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ORIGINAL ARTICLE

Assessment of risk factors for nephrolithiasis in Rawat.

Mahvesh Mahmud[1], Maryam Anwar[2], Hassan Mansoor[3], Muhammad Farrukh Abbas Awan[4], Muddasar Pervaiz[5], Khurram Baqai[6]

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ABSTRACT… Objective: To identify the risk factors for nephrolithiasis among all patients found to have nephrolithiasis on renal sonography. The study will help us report the incidence of renal stones in this area, and as they cause significant morbidity and high costs of healthcare, and guide towards the introduction of public health measures to reduce the incidence of nephrolithiasis. **Study Design:** Descriptive, Questionnaire Based Cross-sectional study. **Setting:** Watim General Hospital, Rawalpindi. **Period:** Jul 1st, 2023 to Sep 30th, 2023. **Methods:** The data of all adult patients who underwent renal sonography and were documented to have nephrolithiasis was obtained through physician administered questionnaires from the ultrasound department records. Data was then entered and analyzed by using the Statistical Package for the Social Sciences (SPSS), version 16. **Results:** Data was collected on 115 patients, of these, 57% were males. 48% of the patients were aged between 18-30 years of age. 54% of the patients belonged to lower socio-economic class. 55% of them had low water intake, and 81% consumed non-purified water. 51% patients also had a positive family history. 81% of the patients had less intake of citrus fruits and 37% of them never exercised. **Conclusion:** Many significant risk factors were assessed. Awareness campaigns and preventive health measures should be implemented addressing the critical risk factors. This will help decrease the burden on patients, and on the health care system.

Key words: Adult, Nephrolithiasis, Prevalence, Risk Factors, Renal Sonography.

INTRODUCTION

Nephrolithiasis is a urological condition in which the precipitation of crystals from urine takes place, and stones are formed inside the kidneys.[1] The classification of kidney stones includes different types of stones based on their composition and include calcium phosphate, calcium oxalate, cystine, struvite, uric acid and mixed stone types, and calcium stones constitute the majority, that is, almost 70–80% of all kidney stones.[2]

The incidence and prevalence of kidney stones is increasing globally.[2] Worldwide, it is the third most prevalent condition, and affects nearly one in every seven men, and one in thirteen women.[1,3]

Environmental factors play a key role in the pathogenesis of nephrolithiasis, and the risk factors are different among different population groups.[2] Pakistan is present in the area known as the "stone belt" contributing towards the high prevalence of renal stones in this region.[1]

A variety of factors affect the incidence of kidney stones, including race, gender, occupation, hot climate, geographic location, positive family history, unhealthy diet (excessive salt, animal proteins, and dairy products in the diet), alcohol consumption and cigarette smoking, positive family history, low physical activity, low fluid intake, dehydration, high body mass index, socioeconomic class, education level, quality of water taken, iatrogenic high intake of vitamins D and C, and comorbid metabolic conditions (hypertension, cardiovascular disease, chronic kidney disease and diabetes mellitus).[2] On the contrary citrus fruits and juices have been shown to decrease the incidence of kidney stones by increasing urinary citrate levels.[4] Patients with kidney stones can either be asymptomatic or they

1. MBBS, DABIM Med/Neph, Associate Professor Nephrology, Watim Medical College, Rawalpindi.
2. MBBS, Resident Medical Officer, Ziauddin University, Karachi.
3. MBBS, FCPS, Senior Registrar Urology, Watim Medical College, Rawalpindi.
4. MBBS, FCPS, Senior Registrar Urology, Watim Medical College, Rawalpindi.
5. MBBS, MPH, Associate Professor, Community Medicine, Al Nafees Medical College, Islamabad.
6. MBBS, FPCS, Assistant Professor, Ziauddin University, Karachi.

