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The clinicodemographic characteristics and outcome of patients with renal colic

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Abstract

Background: Kidney stone disease is important urological condition. This study aims analyse clinico-demographic characteristics and outcome of patients with renal colic, presenting in Emergency Department.

Method: This was a prospective observational study conducted from 15 Jan 2024 to 14 Jun 2024 in the Department of Urology and Department of Emergency, Rapti Academy of Health Sciences, Dang, Nepal. Ethical approval was obtained. Microsoft Excel and Statistical Package for the Social Sciences (SPSS) were used for descriptive analysis of clinicodemographic characteristics parameters such as age, sex, renal colic symptoms, size of stones, hydronephrosis; and outcome variables such as conservative or surgical management. The Chi-square test / Fisher's extract test was used for association. A p-value of <0.05 was considered statistically significant.

Result: Among 156 patients, renal colic was most commonly observed in the age group 20-29 years in 79(50.5%) patients with male to female ratio of 1.05:1, flank pain in 148(94.8%) followed by nausea in 128(82.1%). The history of stone disease was recorded in 36(23%) cases. Stone was located in the lower ureter in 56(35.9%) and in vesico-ureteric junction in 51(32.6%) cases. Surgical management was required in 15(9.6%) cases. Hydronephrosis was observed in 145(93%) patients. Nonsteroidal anti-inflammatory drug was primarily used as an analgesic. Opioid was needed in 14(9%) cases.

Conclusion: Renal colic was most common in the younger age group (20-30 years). Spontaneous passage of stone was common, and only a minority (9.6%) needed surgery.

Keywords: CT kidney ureter bladder, Hydronephrosis, Percutaneous nephrolithotripsy, Renal colic, Ultrasonography, Ureterorenoscopic lithotripsy

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Introduction

Kidney stone disease has long been described as a urological affliction. The rising incidence of renal colic in recent years, is due to the increased use of Ultrasonography (USG) and Computed Tomography (CT) in symptomatic and asymptomatic patients.[1]

The imaging study helps clinician to make clinical decision.[2] The USG abdomen and pelvis as a primary diagnostic test showed several advantages including its availability, lower cost and absence of radiation.[3] A comparative study between USG and CT didn't show superiority of CT in Emergency Department (ED) for the management as well as outcome of renal colic patient such as complications or serious adverse events, re-visit to the emergency or hospitalizations, therefore, CT is reserved, if USG is inconclusive or suspicion of alternative diagnosis.[4]

In general, stones associated with pain, infection, obstruction, active growth, and significant hematuria should be treated without delay.[5] There is lack of available evidences to approach minimally symptomatic or asymptomatic renal calculi.[6] Most patients, presenting with renal colic in emergency department have smaller ureteral stone and there is higher chance of spontaneous passage.[7,8]

The recurrence rate of urolithiasis is high and reported recurrence was up to 34% in 5 year depending on the type of stone and saturation status of the urine.[9]

National studies on renal colic are scarce. This study is aimed to find out the clinico-demographic characteristics and outcome of renal colic in patients, who presented in Emergency Department of Rapti Academy of Health Sciences (RAHS), Western region of Nepal.

Method

This prospective study was conducted in the Department of Emergency and Department of Urology, Rapti Academy of Health Sciences, Dang, Nepal, from 15 Jan 2024 to 14 July 2024. Ethical approval from Nepal Health Research Council (NHRC) was taken (Ref. No. 1466-2024, Protocol Reg. No. 612_2023).

Sample size was calculated using formula: $z^2pq/(d2)$, where; z is 1.96 at a 95% confidence interval, p is prevalence of renal colic 10%[1] (0.1), q is 1-p (0.9), d is allowable error (0.05). The sample size was calculated to be 139. After adjusting 10% incomplete data or further loss, desired sample size calculated to be 152.

Working Definition: A) Renal/ureteric colic was diagnosed according to the Emergency Departmental definition criteria of flank pain with or without referred pain to umbilicus or groin or scrotum, with or without nausea, vomiting, or fever. Diagnosis was confirmed when the stone was identified in ureter, pelvic-ureteric junction, or renal pelvis, on ultrasonography of abdomen and pelvis. B) Location of stone was recorded based on USG abdomen and pelvis report in ED or next day in Urology OPD. C) The severity of pain was measured by Visual Analogue Scale (VAS) with 5-point was used to record pain at the time of arrival in ED and after 30 minutes after analgesics.

