

Original Research Article

Prevalence and socio-demographic status on kidney stone patients in Thanjavur district, Tamil Nadu, India

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ABSTRACT

Background: The formations of human kidney stones are affecting large number of peoples in various age groups in worldwide. The deposition of few minerals, crystalline materials in the kidney and urinary bladder are during the process of metabolism. Stone analysis is of great importance to the therapy and metaphylaxis of residual and recurrent stones.

Methods: A cross-sectional study carried out among 150 populations in rural/urban field practice area of department of community medicine, Thanjavur Government Medical College, Thanjavur, Tamil Nadu, India. The objectives of the study were to estimate the prevalence of risk factors for kidney stone patients. Data was analyzed using the SPSS version 20.0 software.

Results: Among the 150 people were studied in age group of 20–80. Majority (46%) were more than 60 years of age. In this study, the majority of female 56% than men were representing 45% of the sample. It observed that the kidney stone patients were higher in the age group of 21-60 (46%) and lower <20 (1%) and >60 (7%) which was statistically significant (15.33 ± 8.74 ; $p=0.01$).

Conclusions: The results suggest that calcium oxalate stones are predominant in the selected study area. Kidney stone formation may be due to the food habits (diet), age, sex, obesity, genetics and environmental factors, geographical location, climate and lifestyle. The present investigation aims to assess the status of kidney stone diseases and risk factors in and around Thanjavur and the results have been discussed.

Keywords: Epidemiology, Kidney stone, Stone diseases, Risk factors

INTRODUCTION

In the world urolithiasis is the most common urological disease in living beings. Kidney stone, is the most painful and prevalent urological disorders of the urinary system.¹ During the present century, its prevalence has drastically increased in all industrialized countries. About 3–20% of the overall population of the world has the tendency to form one urinary stone during the life time of 70 years.² Urolithiasis (urinary calculi) formation occurs in kidney, bladder and in the urinary tract.^{3,4} Kidney stones are a

common urological condition that has been prevalent since ancient times. In India urolithiasis affects about 2 million people every year.⁵ Stone analysis is of great importance to the therapy and metaphylaxis of residual and recurrent stones.⁶ The composition of urinary stone in India is different from that in the Western countries where calcium oxalate is the predominant component. It affects about 3% of people of the productive age group.⁷ The increasing incidence of crystal deposition diseases in organs such as urinary tract, kidney, gall stones etc., in people of all ages affect a considerable number of the

total population, it is a major social and economic problem, considering the number of days lost from work and cost of hospitalization.⁸⁻¹⁰

Urinary stone is one of the oldest and common afflictions of humans and remains a major public health burden. A large number of people are suffering from urinary stone problem all over the globe. Not only the humans but animals and birds also suffer from the urinary stone problem. Generally, three terms, i.e., incidence, prevalence, and lifetime prevalence, are frequently used in the epidemiological studies of urolithiasis.¹¹ The incidence of stone disease is defined as the number of new stone patients in a given population over a defined period of time. The prevalence is defined as the number of stones present in a screened population at a particular point in time. Finally, the lifetime prevalence is defined as the presence of a stone at any point in a patient's history. Urolithiasis is a global problem spanning all geographic regions with an estimated annual incidence of 1%, prevalence of 3–5% and a lifetime risk of 15–25%. Once afflicted, urolithiasis tends to be recurrent in the majority of cases. The 50% of kidney patients have reappearance within 10 years. In a recent study the recurrence rates are estimated at about 10% per year, totaling 50% over a 5–10 years period and 75% over 20 years.¹²

The incidence of urolithiasis varies in different countries. In India, the "stones belt" occupies parts of Maharashtra, Gujarat, Rajasthan, Punjab, Haryana, Delhi and states of north-east. Fewer occurrences of urinary calculi are found in southern India, which may be due to regular dietary intake of tamarind. In India, 12% of the people is estimated to have urinary stones, out of which 50% may end up with loss of kidneys or renal damage. Also, near 15% of the people of northern India affected from urinary stones.¹³ Singh et al have reported that the rate of incidence of urolithiasis, particularly staghorn calculi in Manipur is very high.¹⁴ In urolithiasis in the recent past indicates that in India, there is an increased prevalence of the urolithiasis in north-western region.

Kidney stone formation may be due to the food habits (diet), age, sex, obesity, genetics and environmental factors, geographical location, climate and lifestyle. The prevalence of this disease has been increasing among males and females of all ages, indicating a possible environmental cause in addition to genetic predisposition. Furthermore, the incidence of stone disease is increasing worldwide.¹⁵ The lifetime risk of kidney stones is 6% for women and 12% for men.^{16,17} For those with untreated stones, the risk at 5 years for forming another stone is 30% to 40%. Since all the epidemiological data show an increase in incidence and prevalence rates, the prevention and techniques for the medical management of urolithiasis requires further attention. The present investigation aims to assess the status of kidney stone diseases and risk factors in and around Thanjavur and the results have been discussed.

