upper and lower urinary tract stones occur but the incidence shows wide regional variations [3]. The incidence of urolithiasis is low in the southern part of the country compared to other parts of India. [4]

Kidney stones result from the precipitation of certain substances within the urine. Imbalance in ratio of Urolithiasis promoters (calcium, oxalate, uric acid and inorganic phosphate) and inhibitors (citrate and magnesium) and alterations in urothelial surface properties explain to some extent the formation of stones. Hereditary and personal history of renal stone, geographic conditions & certain medications also influences stone formation. The various causes cited for the high prevalence of stone disease include food habits (monotonous diet), water quality and the hot climate[5,6] Multifactorial causes of Urolithiasis, and the diversity of their current treatments complicate clinical management of patients, and offer opportunities for fruitful research.

2. Materials & Methods

This prospective observational study was conducted at GMC Gondia. Patients admitted in surgical wards with history, clinical & radiological features suggestive of renal colic were included in the study. The duration of study was from February 2016 to June 2017 (16 Month). The research study was done according to the ethical principles laid down by the Helsinki declaration and permission from the hospital ethics committee was taken.

The cases studied were > 18 years of both sex. The patients were first seen at outpatient departments. A detailed history, physical examination, urine examination, ultrasonography of kidney, urinary bladder (KUB) along with x-ray (KUB region) was done. A case history was recorded in detail as per a preformed proforma. Detailed question regarding the patients' habits, appetite, diet and average daily water consumption were enquired. A note was recorded regarding the previous history of renal calculi. General & detailed systemic physical examinations were done and the signs observed were recorded in proforma case sheets, with due importance to genitourinary system. Necessary investigations were done after a thorough clinical

examination of the patient.

Urine:

A clean specimen of urine collected under aseptic precautions were sent for microscopic haematuria and pus cells and bacteriological examination.

Blood:

Blood examination was done such as Hb%, W.B.C count. Special investigations like serum calcium, serum phosphorous and serum uric acid were done and noted.

Radiological findings:

A routine ultrasound (KUB region) was done by a senior radiologist and plain x-ray KUB were done whose reporting was interpreted. Any patients who needed operative intervention a pre-operative workup was done, and then they were subjected to appropriate anesthesia depending on the condition of the patient.

Statistical analysis & interpretation of data:

Observations made and data collected was divided into categorical and continuous type of data. Analysis was done using appropriate statistical tests. A two-tailed P value of <0.05 was considered statistically significant. All statistical computations were performed using the SPSS software.

3. Results

A total of 218 patients were studied in the 16 month duration. The correlations were studied between demographical, laboratory and radiological factors

The mean age of presentation was 39.37±9.42 years. Youngest patient was 20 years & the oldest was of 68 years. On observing decade wise distribution, renal colic was most commonly observed in age group 20-30 (30.27%). Age group was >30-40 years accounting for 28.44% of the cases as shown in **Table 1**. There were 162(74.3%) male and 56(25.7%) female patients enrolled in the present study. The male to female ratio was 2.8:1.

Table 1: Showing age distribution

Age group	Frequency	Percentage
18-20	04	1.8%
>20-30	66	30.27%

>30-40	62	28.44%
>40-50	46	21.10%
>50-60	20	9.17%
>60-70	20	9.17%
Total	218	100%

Considering the diet habitus, there were 210(96.3%) patients of mixed diet and only 8(3.7%) patients were pure vegetarian.

On measuring total water intake, there were 198(90.8%) patients taking <3 litres of daily intake of water and 20(9.2%) patients were taking >3 litres of water. The mean range of daily water intake was 2091±553.46 as shown in **Table 2**

Table 2: Showing daily intake of water

DAILY WATER INTAKE	FREQUENCY	PERCENTAGE
< 3000 ml	198	90.8%
> 3000 ml	20	9.2%
Total	218	100%

In present study most common symptom observed was pain in abdomen, which was present in all the patients 218(100%). There were 162(74.3%) patients presented with colicky pain in loin and 56(25.7%) were presented with dull aching pain.

The second most common symptom was Nausea 129(59.3%) then vomiting 103(47.7%) and burning micturition 103(47.7%). There were very less patients presented with haematuria 38(17.4%) and fever 54(24.8%) in present study. The history of similar complaints in the past were present in 128 (58.7%) patients and family history were present in 78 (35.8%) patients **Table 3**

Table 3: Showing symptomatic distribution

SYMPTOMS	FREQUENCY	PERCENTAGE
Nausea	129	59.3%
Vomiting	103	47.7%
Burning micturition	103	47.7%
Hematuria	38	17.4%
Fever	54	24.8%
History of renal colic in past	128	58.7%
Family history	78	35.8%

On correlating the urine analysis results, it was seen that though there was less number of macroscopic haematuria but the microscopic haematuria was present in 53(24.5%) and pus cells were present in 105(48.6%) as described in **Table 4**