Details of demographic characteristics, clinical symptoms of renal/ureteric colic, who presented in emergency department of RAHS, were documented. Routine examination and associated comorbidities were recorded as per hospital protocol. Ketorolac or Diclofenac or Buscopan injection was given for pain management. If pain was not relieved then the dose of Ketorolac or Diclofenac was repeated or Tramadol injection was given as decided by the treating doctor.

The treating physician was unaware of the study in ED during the management of renal colic. The laboratory investigations (total and differential blood count, random blood sugar, renal function test (urea, creatinine, sodium, potassium), urine routine and microscopic test were sent as decided by treating physician in emergency department. After stabilization of patient, USG abdomen and pelvis were advised.

After counseling, informed consent was taken and patient was included in research. Patient was advised to attend OPD urology for further

management. Patients with renal stone smaller than 10 mm, with minimum hydronephrosis, minimum pain or no pain, were advised to follow up after 2 weeks. As per urology departmental criteria, CT KUB (Kidney Ureter Bladder) or CT IVU (Intravenous Urogram) was advised in all cases before surgical intervention.

A CT KUB or CT IVU was advised in patients with renal stone size <10 mm that had not passed after 4 weeks, or stone size >10 mm, or in presence of moderate or severe hydronephrosis, or intractable pain. CT-IVU was done in cases with thin parenchyma, moderate to gross hydronephrosis, or with associated renal anatomical abnormalities.

Exclusion criteria for enrollment in present study were absence of symptoms (pain), absence of stone on USG report, bilateral stones, renal failure, single kidney, trauma cases, and pregnancy.

The indications for surgery were stone size <10 mm that had not passed out after 4 weeks following medical expulsion therapy or analgesics, and stone size of >10 mm.

Ureterorenoscopic Lithotripsy (URSL) was performed for stones located in the ureter. Percutaneous Nephrolithotripsy (PCNL) was done for stones located in PUJ or stone migrated from ureter to kidney during URSL.

Surgical technique included ureterorenoscopy as per hospital routine procedure for patients with a pre-operative negative urine culture. A single prophylactic dose of antibiotic inj. Ceftriaxone 1 gm was given. Surgery was performed under spinal anesthesia or general anesthesia. The URSL was performed using Olympus 7.5-8.5 Fr.

As per hospital practice, PCNL was performed in supine or prone position, with rigid nephroscope 11 Fr Olympus. The energy source was pneumatic lithotripter.

As per hospital practice, the patients were discharged on 1st post-operative day after URSL and on 3rd day after PCNL if there were no complications.

Result

Out total 156 cases in this study, the most affected age group was 20-29 years and the male to female ratio was 1.05:1, Table 1.

Table 1. Clinico-demographic profile of patients with renal colic, n=156

Variable	n(%)
Age group(years)	
20-29	79(50.6)
30-39	41(26.3)
40-49	22(14.1)
50-59	7(4.4)
>60	7(4.4)
Sex	
Male	80(51.3)
Female	76(48.7)

The flank pain was observed in 148(94.8%), nausea in 128(82.1%), and vomiting in 64(41%) cases. The vague abdominal pain was found in 28(17.9%) cases. Fever was present in 5(3.2%) cases, Table 2.

In majority of cases, pain was severe (Grade 4) in 136(8.1%) and mild (grade 2) in 77(49.3%) cases at the time of arrival and after 30 minutes of analgesics, respectively, Table 3.

The stone was in lower ureter in 56(36%) cases followed by vesico-ureteric junction (VUJ) in 51(32.6%) cases. The spontaneous stone clearance rate, according to the stone location was 80%, 73.3%, 66.6%, 98%, and 98% in pelvis ureteric junction (PUJ), upper ureter, mid ureter, distal ureter, and vesico-ureteric junction (VUJ) respectively, Tabel 4.

Table 2: Symptoms of patients with renal colic, n=156

Symptom	n(%)
Flank pain	148(94.8)
Nausea	115(73.7)
Vomiting	64(41)
Vague Abdominal pain	28(17.9)
Fever	5(3.2)

Table 3: Pain score (VAS) of patients with renal colic at arrival and after 30 m of analgesic, n=156

VAS pain score	At arrival n(%)	30 m after analgesics n(%)
Grade I	0(0)	59(37.8)
Grade II	0(0)	77(49.3)
Grade III	12(7.7)	11(7)
Grade IV	136(87.1)	9(5.7)
Grade V	8(5.1)	0(0)

Table 4: Outcome in terms of stone passage with location and size of stone in patients presented with renal colic, n=156

