ORIGINAL RESEARCH

Study on Etiology and Clinical Features of Renal Caliculi in a Teaching Hospital

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ABSTRACT

Background: Kidney stone disease a crystal concretion formed usually within the kidneys. It is an increasing urological disorder of human health, affecting about 12% of world population. The aetiology of kidney stone is multi factorial Kidney stones are divided into 4 types calcium oxalate stones, struvite stones, Uric acid stones, Cystine stones. The formation of kidney stone is Multi factorial including age, sex hereditary, geographic climate, and dietary factors.

Aim of the Study: To know the aetiology and clinical features of kidney stones in a rural medical college hospital.

Materials and Methods: This study has been conducted for 8 months from Jan 2022 to August 2022 in Gowridevi Medical College in the department of General Surgery. We have examined 230 patients out of these 230, Males were 95, Females patients were 81, and children were 54.

Results: We have included total no. of 230 patients in this study out of these 230 Male patients were 95, female patients were 81 and children were 43. The common age group involved in adults is between 20 years to 70 years.

Conclusion: Despite considerable improvements in the development of new therapies for the management of urinary stones, the incidence of urolithiasis is increasing worldwide. Many aspects of renal stone formation remain unclear. However, it is certain that renal cell injury, crystal retention, cell apoptosis, Randall's plaque, and associated stone inhibitors or promoters play important roles for kidney stone formation. These seem to be critical targets that lead to developinga novel strategy to prevent kidney stone disease and drugs against kidney stones.

Keywords: Kidney, Ureter, Stones, Oxalate, Haematuria, Obstruction.

INTRODUCTION

Overview of Kidney Stones. Kidney stones are mainly lodged in the kidney(s) (1). Mankind has been afflicted by urinary stones since centuries dating back to 4000 B.C., and it is the most common disease of the urinary tract. The prevention of renal stone recurrence remains to be a serious problem in human health. The prevention of stone re-occurrence requires better understanding of the mechanisms involved in stone formation (2). Kidney stones have been associated with an increased risk of chronic kidney diseases , end-stage renal failure, cardiovascular diseases diabetes, and hypertension. It has been suggested that kidney stone may be a systemic disorder linked to the metabolic syndrome. Nephrolithiasis is responsible for 2 to 3% of end-stage renal cases if it is associated with nephrocalcinosis. The symptoms of kidney stone are related to their location whether it is in the kidney, ureter, or urinary bladder. Initially, stone formation does not cause any symptom. Later, signs and symptoms of the stone disease consist of renal colic (intense cramping pain), flank pain (pain in the back side), hematuria (bloody urine), obstructive uropathy (urinary tract disease), urinary tract infections, blockage of urine flow, and hydronephrosis (dilation of the kidney). These conditions may result in nausea and vomiting with associated suffering from the stone event (3). Thus, the treatment and time lost from work involves substantial cost imposing an impact on the quality of life and nation's economy. Epidemiology of Kidney Stones. Globally, kidney stone disease prevalence and recurrence rates are increasing, with limited options of effective drugs. Urolithiasis affects about 12% of the world population at some stage in their lifetime. It affects all ages, sexes, and races (4) but occurs more frequently in men than in women within the ageof 20–49 years. If patients do not apply Meta phylaxis, the relapsing rate of secondary stone formations is estimated to be 10–23% per year, 50% in 5–10 years,

and 75% in 20 years of the patient. However, lifetime recurrence rate is higher in males, although the incidence of nephrolithiasis is growing among females. Therefore, prophylactic management is of great importance to manage urolithiasis. Recent studies have reported that the prevalence of urolithiasis has been increasing in the past decades in both developed and developing countries. This growing trend is believed to be associated with changes in lifestyle modifications such as lack of physical activity and dietary habits and global warming. In the United States, kidney stone affects 1 in 11 people, and it is estimated that 600,000 Americans suffer from urinary stones every year. In Indian population, about 12% of them are expected to have urinary stones and out of which 50% may end up with loss of kidney functions.