Correspondence Address:
Dr. Mahvesh Mahmud
Department of Nephrology
Watim Medical College, Rawalpindi.
mahveshkm@gmail.com

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can present with symptoms like nausea, emesis, flank pain or urinary tract infection.[5]

Renal stones have a prevalence and a high frequency of repeated occurrence, therefore they can significantly increase the cost of healthcare. Moreover, the complications caused by renal stones such as decreased kidney function, hydronephrosis / obstruction, urinary tract infections, can eventually lead to kidney failure.[6]

In Pakistan, the population at large is not very familiar with its risk factors, which may be one of the reasons contributing to the high incidence of nephrolithiasis among the natives of Pakistan. Moreover, limited sources of education and the underdeveloped system of health care system further aggravate health-related issues. As information from Pakistan about the risk factors for nephrolithiasis, especially the smaller towns, is limited, our study aims to identify the risk factors for nephrolithiasis among all patients found to have nephrolithiasis on renal sonography at Watim General Hospital, Rawat. It will also help us report the incidence of renal stones in this area, and as they cause significant morbidity and high costs of healthcare, and will help in us in introducing public health measures to try to reduce the incidence of nephrolithiasis. Moreover this will be the first study from a small town in Pakistan, as the other studies are from large urban centres.

METHODS

This hospital based descriptive, questionnaire based cross-sectional study has been carried at Watim General Hospital in Rawalpindi, Pakistan. This hospital caters to a large number of population within the city, as well as receives patients from other cities and towns of the northern province. The study was carried out over a period of three months. All patients > 18 years of age and < 70 years of age who underwent renal sonography and were documented to have nephrolithiasis were included in the study. Patients who were < 18 and > 70 years of age were excluded from the study, as were patients with congenital renal anomalies.

After taking approval from the ethical review board (WMDCR/ERB/2023/59), informed consent was taken from the participants. Demographic data was obtained, and height and weight was measured for Body Mass Index calculation. The data was obtained through physician administered questionnaires from the ultrasound department records. The questionnaires were approved by the Hospital Ethics Committee.

Data was then analyzed by using the Statistical Package for the Social Sciences (SPSS), version 16, and frequencies and percentages were used in the descriptive statistics.

RESULTS

This study included a total of 115 participants, out of which there were 66 males (57%) and 49 females (43%).

The first part of questionnaire comprised of the demographic details of participants including age, gender, education level and BMI. These were summarized in Table-I.

Variable	Frequency (%)
Gender	
Male	66 (57%)
Female	49 (43%)
Age Group in Years	
18-30	55 (48%)
30-50	37 (32%)
50-70	23 (20%)
BMI in kg/m^2	
<25	67 (58%)
25-30	46 (40%)
>30	2 (2%)
Education	
Less than Matric	34 (29%)
Matric	32 (28%)
Inter	39 (34%)
Graduate	9 (8%)
Postgraduate	1 (1%)
Socio-economic class	
Lower	62 (54%)
Middle	43 (37%)
Upper	10 (9%)

Table-I. Sociodemographic characteristics of the participants

As seen below, male patients were more prone to develop renal stones. Similarly, renal stones were

more common in the younger age group (18-30 years). High BMI was not a contributing factor. Patients belonging to lower socio-economic class were found to have an association with the development of renal stones.

The second part of questionnaire is summarized in Table-II. It represents the association of patient factors and kidney stone. Multiple factors were assessed including water intake, the presence of any co morbid conditions (diabetes, hypertension), family history of renal stones, the consumption of meat and citrus products, and the presence of exercise in one's lifestyle.

Variable	Frequency (%)
Water Intake	
Low	63 (55%)
Medium	41 (36%)
High	11 (09%)
Purified Water Consumption	
Yes	22 (19%)
No	93 (81%)
Hypertension	
Yes	34 (30%)
No	81 (70%)
Diabetes	
Yes	27 (23%)
No	88 (77%)
Hyperlipidemia	
Yes	21 (18%)
No	94 (82%)
Family History of Renal Stones	
Yes	59 (51%)
No	56 (49%)
Cigarette Smoking	
Yes	31 (27%)
No	84 (73%)
Meat Intake	
Less	39 (34%)
Medium	46 (40%)
More	30 (26%)
Citrus Intake	
Less	93 (81%)
Medium	21 (18%)
More	1 (1%)
Exercise 30 mins daily	
Yes	12 (10%)
Frequently	27 (23%)
Sometimes	34 (30%)
Never	42 (37%)

Table-II. Association of patient factors and kidney stone.

