International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 26-06-2019; Accepted: 28-07-2019
www.medicalsciencejournal.com
Volume 5; Issue 8; August 2019; Page No. 256-260

Evaluation of factors responsible for occurrence of renal stones: Our experience

Dr. Sanjay Kumar Gupta
Assistant Professor, Department of General Surgery, Mata Gujri Memorial Medical College and Lion Seva Kendra Hospital, Kishanganj, Bihar, India

Abstract
In India Kidney stones are not uncommon problem due to the hot and often humid weather. Most of these stones are made up of Calcium, Oxalate and phosphates. The cause of stone disease is debatable; however it is well known that drinking less water is a risk factor for stone disease. New research by the National Kidney foundation suggests that the culprit is a tiny bacteria called Nano bacteria. These bacteria use a protective covering made of Calcium, which may act as a seed for calcium deposits that may enlarge to form stones. Researchers examined 30 stones in a study and found living Nano bacteria in all of them. So antibiotics may prove to be effective means of treating and preventing Kidney stones. These findings are exciting and may eventually lead to new and more effective ways of treating and preventing kidney stones.
The present study was planned in Department of General Surgery, Mata Gujri Memorial Medical College and Lion Seva Kendra Hospital, Kishanganj, Bihar. The study was done from Jan 2016 to November 2016. Total 50 cases of the Kidney stones were evaluated in the present study.
From the present study, it was found that the major risk factors that contribute to the stone formation and its re occurrence are Age, Gender, and other disease, habits (Vegetarian and Non-Vegetarian) and personal habits (Smoking and Alcohol). Management of renal calculi can be achieved by focusing on proper diet, exercise and adequate fluid intake. A multidisciplinary approach should be adopted like changing their lifestyle, dietary intervention on large scale and health education in this regard may be helpful as a preventive measure to overcome the problem.

Keywords: Kidney stones, Renal stones, Urolithiasis, Factors, etc

Introduction
Kidney stone disease, also known as urolithiasis, is when a solid piece of material (kidney stone) develops in the urinary tract. Kidney stones typically form in the kidney and leave the body in the urine stream. A small stone may pass without causing symptoms. If a stone grows to more than 5 millimeters (0.2 in), it can cause blockage of the ureter, resulting in severe pain in the lower back or abdomen. A stone may also result in blood in the urine, vomiting, or painful urination. About half of people who have had a kidney stone will have another within ten years. Most stones form due to a combination of genetics and environmental factors. Risk factors include high urine calcium levels; obesity; certain foods; some medications; calcium supplements; hyperparathyroidism; gout and not drinking enough fluids. Stones form in the kidney when minerals in urine are at high concentration. The diagnosis is usually based on symptoms, urine testing, and medical imaging. Blood tests may also be useful. Stones are typically classified by their location: nephrolithiasis (in the kidney), ureterolithiasis (in the ureter), cystolithiasis (in the bladder), or by what they are made of (calcium oxalate, uric acid, struvite, cystine) [1].
In those who have had stones, prevention is by drinking fluids such that more than two liters of urine are produced per day. If this is not effective enough, thiazide diuretic, citrate, or allopurinol may be taken. It is recommended that soft drinks containing phosphoric acid (typically colas) be avoided. When a stone causes no symptoms, no treatment is needed. Otherwise pain control is usually the first measure, using medications such as nonsteroidal anti-inflammatory drugs or opioids. Larger stones may be helped to pass with the medication tamsulosin or may require procedures such as extracorporeal shock wave lithotripsy, ureteroscopy, or percutaneous nephrolithotomy [1]. Between 1% and 15% of people globally are affected by kidney stones at some point in their lives. In 2015, 22.1 million cases occurred, resulting in about 16,100 deaths. They have become more common in the Western world since the 1970s. Generally, more men are affected than women. Kidney stones have affected humans throughout history with descriptions of surgery to remove them dating from as early as 600 BC [2].
The hallmark of a stone that obstructs the ureter or renal pelvis is excruciating, intermittent pain that radiates from the flank to the groin or to the inner thigh. This pain, known as renal colic, is often described as one of the strongest pain sensations known. Renal colic caused by kidney stones is commonly accompanied by urinary urgency, restlessness, hematuria, sweating, nausea, and vomiting. It typically comes in waves lasting 20 to 60 minutes caused by peristaltic contractions of the ureter as it attempts to expel the stone. The embryological link between the urinary tract, the genital system, and the gastrointestinal tract is the basis of the radiation of pain to the gonads, as well as the nausea and vomiting that are also common in urolithiasis. Postrenal azotemia and hydronephrosis can be observed following the obstruction of urine flow through one or both ureters. Pain in the lower-left quadrant can sometimes be confused with diverticulitis because the sigmoid colon overlaps the ureter, and the exact location of the pain may be difficult to isolate due to the proximity of these two structures [3].
Dehydration from low fluid intake is a major factor in stone