METHODS

Sample collection and preparation

The present study intends to measure the kidney stone diseases and risk factors. The randomly selected 100 symptomatic patients are involved in this study. 50 Controls are in the same area and have not previous history of abdominal pain or the symptoms of kidney stones. This study was carried out from six month in the duration of May 2018-October 2018. Samples were collected from Thanjavur Government Medical College, Thanjavur district, State of Tamil Nadu, India by specialist doctors as urinary infection. The printed form of questionnaire was used. Some of the relevant information about the patients was obtained from medical case history.

Healthy volunteers

Details of the questionnaire included age, sex, marital status, smoking habit, food habit, family socio-economic status, educational status, residing area (urban/rural), and previous history of kidney stone and heredity of kidney stone disease. These details were obtained by medical officers working the respective hospitals and prior to study consent was obtained from all study subjects. The controls were volunteers, similar socio-economic and demographic characteristics. The volunteers were from the same demographic region with no history of kidney stone disease. The method of interviewing was carefully standardized so that the required information could be obtained and interpreted in a uniform way. Partially filled in questionnaire from the participants were excluded from this study. The same questionnaire was used for both cases and controls.

Statistical analysis

Statistical analysis was performed using SPSS software program, version 20.0. The results were expressed as mean and standard deviation. The patient's data were analyzed by analysis of variance test. The results were considered significant when the p value was found to be <0.05 in a confidence interval of 95%. The ANOVA tests were applied to determine the differences between one group (kidney stone patient) and another (Healthy people).

RESULTS

The study included 100 patients with kidney stone disease were identified in the age group of 20 to 80 years. The majority of female 56% than men were representing 45% of the sample. Majority (46%) were more than 60 years of age. The mean ages for women were 18.33±1.53. Stones were classified visually by naked eye. If doubt arises, Fourier transform infrared (FTIR) spectrum will be recorded. The patients' average ages, in the cases of kidney stones are 43.32±13.43. Generally, gender is a

predominant risk factor. Kidney stone prevalence in men (44.35%) and in women (55.65%) patients i.e. women have a greater risk of kidney stone disease than men at all ages. The slightly lower than the mean age of 15.0 ± 13.0 were found in male. Out of 50 healthy peoples, majority

female 56% than 44% were found in male. In relation to residence area, 72% were urban kidney stone patients and 28% were rural patients. The factors associated with the prevalence of kidney stone patients and control study is shown in Table 1.

Table 1: Factors associated with the prevalence of kidney stone patients and control.

Parameters	Control (n=50) N (%)	Kidney stone patients (n=100)				Mean \pm SD	P value
		Calcium (n=50)	Struvite (n=25)	Uric acid (n=25)	Percentage (%)		
Sex							
Male	22 (44)	30	8	7	45	15.0 ± 13.0	0.68 ^{NS}
Female	28 (56)	20	17	18	55	18.33 ± 1.53	
Age in years							
0-20	8 (16)	1	0	0	1	0.33 ± 0.58	0.01 ^S
21-40	15 (30)	25	13	8	46	15.33 ± 8.74	
41-60	25 (50)	22	12	12	46	15.33 ± 5.77	
61-80	2 (4)	2	0	5	7	2.33 ± 2.52	
Residence							
Rural	20 (40)	15	5	8	28	9.33 ± 5.13	0.08 ^{NS}
Urban	30 (60)	35	20	17	72	24.0 ± 9.64	
Education							
Literate	45 (90)	48	22	21	91	30.33 ± 15.31	0.03 ^S
Illiterate	5 (10)	2	3	4	9	3.0 ± 1.0	
Marital status							
Married	42 (84)	45	20	17	82	27.33 ± 15.37	0.07 ^{NS}
Unmarried	8 (16)	5	5	8	18	6.0 ± 1.73	
Economic status							
Good	5 (10)	6	2	2	10	3.33 ± 2.31	0.03 ^S
Medium	35 (70)	40	18	2	60	20.0 ± 19.08	
Low	10 (20)	4	5	21	30	10.0 ± 9.54	
Smoking habit							
Smoker	10 (20)	8	18	5	31	10.33 ± 6.81	0.03 ^S
Non smoker	40 (80)	42	7	20	69	23.0 ± 17.69	
Genetics of stone disease							
Yes	3 (6)	5	0	2	7	2.33 ± 2.52	0.01 ^S
No	47 (94)	45	25	23	93	31.0 ± 12.17	
Food habit							
Vegetarian	20 (40)	35	7	5	47	15.67 ± 16.77	0.08 ^{NS}
Non-veg	30 (60)	15	18	20	53	17.67 ± 2.52	
Alcohol intake							
Drinkers	12 (24)	35	15	17	67	22.33 ± 11.02	0.16 ^{NS}
Non-drinkers	38 (76)	15	10	8	33	11.0 ± 3.61	
Drinking water							
Tap water	32 (64)	35	15	20	70	22.33 ± 10.41	0.01 ^S
Bore well	18 (36)	15	10	5	30	10.0 ± 5.0	

S- Significant; NS-Not Significant. $p < 0.05$ level of significant.