Variable	Total patients with stones (156), n(%)	Spontaneous stone passage (141), n(%)	p-value
Stone location			
Pelvi-ureteric junction	10(6.4)	8(80)	0.858
Upper ureter	30(19.2)	22(73)	
Mid ureter	9(5.8)	6(66.6)	
Lower ureter	56(35.9)	55(98)	
Vesico-ureteric junction	51(32.7)	50(98)	
Stone size (mm)			
<5	64(41)	63(98.4)	0.078
5-7.9	71(45.5)	70(98.5)	
8-10	16(10.3)	8(50)	
>10	5(3.2)	0(0)	
Duration of stay in emergency (h)			
≤6	137(87.8)	-	0.001
>6	19(12.2)	-	
Hospitalization from emergency	4(2.5)	-	-

The surgical management was required in 15(9.6%) cases. Out of 64 cases of stone smaller than 5 mm, the surgery was required in one case. Out of 71 cases of 5-7 mm stone, surgery was required in one case. Out of 16 cases with stone size from 8-10 mm, surgery was needed in 8 cases. All five cases with stones >10 mm needed surgery. The duration of stay in emergency was <6 hours and >6 hours in 137(87.8%) and in 19(12.2%) cases, respectively, Table 5.

Table 5: Outcome of renal colic patients with different stone size and surgical intervention, n=156

Stone size (mm)	Number of patients, n(%)	Surgical intervention, n(%)	p-value
<5	64(41)	1	<0.0001
5-7.9	71(45.5)	1	
8-10	16(10.3)	8	
>10	5(3.2)	5	

Discussion

In present study, the renal colic was most common in 20-29 years age group with male to female ratio of 1.05:1. The most common symptom was flank pain followed by nausea. History of stone disease of urinary system was reported in 36(23%) cases. The stone was commonly located in the lower ureter followed by VUJ. The surgical management was required in 15(9.6%) cases. These finding were similar to other studies.[11-13] The variations observed in most of the studies were due to the various factors such as genetic, environmental, dietary, lifestyle, regional differences, racial and ethnic variation.[14] In present study, the narrowed gap of prevalence of renal colic between males and females was also consistent with other study.[15]

The present study showed flank pain as the most common symptom in patients with renal stone. In our cases, we included, only those cases with pain and documented stone on USG report only, therefore, we had higher number of patients with flank pain. However, 28(17.9%) patients had vague abdominal pain in our study. A recent study showed the vague abdominal pain in 14(16.9%) cases, similar to our study.[16] Various studies reported the flank pain, nausea, hematuria and past history of stone disease as strong predictors to diagnose renal colic with probability of 80-90% for ureteric stone, which was increased with the imaging modality USG.[17,18] The absence of flank pain, mild pain that was rated <5 on a scale of 10, or pain occurring gradually are suggestive to alternative diagnosis.[19]

In our study, the history of stone disease of the urinary system was observed in 36(23%) cases. Like our study, a recent study reported the history of stone disease in 27% cases.[16] In various studies, the recurrence rate of urolithiasis varied from 50% to 80% in 3 to 10 years depending on age, geographical location and type of stone.[20,21] The lower number of history of stone disease in our cases, may be due to the higher number of our cases belonging to younger age group 20-29 yrs.

Our study showed that the stone was commonly located in the lower ureter. These findings are consistent with other studies.[4,22] In literature, the variations were observed due to sample size, geographical area or it may be due to the cultural variations to seek medical services of the local people.[4,22]

In our study, spontaneous stone passage rate, according to the stone location was 80%, 73.3%, 66.6%, 98%, and 98% in pelviureteric junction (PUJ), upper ureter, mid ureter, distal ureter, and vesico-ureteric junction (VUJ) respectively. The study reported the spontaneous passage of stone is dependent on stone size and location and the reported passage rate of ureteric stone was 48%, 60%, 75% and 79% for proximal, middle, distal and ureterovesical junction stones, respectively, but their study enrolled low number of cases with smaller stone size.[23] Another study based on CT imaging showed the spontaneous passage of stone was 52%, 70% and 83% for proximal, middle and distal stones respectively. This study also reported the passage of stone was 89%, 49% and 29% for stones <5 mm, 5 to 7 mm and >7 mm,

respectively.[24] Contradictory to these findings, our results didn't show statistical significance depending on location (p value,0.858) and size of stone (p-value,0.078), which may be due to low number or disproportionate number of cases according to location. A study reported that the width of stone was better predictor of spontaneous passage than the length of stone.[8]