formation. Obesity is a leading risk factor as well. High dietary intake of animal protein, sodium, sugars including honey, refined sugars, fructose and high fructose corn syrup, oxalate, grapefruit juice, and apple juice may increase the risk of kidney stone formation. Kidney stones can result from an underlying metabolic condition, such as distal renal tubular acidosis, Dent's disease, hyperparathyroidism, primary hyperoxaluria, or medullary sponge kidney. 3–20% of people who form kidney stones have medullary sponge kidney. Kidney stones are more common in people with Crohn's disease; Crohn's disease is associated with hyperoxaluria and malabsorption of magnesium [4]. A person with recurrent kidney stones may be screened for such disorders. This is typically done with a 24-hour urine collection. The urine is analyzed for features that promote stone formation.

Calcium is one component of the most common type of human kidney stones, calcium oxalate. Some studies suggest that people who take calcium or vitamin D as a dietary supplement have a higher risk of developing kidney stones. In the United States, kidney stone formation was used as an indicator of excess calcium intake by the Reference Daily Intake committee for calcium in adults [5].

In the early 1990s, a study conducted for the Women's Health Initiative in the US found that postmenopausal women who consumed 1000 mg of supplemental calcium and 400 international units of vitamin D per day for seven years had a 17% higher risk of developing kidney stones than subjects taking a placebo. The Nurses' Health Study also showed an association between supplemental calcium intake and kidney stone formation [6].

Unlike supplemental calcium, high intakes of dietary calcium do not appear to cause kidney stones and may actually protect against their development. This is perhaps related to the role of calcium in binding ingested oxalate in the gastrointestinal tract. As the amount of calcium intake decreases, the amount of oxalate available for absorption into the bloodstream increases; this oxalate is then excreted in greater amounts into the urine by the kidneys. In the urine, oxalate is a very strong promoter of calcium oxalate precipitation—about 15 times stronger than calcium. A 2004 study found that diets low in calcium are associated with a higher overall risk for kidney stone formation [28]. For most individuals, other risk factors for kidney stones, such as high intakes of dietary oxalates and low fluid intake, play a greater role than calcium intake [7].

Health is viewed as dynamic, ever changing condition that enable person to function at an optimum potential at any given time. The ideal health status is one in which people are successful in achieving their full potential regardless of any disability. A significant amount of information has shown that people by virtue of what they do or fail to do, influence their on health [8]. Renal stone or calculus or nephrolithiasis is one of the most common diseases of the urinary tract. It occurs more frequently in men than in women and in whites than in blacks. It is rare in children. Urinary calculus is a stone-like body composed of urinary salts bound together by a colloid matrix of organic materials. It consists of a nucleus around which concentric layers of urinary salts are deposited. Nephrolithiasis occurs in all parts of the world, with a lower lifetime risk of 2-5% in Asia, 8-15% in the West, and 20% in Saudi Arabia [9]. Urolithasis is the third most common urological diseases affecting both male and female. Individual with an incidence rate of 12% in industrialized countries. If not treated recurs in 35% and 50% of patients with calcium oxalate stone [10].

The various factors responsible for renal calculi are preoperative factors like age, duration of symptomology of nephrolithasis; urinary tract infection, co-existent medical diseases, and base line serum creatinene are responsible for kidney stone. The post-operative factors were recurrent infection, protinuria, cortical atrophy, residual fragment as stone recurrence [10].