MATERIALS AND METHODS

This study has been conducted for 8 months from Jan 2022 to August 2022, in the department of General surgery, Gouri Devi Institute of Medical Sciences & Hospital, Durgapur, West Bengal (India) after history taking, were have examined all the patient in details and advised for investigations. The investigations advised are complete blood picture, random blood sugar, blood urea, serum creatinine X-ray KUB intravenous pyelogram, ultrasonography complete urine analysis and special investigations like, chemical composition of stones, serum calcium, phosphates, uric acid, parathyroid hormones 24 hours urine for oxalates and uric acid, estimation. We have obtained the consent by giving consent form in the local language. After collecting the entire data, it is compelled in systemic manner and computerized by using M.S. Office.

Table 1: Different Age Groups

Age Group in Years	No. of Patients (M) 95	No. of Patients (F) 81
20-29 yrs.	31 (29.45%)	28 (22.68%)
30-39 yrs.	28 (26.6%)	26 (21.06%)
40-49 yrs.	19 (18.05%)	15 (12.15%)
50-59 yrs.	10 (9.5%)	9 (7.29%)
60-70 yrs.	7 (6.7%)	3 (22.68%)

Table 2: Different Clinical Features

Clinical Feature	No. of Patients 91 (M)	No. of Patients (F) 85
Pain	89 (81.97%)	78 (86%)
Haematuria	62 (56.4%)	65 (69.5%)
Vomiting	73 (66.5%)	71 (76.5%)
Fever and Other Symptoms	42 (38.22)	36 (39.3%)

Table 3: Different Types of Stones

Types of Stones	No. of Patients (M) 91	No. of Patient (F) 85
Calcium Oxalate	52 (47.32%)	49 (41.65%)
Uric Acid	21 (19.11%)	18 (15.3.65%)
Struvite	11 (10.8%)	13 (11.5%)
Cystine	7 (6.37%)	5 (4.25%)

RESULTS AND DISCUSSION

We have examined total no. of 230 patients in this study out of these 230 patients. Males were 95, female patients were 81 and children were 54. Renal stones are common in children also. Males were commonly affected than females. The common age group involved in our study is between 20 years and 70 years. The most common age group is 2nd and 3rd decade. The studies conducted by V.K. Sigurjonsdottir, H.L. Runolfsdottir et al shows almost similar result. In males it i around 29.45% in 4th decade whereas in females it is 22.68%, 21.06% and 12.15% respectively. The common clinical features noticed in our study are pain in the lion region 81.9% in Males, 86% in Female haemantamine 56.4% in males and 69.5% in females. Vomiting 66.5% and 76.5% respectively. Fever and other systems were noticed in 38.22% males and 39.3 of females (5) The studies conducted by M. Lopez and B. Hoppe, shows pain is in 89.7% in males and 88.3% in females, haematuria noticed in 51.2% males and 62.4% in females. Ever vomiting were in 31.3% of male patients and 41.5% of female patients. The Renal stones are mainly classified into 4 groups calcium oxalate stores (6) uric acid stones struvite stones (7) cosine stones. In our study the A. D. Rule, V. L. Roger stones where calcium oxalate stones 47.5% uric acid stones were 26.8% followed by struvite stones are nearly 4% According to study conducted by E. M. Worcester and F. L. Coe et al The oxalates stones are 56.5% uric acid stones are 22.5%.(8) he urinary filtrate is formed in the glomerulus and passes into the tubules where the volume and content are altered by reabsorption or secretions. Most solute reabsorption occurs in the proximal tubules, whereas fine adjustments to urine composition take place in

the distal tubule and collecting ducts. (9) The loop of Henle serves to concentrate urine composed of 95% water, 2.5% urea, 2.5% mixture of minerals, salts, hormones, and enzymes. In the proximal tubules, glucose, sodium, chloride, and water are reabsorbed and returned to the blood stream along with essential nutrients such as amino acids, proteins, bicarbonate, calcium, phosphate, and potassium. In the distal tubule, the salt and acid- base balance of blood is regulated. (10) The location of stones may vary as indicated in based on variations in mineral composition and pathogenesis, kidney stones are commonly classified into five types as follows.