The distribution of the stone patients based on education and there are 91% patients with literate levels and 9% patients with illiterate levels. Out of 50 healthy peoples 90% are high education levels, 10 are Low education levels. It reveals that the stone patients based on marital status. There are 82% patients are married and 18% patients are unmarried. Out of 50 healthy people 84% are married, 16% are unmarried. In economic status, Out of

100 kidney stone patients 10% are good, 60% patients medium and 30% are low. Out of 50 healthy people 10% are good, 70% peoples medium and 20% are low. There are 31% patients with smoker and 69% patients with non-smoker. Out of 100 patients, 67% with drinkers and 33% patients are non-drinkers. The genetics of stone disease 7% patients were appeared and 93% patients not

appearance. The majority of patients 70% were usage for tap water than 30% patients are used for bore well water.

DISCUSSION

Among the 150 people were studied in age group of 20–80. Majority (46%) were more than 60 years of age. In this study, the majority of female 56% than men were representing 45% of the sample. It observed that the kidney stone patients were higher in the age group of 21–60 (46%) and lower <20 (1%) and >60 (7%) which was statistically significant (15.33 ± 8.74 ; $p=0.01$). Men were at larger risk of producing calcium oxalate stones (73% were in men) and uric acid stones (79% were in men). Women were at greater risk of infection stones (58% occur in women).¹⁸ In this study, Majority of calcium stone were found in male (60%) than female (40%).¹⁹ Baker et al have found that the peak age for the development of calcium oxalate stones was between 50 and 60 years.²⁰ Uric acid stones tended to occur in an older population with an average age of 60–65 years. Infection stones, however, occurred in younger people, most commonly in women between the ages of 20 and 55 years. The frequencies of different stone types in men were calcium 60%, uric acid 14% and struvite. In women, the compositions of stones were calcium 40%, uric acid 36% and struvite 1.334%.^{21,22} The non-veg food intake is associated with a higher risk of stone formation. High fluid intake is associated with a lower risk of developing kidney stones in men and women.²³ The urban patients were (24.0 ± 9.64) in higher than rural area (9.33 ± 5.13) as compared with the healthy people, which is statistically not significant ($p=0.08$). The education status showed a higher proportion of kidney stone patients with control (91% vs. 90%; 30.33 ± 15.31 ; $p=0.03$) and a lower proportion (9% vs. 5%; 3.0 ± 1.0) were observed. The married patients (27.33 ± 15.37 ; $p=0.07$) were infected with stone disease than unmarried (6.0 ± 1.73) as compared with the non-stone infection patients. The good economic status of patients with control (10% vs. 10%; 3.33 ± 2.31 ; $p=0.03$) and a lower status of (30% vs. 20%; 10.0 ± 9.54) were presented. The value of 31% smokers and 69% non-smokers had stone infection. Stone patients were at drinkers (67%) more than non-drinkers (33%) getting risk of stone infection. A probability level (p value) of greater than 0.05 is considered statistically not significant between kidney stone patients and control.

CONCLUSION

In conclusion, calcium stones are predominantly present in the study area. Kidney stone formation may be due to the food habits (diet), age, sex, obesity, genetics and environmental factors, geographical location, climate and lifestyle. The present investigation aims to assess the status of kidney stone diseases and risk factors in and around Thanjavur. The average age of uric acid stone patients is less compared to other stone patients. Kidney stone formation is a multifactorial disease that can be influenced both positively and negatively by diet. The

strongest studies, on the importance of diet and stone disease in humans, are epidemiological; and more intervention studies in humans are needed to clarify the biological processes involved in these interesting associations. Some risk factors are age, sex, residing area, ethnicity, smoking habit, beverage consumption, food habit etc., can be modified; due to change in westernized food, low fibre and high-fat may lead to formation of kidney stone disease. Reducing the detriments such as high fat intake, calorie, decrease fibre, caffeinated coffee may useful to reduce the risk of stone formation. We believe that the investigation of the kidney stone and risk factors is difficult task; however it could be minimized by controlling such risk factors.

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