Epidemiology of nephrolithasis varies according to the geographical areas and socioeconomic conditions. In world statistics, in the United State, up to 12% of men and 6% of women will develop a renal stone at some point of life. In Thailand, the highest prevalence (16-9%) was reported in the north east province. while the Middle Eastern country, the life time prevalence of kidney stone is higher. Recurrence case as high as 50% in 10 years have been documented. Calcareous stone is the most common type of kidney stone. It account for more than 80% of all stones. The primary chemical complexes are calcium oxalate and calcium phosphate, uric acid stone represent about 4.5-23%. Among Indians, renal tubular acidosis is the main causes for the high incidence of renal calculi. In India 12% people have stone in their life time. 12% of men will suffer from kidney stone in 48 years old. 5% of women suffer from kidney stone in 48 years old. 50% have recurrence in 5-10 years. Highest incidence of kidney stone is in 30-45 years of age group and incidence decline after age of 50. 7-10 person of every 1000 population got hospital admission due to kidney stone. Urinary stone constitute one of the commonest diseases in our country. In India, approximately 5-7 million people suffer from stone disease and at least 7-10/1000 of Indian population needs hospitalization due to kidney stone [10].

In India stone belt occupies parts are Maharastra, Gujarat, Punjab, Harayana, Delhi and Rajasthan. In these regions, the disease is so prevalent, that most of the members of family will suffer from kidney stone some times in their lives. A study conducted that kidney stone frequently affects people age group between 20-40 years; only 31.9% of patients had a positive family history of renal stone. Calcium oxalate stone was the most prevalent type (73.8%). uric acid stone was found in 16.0%. The food frequency questionnaire data showed that 59.7% of patient consumed less then 2 lts of water/ day. In contrast high consumption of rice was obtained in over 65% of stone patients. A study conducted among the tribal population of India to find out the association between the Fluoride & urolithasis in humans. The study results showed that fluoride *in vivo* may behave mild promoter of urinary stone formation by the excretion of insoluble calcium fluoride, increasing the oxalate excretion and mildly increasing oxidative burden [10].

A study to assess the prevalence of kidney stone among age group between 20-70 years. The study result showed that 5.2% of adults (6.3% of men & 4.1% of women) had kidney stone. The estimated number of hospital admission among adults aged 20 or older with “calculus of kidney” as a primary diagnosis in year 2004 about 1,17,000 & in 2000 about 1,77,496 [11].

In India Kidney stones are not uncommon problem due to the hot and often humid weather. Most of these stones are made up of Calcium, Oxalate and phosphates. The cause of stone disease is debatable; however it is well known that

drinking less water is a risk factor for stone disease. New research by the National Kidney foundation suggests that the culprit is a tiny bacteria called Nano bacteria. These bacteria use a protective covering made of Calcium, which may act as a seed for calcium deposits that may enlarge to form stones. Researchers examined 30 stones in a study and found living Nano bacteria in all of them. So antibiotics may prove to be effective means of treating and preventing Kidney stones. These findings are exciting and may eventually lead to new and more effective ways of treating and preventing kidney stones [12].

Material and Methods

The present study was planned in Department of General Surgery, Mata Gujri Memorial Medical College and Lion Seva Kendra Hospital, Kishanganj, Bihar. The study was done from Jan 2016 to November 2016. Total 50 cases of the Kidney stones were evaluated in the present study.

Informed consent was taken from patients. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria

- Patients with in the age group of 20-80 years including both genders.
- Patients who are willing to participate in the study.

Exclusion Criteria

- Patients below 20 years and above 80 years
- Patients who are not willing to participate in the study.

Results & Discussion

Kidney stones result when urine becomes too concentrated and substances in the urine crystallize to form stones. The most common cause of kidney stones is not only drinking enough water but excessive intake of animal protein and vegetables rich in minerals. Kidney stones have become increasingly prevalent in the developed countries over the past 100 years. The incidence of urolithiasis in a population depends on the geographical area, racial distribution, socio-economic status and dietary habits. During the past decades, these factors have changed affecting the incidence and also the chemical composition of calculi. The identification of the calculi composition enables both clinical management with possibility of good treatment, lower (decreased) cost and a better quality of life; and better understanding of physicochemical principles underlying the formation

Renal calculi more commonly known as kidney stones which affects excretory and secretary function of the urinary system. Stones are formed in the urinary tract when urinary concentration of substance such as calcium oxalate, calcium phosphate and uric acid increased. This is referred to as super saturation and is dependent on the amount of substance, ionic strength and ph of urine. The different sites of calculi formation in the urinary tract are medulla of kidney, ureter and bladder. Certain factors favour the formation of stone including infection, urinary stasis and period of immobility [13].

The various factors responsible for renal calculi are preoperative factors like age, duration of symptomology of nephrolithasis; urinary tract infection, co-existent medical diseases, and base line serum creatinene are responsible for kidney stone. The post-operative factors were recurrent infection, protinuria, cortical atrophy, residual fragment as stone recurrence [14].