Table 4: Showing distribution of microscopic haematuria and pus cells

Urine analysis	Frequency	Percentage
Microscopic hematuria	53	24.5%
Pus cells	105	48.3%
Normal urine	60	27.2%
Total	218	100%

In present study the most common organism found on cultured urine was E.coli in 54(24.8%), the second most common organism grown was Klebsiella in 22 (10.1%) patients. Proteus was observed in 8 (3.7%) and No growth was observed in almost 134(61.5%) patients as depicted in **Table 5**

Table 5: Showing distribution of cultured organism

Organism grown	Frequency	Percentage
E.coli	54	24.8%
Klebsiella	22	10.1%
Proteus	8	3.7%
No growth	134	61.5%
Total	218	100%

In present study following blood investigations were done.

- a) Serum calcium.
- b) Serum phosphorous.
- c) Serum uric acid.

The serum calcium levels Serum calcium (normal range 8.6-

10.3mg/dl) were >9 in 128(58.71%) patients and 90 patients (41.28%) had calcium level less than 9mg/dl. The mean serum calcium range was 8.754±0.7245.

In the present study, 211(97.24%) patients were having normal levels of serum phosphorous. Serum phosphorous (normal range 2.7-4.5 mg/dl). The mean range was 3.590±0.5571.

211(94.5%) patients were having normal levels of serum uric acid Serum uric acid (normal range: 3.5-7.2ml/dl). The mean range was 3.979±0.9539.

On assessing the radiological investigations the radio opaque shadow was seen in 104(47.7%) patients on X-Ray. On ultrasonography, right sided renal calculi were seen in 102(46.8%), left sided renal calculus were seen in 80(36.7%), and B/L renal calculi were seen in 36(16.5%) patients. **Table 6**

Table 6: Showing distribution of side of renal calculi

Side of renal calculi	Frequency	Percentage
B/L renal calculi	36	16.5%
Left renal calculi	80	36.7%
Right renal calculi	102	46.8%
TOTAL	218	100%

Most of the renal calculi cases 170(78.0%) were managed conservatively. In surgical management, 48 patients were treated in the present study. In that pyelolithotomy was done in 32 patients, nephrolithotomy was done in 4 patients and PCNL was done in 12 patients. ESWL was not done as the facility was not available at centre **Table 7**

Table 7: Showing distribution of surgery performed

Surgery	Frequency	Percentage
Pyelolithotomy	32	66.51%
Nephrolithotomy	4	8.33%
PCNL	12	25%
Total	48	100%

4. Discussion

Urinary stones are related with various risk factors that have to do either with each person's temperament (endogenous risk factors) or with the environment (exogenous risk factors). Usually there is a combination of both endogenous and exogenous factors leading to the formation of stones. Many studies have been done on renal calculi showing different etiological, demographical factors. In the present study following variables were studied and results were obtained.

Age remains an important factor in presentation of renal calculi. In present study total 218 patients were included and studied in that the mean age of presentation was The mean age of presentation was 39.37±9.42 years which is quite similar, considering the standard deviations to those reported by Gyawali PR et al (2011) [7] showing mean age 40 years & Dhananjay V. Bhale et al (2013) [8, 9] study showing mean age of presentation 40.2 years. **Table 8**

Table 8 showing mean age distribution in different studies

Study	Year	Mean age(years)
Gyawali PR et al [7]	2011	40
DSVGK Kaladhar et al[19,20]	2012	42
Dhananjay V. Bhale et al [9]	2013	40.2
Present study	2017	39.37±9.42

74.3% of the patients in this study were males and 25.7% of the cases were females thus giving a male to female ratio of 3:1. This can be explained as stone disease typically affects adult men more commonly than adult women. By a variety of indicators including inpatient admissions, outpatient office visits, and emergency department visits, men are affected two to three times more often than women (Hiatt et al, 1982[10]; Soucie et al, 1994[11]; Pearle et al, 2005 [12]) **Table 9**

Table 9: Showing mean male to female ratio in different studies

Study	Year	Male : female
Baker et al [21]	1993	2.7:1
Hughes P [22]	2010	2.4:1
Present study	2017	3:1

Diet is another important predisposing factor for renal stones. Intake of dietary fibre is directly associated with the risk of kidney stones. Most of non-vegetarian food contains high fibre. In present study 96.3% patients were having mixed diet and only 3.7% were having vegetarian diet. Griffith HM et al (1981) [13] and Safarinejad MR et al (2007) [14] also concluded about direct association of fibre diet and kidney stones.

The main factor that may be cause of kidney stone formation is less daily water consumption. In present study 90.8% patients were drinking <3 litres of water and only 9.2% patients were drinking >3 litres of water per day. According to K. Ravi Kumar et al study most of the patients were drinking <3 litres of water per day were having renal stones.