Pain measured as VAS, was severe (Grade 4) in majority of the patients at the time of arrival in Emergency in our study. VAS was mild in most of the patients after 30 minutes of analgesics. After sub-group analysis, opioid analgesia was needed in 14 cases after non-steroidal anti-inflammatory drugs (NSAIDs). Opioid was given in majority of cases of lower and VUJ stones. In present study, primarily prescribed non-steroidal anti-inflammatory drug (NSAID) was inj. Diclofenac or inj. Ketorol. Diclofenac and Ketorol injection were given in 65(41.6%) and 60(38.5%) patients, respectively. The anti-spasmolytic (inj. Buscopan), a primarily prescribed drug for pain management, was given in 26(16.9%) patients. The combination of anti-spasmolytic and NSAIDs or opioid was given in 38(24.3%) cases. We found the lack of uniformity to treat renal colic in ED, which could be because of unavailability of medicine in hospital pharmacy or the treating physician choice. The study advised more research could improve the patient-centeredness of emergency department care.[25]

Visual analog scales (VAS) were first reported by Woodforde and Merskey to measure pain descriptive scale in a variety of conditions with a 5-point ("nil," "mild," "moderate," "severe," and "very severe") and a numeric rating scale (with response options from "no pain" to "unbearable pain"). VAS was better interpreted by literate than illiterate patients. However, VAS is highly subjective and it is easy to use.[26] After sub-analyzing in our study, the mean age of patients, who needed opioid analgesia was 31.2 years. This finding was similar to other study.[27] The study reported that the younger patient has a lower threshold for pain and the treating doctor should be aware of this knowledge.[27]

The NSAIDs are the primary drugs to treat renal colic according to European Association of Urology guidelines 2023, however specific NSAIDs and routes have not been recommended. The opioids are reserved as the initial analgesia in certain cases in children and pregnancy.[28] In patients with adequate renal function and normal cardiovascular status, diclofenac is recommended. Superiority of Ibuprofen or Ketorolac or Diclofenac is not defined. [29]

The presence of hydronephrosis is the secondary sign to suspect renal colic. In our study the hydronephrosis was observed in 145(93%) cases. The presence of hydronephrosis and small size stones are the predictor of the spontaneous stone passage however, surgery was required in one case without hydronephrosis in our study.[25]

In the present study, surgical management was required in 15(9.6%) cases especially in patients with stone size 8-10 mm (50%) and stone size more than 10 mm (100%). (p<0.0001).

The urological armamentarium to treat urolithiasis is extra-corporeal shockwave lithotripsy (ESWL), URS, PCNL, laparoscopic or robotic-assisted or open stone surgery. The management of renal colic depends on the stone size, number, location and hardness, associated comorbidities of patient, urinary tract anatomy, available equipment, and surgical expertise. Studies reported the requirement of surgical management in renal colic cases varied from 1-40% either early (stone destruction, stone extraction, ureteral dilation or stenting within 5 days) or late intervention.[24,30] Predictors of surgical interventions are high WBC and CRP, upper and middle ureteric calculi, size of the stone >6mm, ureteric wall thickness and fat stranding, and presence of hydronephrosis.[31]

In present study, a total of four cases were admitted in hospital from the emergency department. Among them, three cases were admitted due to fever suspected as complicated urinary tract infection and one case was admitted due to retractable pain. Duration of stay in emergency in our cases was <6 hours in majority of cases (p 0.001).

A study reported that the surgical intervention at 4 weeks for patients with ureteric colic hasn't changed in cases with or without medical expulsion therapy(MET), tamsulosin 400 µg or nifedipine 30 mg.[32] A Cochrane Database of

Systematic survey 2018 reported that the higher-quality, placebo-controlled studies only showed a benefit of decrease in hospitalizations, but there was no significant changes in the need for intervention.[33] This systematic survey also concluded that the alfa blockers are more effective for stone size >5mm. In our cases, all patients received either an alfa blocker or NSAIDs or both for lower ureteric or VUJ stone, though we didn't study the role of MET.

Some of the limitation being a single center study, diagnosis of renal colic based on USG, VAS taken before medication and after 30 minutes only, and role of medical expulsion therapy (MET) or NSAIDS not included.

Conclusion

Renal colic was most common in younger age group, and there was narrowing gap between males and females. The flank pain, followed by nausea were the common symptoms. The history of stone disease of urinary system was reported in one fourth cases. The patients who presented in emergency for management of renal colic, most of stones were small sized and the surgical management was required in minority cases. The NSAIDs was most prescribed analgesics for the management of renal colic.

Author contribution

Concept, design, planning: All; Data collection: PR, NSG; Data analysis: All; Draft manuscript: PR; Revision, final manuscript, accountability: All.

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Conflict of Interest

None

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Supplementary material

The data and supplementary material that support the findings of this study are available from the corresponding author upon reasonable request.

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