Among Indians, renal tubular acidosis is the main causes for the high incidence of renal calculi. In India 12% people have stone in their life time. 12% of men will suffer from kidney stone in 48 years old. 5% of women suffer from kidney stone in 48 years old. 50% have recurrence in 5-10 years. Highest incidence of kidney stone is in 30-45 years of age group and incidence decline after age of 50. 7-10 person of every 1000 population got hospital admission due to kidney stone. Urinary stone constitute one of the commonest diseases in our country. In India, approximately 5-7 million people suffer from stone disease and at least 7-10/1000 of Indian population needs hospitalization due to kidney stone [14].

Diet plays an important role in the development of kidney stone. Diet rich in animal protein (meat, chicken, fish, dairy and poultry) releases too much amount of calcium and citrate in the urine. Intake of animal protein also increases glomerular filtration rate and thus, this contribute to an increased urinary excretion of calcium, oxalate and uric acid [15]. Oxalate rich food items like green beans, tomato, nuts, chocolates, and tea increases risk of kidney stone. The present report described that vegetarian are at lower risk for stone formation in contrast to non-vegetarian.

Table 1: Socio-demographic parameters of the study patients

Parameters	No. of Cases
Age (in years)	
21 - 30	1
31 – 40	12
41 - 50	16
51 – 60	12
61 - 70	5
71 - 80	4
Gender	
Male	33
Female	17
Socioeconomic data	
Upper	27
Middle	22
Lower	1
Religion	
Hindu	42
Muslim	6
Christian	2
Education	
Illiterate	1
Literate	49
Occupation	
Profession	7
Clerk, shop owner, farmer	6
Skilled work	4
Semi-skilled work	19
Unskilled work	7
Unemployed	7
Marital status	
Married	35
Unmarried	15

Table 2: Association of Risk factors with renal calculi patients

Parameters	No. of Cases
Already stones in their life time	22
Family history of kidney stone daily	12

Sweat a lot every day	36
Used NSAID frequently	12
BMI between <25 and ≥39.99	27
Childhood obesity	17
Problem in voiding	14
Stressful life	23
Habit of late night eating	14
Pure vegetarians	2
Non-vegetarians	1
Mixed diet	45
Consume coffee and tea more than 8 ounce a day	28
Consume soft drinks	32
Higher sodium intake	25
Frequently consume processed foods	25
Taking high sugar	0
Soya	18
Habits of smoking	21
Alcohol consumption	20
Lacks of physical activity	17
Associated with hypertension	13
Associated with Diabetes	7
Associated with UTI	0
History of ovaries removed	0
Rapid weight loss	2

A Report from American Journal of kidney diseases shows that kidney stones are associated with metabolic syndrome. The study comprises of 18,825 men and women aged 20 years, and older. Researchers mentioned that the prevalence of a self-reported history of kidney stones increase with the number of metabolic syndrome traits, such as obesity, hypertension and diabetes. The prevalence was 3% among those with no traits, 7.5% in subjects with three traits, and 9.8% among those with five traits. The presence of four or more traits was associated with a twofold increased risk of self-reported kidney stones [16]. The age and sex distributions of incidence of urinary stones were observed in-group of 119 patients and found that the peak age incidence occurred in the 3rd to 5th decade. These observations were confirmed by many others [17].

International renal stones support network has given a detailed statistical incidence of urinary stones in USA, and concluded that the incidence is high comparatively with the rest of the world. Other high incidence areas are the British, Scandinavian countries, Mediterranean countries, Northern India, Pakisthan and Thailand. Low incidence was found in Central South America, most of Africa and Australia populated by aborigines [18]. A study conducted on geographical distribution of urolithiasis noticed that the stone formations are predominantly seen in small villages as compared with urban population and observed that stone disease appeared to occur in endemic areas for Iodine-deficient goiter [19].

The study conducted on the effect of dietary factors, and life style modifications in the formation of urinary stones indicated that urinary stones are likely to be found in individuals who have sedentary occupation [20]. The incidence was higher in administrative, managerial personal than in manual workers and the highest incidence were seen in cooks and engineering room personnel due to hot working condition [21]. A comparative study was done to find the relationship between occupation and social class on risk of stone formation and confirmed that the risk increased in the most countries, regions, societies and individuals having more income to spend on animal protein, which leads to increased urinary concentration of calcium, oxalate and uric acid [22]. The studies revealed that there is significant influence of wine and beer on formation of uric acid and calcium stones [23]. A study indicated the influence of strong tea, and instant coffee on occurrence of urinary stones in Southern Thailand where 10,344 urolithiasis patients sought treatment in that area, who consumed the above beverages in large amounts [24].