CALCIUM STONES

Calcium Oxalate and Calcium Phosphate. Calcium stones are predominant renal stones comprising about 80% of all urinary calculi. (11) The proportion of calcium stones may account for pure calcium oxalate (CaOx) (50%), calcium phosphate (CaP, termed as apatite) (5%), and a mixture of both (45%). The main constituent of calcium stones is brushite (calcium hydrogen phosphate) or hydroxyapatite. Calcium oxalate is found in the majority of kidney stones and exists in the form of CaOx monohydrate phosphate stones occur when pH is greater than 7.5. The recurrence of calcium stone is greater than other types of kidney stones. Struvite or Magnesium Ammonium Phosphate Stones. Struvite stones occur to the extent of 10–15% and have also been referred to as infection stones and triple phosphate stones. It occurs among patients with chronic urinary tract infections that produce urease, the most common being Proteus mirabilis and less common pathogens include Klebsiella pneumonia, Pseudomonas aeruginosa, and Enterobacter.(12) Urease is necessary to split/cleave urea to ammonia and CO_2, making urine more alkaline which elevates pH (typically > 7). Phosphate is less soluble at alkaline versus acidic pH, so phosphate precipitates on to the insoluble ammonium products, yielding to a large staghorn stone formation. Women's are likely to develop this type of stone than the male. Escherichia coli is not capable of splitting urea and is not as- sociated with struvite stones. Uric Acid Stones or Urate. This accounts approximately for 3–10% of all stone types Diets high in purines especially those containing animal protein diet such as meat and fish, results in hyperuricosuria, low urine volume, and low urinary pH (pH < 5.05) exacerbates uric acid stone formation. Cystine Stones. These stones comprise less than 2% of all stone types. It is a genetic disorder of the transport of an amino acid and cystine. It results in an excess of cystinuria in urinary excretions, which is an autosomal recessive disorder caused by a defect in the rBAT gene on chromosome 2. Drug-Induced Stones. This accounts for about 1% of all stone types. Drugs such as guaifenesin, triamterene, atazanavir, and sulpha drugs induce these stones. For instance, people who take the protease inhibitor indinavir sulphate,a drug used to treat HIV infection, are at risk of developing kidney stones.(13) The pathogenesis of kidney stone or biomineralization is a complex biochemical process which remains incompletely understood. Renal stone formation is a biological process that involves physicochemical changes and supersaturation of urine. Supersaturated solution refers to a solution that contains more of dissolved material than could be dissolved by the solvent under normal circumstances. As a result of supersaturation, solutes precipitate in urine leads to nucleation and then crystal concretions are formed. That is, crystallization occurs when the concentration of two ions exceeds their saturation point in the solution.(14) The transformation of a liquid to a solid phase is influenced by pH and specific concentrations of excess substances.

CONCLUSION

Despite considerable improvements in the development of new therapies for the management of urinary stones, the incidence of urolithiasis is increasing worldwide. Many aspects of renal stone formation remain unclear. However, it is certain that renal cell injury, crystal retention, cell apoptosis, Randall's plaque, and associated stone inhibitors or promoters play important roles for kidney stone formation. These seem to be critical targets that lead to developinga novel strategy to prevent kidney stone disease and drugs against kidney stones. In addition, the identification of novel treatment targets on the basis of molecular and cellular alterations in relation to stone formation will help develop better drugs. Moreover, better understanding of the mechanisms of urolithiasis associated with stone inhibitors or promoters will be critical for stone-removing medications.

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