It was found that low water intake, the consumption of non-purified water, family history of renal stones, less citrus intake and no exercise in daily life were the highest contributing risk factors for the development of renal stones.

DISCUSSION

This study identified the various risk factors associated with the development of renal stones. Our results showed that males were more prone to getting renal stones. This is not consistent with another study from a nearby country[2], but consistent with three other studies conducted in Nepal, Iran and the United States.[8,9] Rafiei et al. in contrast reported that women were at a greater risk.[10] The higher risk of kidney stone development in men may be due to the effects of estrogens and androgens on urinary oxalate and calcium concentrations. Estrogen increases the production of citric acid and thus prevents kidney stone formation, which binds urinary calcium, thereby reducing the supersaturation of urine.[2] Therefore, recommendations for the prevention of renal stone development in terms of diet and physical activity is more important in males.

Based on our results, renal stones were more common in the younger age group (18-30 years). This is similar to another study conducted in Jeddah and Riyadh.[11] In contrast, some studies for example, Baatiah et al. showed that the prevalence of renal stones increased with age.[12,13]

Further, we also see that the patients belonging to lower socio-economic class were found to have an association with the development of renal stones. This is probably due to the consumption of non-purified water in the lower income society. As seen ahead in the results, the consumption of non-purified water is one of the leading causes of the development of renal stones. It could also be attributed to the lack of awareness regarding general preventive measures including the importance of exercise or the consumption of citrus fruits.

Further results showed that low water intake, the consumption of non-purified water, family history of renal stones, less citrus intake and no exercise in

daily life were the highest contributing risk factors for renal stone development. 55% of the patients developed renal stones who had low water intake, whereas 81% of those who developed stones also consumed non-purified water. Another study conducted in Iran also showed a positive association with the consumption of non-purified water.[7] 51% of the patients who developed stones also had a positive family history. This is similar to other studies.[12,13] 81% of the patients had less citrus intake and 37% of the patients never exercised.

Other factors for example hypertension, hyperlipidemia, diabetes, cigarette smoking and meat intake also contributed to the development of stones. For instance, 30% of the patients with hypertension, 23% with diabetes, 18% with hyperlipidemia, developed renal stones. This is consistent with a study conducted in Iran which showed that 27.93% of the patients had hypertension and 24.08% had diabetes.[7] In another study by Kalani et al.[14] 29.7% of patients with renal stone disease had hypertension. 27% of smokers developed renal stones. The high levels of cadmium and lead in the smokers' body may explain the association between cigarette smoking and the formation of kidney stones. Cigarette smoking may reduce urinary flow rate and increase the concentration of serum cadmium, resulting in the induction of urolithiasis.[7,15]

This study has its strengths and limitations. Multiple risk factors were assessed and the questionnaire was handed by the doctors themselves so there was no error in data collection procedure. However, since the study was conducted in a small town in Pakistan, the sample size was smaller and did not represent the true population. Chances of recall bias were present. As with all cross-sectional studies, the sequence of temporality is weak, between the related factors and the disease.

CONCLUSION

As per results of our study, the most significant factors for nephrolithiasis included male gender, low level of education, positive family history, low intake of water, consumption of non-purified drinking water, less citrus fruits' intake and less exercise in daily life. Diabetes, hypertension and cigarette smoking also had an impact.

Hence, by identifying patients who may be susceptible to kidney stones and then by educating them, the financial burden of kidney stones on the individual and the society can be decreased, which is very important for our country which has limited healthcare resources. Therefore, it is imperative to promote awareness campaigns that address the critical risk factors as identified above. The results of this study should be helpful for implementing preventative measures by health care providers.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Mahvesh Mahmud	Article concept & design & final draft.	
2	Maryam Anwar	Final draft of manuscript.	
3	Hassan Mansoor	Data acquisition.	
4	M. Farrukh Abbas Awan	Data entry & Analysis.	
5	Muddasar Pervaiz	Approval of final version.	
6	Khurram Baqai	Data analysis.	