Conclusion

From the present study, it was found that the major risk factors that contribute to the stone formation and its re occurrence are Age, Gender, and other disease, habits (Vegetarian and Non-Vegetarian) and personal habits (Smoking and Alcohol). Management of renal calculi can be achieved by focusing on proper diet, exercise and adequate fluid intake. A multidisciplinary approach should be adopted like changing their lifestyle, dietary intervention on large scale and health education in this regard may be helpful as a preventive measure to overcome the problem.

References

1. "Kidney Stones in Adults". February 2013. Archived from the original on 11 May 2015. Retrieved, 2015.
2. Schulsinger DA. Kidney Stone Disease: Say NO to Stones!. Springer, 2014, p. 27. ISBN 9783319121055. Archived from the original on, 2017.
3. Cavendish M. "Kidney disorders". Diseases and Disorders. 2 (1st ed.). Tarrytown, New York: Marshall Cavendish Corporation, 2008, pp. 490-3. ISBN 978-0-7614-7772-3.
4. Farmer RG, Mir-Madjlessi SH, Kiser WS. "Urinary excretion of oxalate, calcium, magnesium, and uric acid in inflammatory bowel disease". Cleveland Clinic Quarterly. 1974; 41(3):109-17. doi:10.3949/ccjm.41.3.109. PMID 4416806.
5. "Summary". In Committee to Review Dietary Reference Intakes for Vitamin D and Calcium. 2011, pp. 1-14.
6. Johri N, Cooper B, Robertson W, Choong S. "An update and practical guide to renal stone management". Nephron Clinical Practice. 2010; 116(3):c159-71. doi:10.1159/000317196. PMID 20606476.
7. Liebman M, Al-Wahsh IA. "Probiotics and other key determinants of dietary oxalate absorption" (PDF). Advances in Nutrition. 2011; 2(3):254-60. doi:10.3945/an.111.000414. PMC 3090165. PMID 22332057. Archived (PDF) from the original on, 2016.
8. Suzanne C Smeltzer, Brenda G Bare. Textbook of medical surgical nursing, 10th edi. Philadelphia. Lippincott publication, 2004.
9. Joyee M Black, Jane Hokanson Hawks. Medical surgical nursing, 7th edi. Singapore. Elsevier publication, 2007
10. www.google.com/epidemiology of kidney stone diseases in adults.
11. Stamatelou KK, Francis ME, Jones CA, Nyberg LM, Curhan GC. Time trends in reported prevalence of kidney stones in the United States. 2003; 63:1817-1823.
12. www.bio-medicine.org/medicine-news/kidny-stpmes-omteresting-new-research-omplicates-bacterio-aas-ots-

cause-70-1/-3k
13. Suzanne C Smeltzer, Brenda G Bare. Textbook of medical surgical nursing, 10th edi. Philadelphia. Lippincott publication, 2004.
14. www.google.com/epidemiology of kidney stone diseases in adults.
15. Trinchieri A, Mandrassi A, Luongo P, Coppi F, Pisani E. Familial aggregation of renal calcium stone disease, Journal of Urology. 1988; 139:478- 81.
16. Charnow 'A'. Jody kidney stones associated with metabolic syndrome. New scientist magazine, issue of renal and urology news, 2008.
17. Glenn M Preminger, "Risk factors and symptoms related to age. Kidney international, 2006.
18. www.pubmedcentral.nih.gov/
19. Riser Nancy MN. "Geographical distribution of urolithiasis". American Journal of Nursing, 2005, 54.
20. Taylor EN, Stampfer MJ. "Dietary factors and lifestyles modifications in urinary stones." Jama. 2005; 293(9):455-62.
21. Pak CYC Sakhaee. "Biochemical profile of nephrolithiasis". Kidney int. 2001; 60:757-61.
22. Robert E Gerstenbluth. "Dietary modification and medical therapy in urinary stones." Medical clinics of North America. 2004; 88(2):431.
23. Williams. Basic Nutrition – Diet Therapy. 12th Edition. Mosby Company: Elsvier, 2005, 404-408.
24. Tanthanuch M Apiwatgaroon, "Urinary tract stones in southern Thailand". J. Med. Association, Thailand. 2005; 88(1):80-5.