In the present study, the most common symptom was pain in abdomen which was present in all patients (100%). As per the literature most renal stones are asymptomatic. In present study all the diagnosed cases of renal colic were included presented with pain in abdomen hence the percentage of pain is 100%. The classic presentation of a renal stone is acute, colicky flank pain radiating towards groin or scrotum. In present study colicky pain in loin were experienced in 74.3% patients and dull aching pain were experienced by 25.7% patients.

In the present study nausea was seen in 59.3% of patients and vomiting was seen in 47.7% of patients which is related close with the literature which shows Nausea and vomiting occur in at least 50% of patients with acute renal colic. Nausea is caused by the common innervation pathway of the renal pelvis, stomach, and intestines through the celiac axis and vagal nerve afferents. This is often compounded by the effects of narcotic analgesics, which often induce nausea and vomiting through a direct effect on gastrointestinal (GI) motility and an indirect effect on the chemoreceptor trigger zone in the medulla oblongata. Non-steroidal anti-inflammatory drugs (NSAIDs) can often cause gastric irritation and Gastro Intestinal upset. **Table 10**

Table 10 showing distribution of percentage of nausea and vomiti ng in different study

Study	Percentage of nausea and vomiting	Year
Coe FL et al [23]	50%	2005
C. Türk et al [24, 25]	50%	2016
Present study	47.7%	2017

In present study burning micturition was present in 47.7% of patients which is coinciding with literature .The result also coincide with the study done by Madhavi S et al. [15]

In the present study 58.7% of patients were having past history of renal colic. The study from Moe OW et al [16] shows almost similar results as shown in **Table 11**

Table 11 showing studies with past history of renal colic

Study	Year	Percentage
Moe OW et al [16]	2006	50%
Ljunghall S et al [26]	1984	50%
Present study	2017	58.7%

In the present study in urine analysis pus cells were found in 48.6% and microscopic haematuria were found in 24.8% of patients. According to Hizbullah Jan et al [17] 78% patients of renal stones were positive for pus cells and haematuria were present in 28% patients which is similar with present study. In present study the variation is probably due to the previous antibiotic course taken outside. **Table 12**

Table 12 showing distribution of pus cells and haematuria in different studies

Urine analysis	study	Percentage	Year
Pus cells	Hizbullah Jan et al [17]	78%	2008
	Present study	48.6%	2017
Hematuria	Hizbullah Jan et al	28%	2008
	Present study	24.8%	2017

In present study in urine culture the 61.5% patients were having no growth in their urine sample. So considering 42 patients as 100% the most common organism was E.coli 24.8%, then second most was Klebsiella 10.1% and Proteus 3.7%. The results are similar with the literature and study done by Hizbullah Jan et al. **Table 13**

Table 13 showing distribution of urine culture results from different studies

Study	Organism grown	percentage	Year
Hizbullah Jan et al [17]	E coli	30%	2008
	Klebsiella	11%	
	Proteus	19%	
Mawhoob N. Alkadasia et al [27]	E coli	71%	2014
	Klebsiella	7%	
	Proteus	12%	
Present study	E coli	24.8%	2017
	Klebsiella	10.1%	
	Proteus	3.7%	

In present study serum calcium, serum phosphorous and serum uric acid were studied and the mean ranges were obtained, the serum calcium levels were on higher side but not raised than its normal value 64% patients were found to be on higher side and mean range was 8.754±0.7245. This results were similar with literature and study done by Gyawali PR et al [18] and Dhananjay V. Bhale et al. **Table 14**

Table 14 showing mean ranges and percentage of serum levels from different studies

Study	Mean ranges (mg/dl)			Year
	Serum calcium	Serum phosphorous	Serum uric acid	
Gyawali PR et al	8.2	3.9±1	5.3±1.4	2010
Dhananjay V. Bhale et al	8.1±1.1	3.6±0.8	5.1±0.4	2013
Present study	8.7±0.7	3.5±0.5	3.9±0.9	2017

In present study x-ray KUB (kidney, ureter and urinary bladder) and Ultrasonography KUB were done for every patient. On x-ray KUB radio opaque shadows were found in 47.7% patients and all the patients were having renal stones on Ultrasonography as per the inclusion criteria of study. The ultrasonography KUB is the gold standard radiological investigation in this study.

In the present study 100% patients presented with lumbar or renal angle pain which were treated with analgesics and antispasmodic and according to their sizes 78% were treated conservatively and 22% were subjected to surgical procedures.

5. Conclusion

The study could answer all the research questions in the methodology. The demographic factors and the etiological factors associated with renal stone could be identified. We hereby conclude that the demographic and the etiological factors are the main predisposing factors for renal stones as they are directly correlated with incidence of renal stone. The dietetic factors and less water consumption are also important predisposing factors. All these factors successfully predict the risk of developing renal stone and should be included in patient history with doubtful cases.

Ethical approval

The protocol for the study was approved by the institutional ethics committee.

Funding & Conflict of Interest

There are no sources of financial supports. The authors declare to have no conflict of interest.

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