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Identification of risk factors for urolithiasis in patients presenting to urology department: A retrospective case-control study

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Abstract
Background: In Asia, about 1%-19.1% of the population suffer from urolithiasis. The epidemiology of urolithiasis differs according to geographical area and historical period: changing socio-economic conditions have generated changes in the incidenceand type of lithiasis in terms of both the site and the physical-chemical composition of the calculi.
Methodology: A retrospective case-control study was adopted for the study Among 120 patients from urology department of SPNMH, Khagaria. The tools included a semi-structured interview schedule for socio-personal and lifestyle factors, and a clinical data sheet for medical variables.
Results: Overall finding of this study revealed that significant associations between urolithiasis and frequent urinary tract infections ($\chi^2 = 5.886$, $p<0.01$), low water intake ($\chi^2 = 16.5$, $p<0.001$), reduced urine output ($\chi^2 = 24.2$, $p<0.001$), and infrequent urination ($\chi^2 = 11.35$, $p<0.001$). Dietary habits also showed significant associations: high consumption of red meat ($\chi^2 = 9.449$, $p<0.05$), tea ($\chi^2 = 0.050$, $p<0.05$), and low fruit intake ($\chi^2 = 14.8$, $p<0.001$). Odds ratio analysis highlighted key risk factors: frequent urinary tract infections [OR = 9.007, CI: 1.98-75.020], congenital anomalies of the urinary system [OR = 1.07, CI: 1.001-1.146], immobility [OR = 1.071, CI: 1.001-1.146], and use of air conditioning [OR = 5.118, CI: 1.057-24.78]. Patients with recurrent UTIs were found to be approximately nine times more likely to develop urolithiasis.
Conclusions: The study emphasizes the importance of early identification and modification of lifestyle and clinical risk factors to prevent urolithiasis. Findings have implications for patient education, preventive strategies, and targeted urological care.

Keywords: Risk factors, urolithiasis and identification

Introduction
The prevalence of kidney stones in the world is increasing and environmental factors seem to play a major role in this issue. The overall probabilities of forming stones vary around the world; nevertheless, it is a public health concern worldwide. Lifestyle can influence the risk of stone formation. Overweight and obese individuals were reported to have a higher risk of developing idiopathic calcium oxalate residues in the kidney resulting in renal stone formation. Furthermore, poor dietary habits such as a high salt diet, a high-protein diet, and extreme fasting could contribute to the increasing incidence of renal stones. The relationship between water intake and kidney stones has been addressed by several studies as hydration, which is considered to be a major determinant of stone formation.

Objectives
- Identify the risk factors of urolithiasis among patients receiving treatment from urology department of SPNMH, Khagaria.

Materials and Methods
- **Research approach:** Quantitative Research approach
- **Research design:** A retrospective case-control design
- **Sampling technique:** The samples were selected by consecutive sampling technique.

- **Sample size:** The overall sample size was 120. So, the sample size is 60 cases and 60 controls.

Tools

- The tool used in the present study for collecting the data consisted of semi structured interview schedule to identify the risk factors of urolithiasis.
- **Tool 1:** Semi structured Interview schedule to assess the socio personal data Technique: self-report
- **Tool 2:** Semi structured interview schedule to assess the risk factors of urolithiasis Technique: self-report
- **Tool 3:** Data sheet for clinical variables by using interview schedule and record review Technique: self-report, biophysical method.
- **Data collection:** The study was conducted after getting approval from the Institutional Ethics Committee of SPNMH, Khagaria. The period of data collection was from 01.02.2023 to 10.03.2023 and the data were collected from 60 patient who attend urology department and 60 patients who attend the general medicine department.

Results

Table 1: Distribution of participants based on history of working abroad and monthly income n=120

Variables	Group			
	Cases		control	
	f	%	f	%
Monthly income in				
<10000	45	75	41	68.3
10001-15000	10	16.7	16	26.7
15001-20000\	2	3.3	3	5.0
>20000	3	5.6	-	-
History of working abroad				
No	51	85.5	58	96.6
<5 years	3	5.0	1	1.7
5-10 years	4	6.7	1	1.7
>10years	2	3.3	-	-

Table 1 indicates that 75% participants in the case group and 68.3% of the participants in the control groups had<10000 income. 16.7% participants in the case group and 26.7% of the participants in the control groups had 10001-15000 income. 3.3% participants in the case group and 5.0% of the participants in the control groups had 15000-20000 income. 5.6% participants in the case group had an income of >20000.

Table 2: Distribution of participants based on duration of illness and site of stone n=60

Cases		
Clinical variables	**f**	**%**
Duration of diagnosis		
<1 year	49	81.7
6-10 years	9	15.0
11-15 years	2	3.3
>15 years	-	-
Site of stone		
Kidney	51	85.0
Ureter	7	11.7
Urinary bladder	2	3.3
urethra	-	-

Table 2 depicts that 81.7% participants of the case group diagnosed urolithiasis<1 year. 15% participants in the case group diagnosed urolithiasis within 6-10 years. 3.3% participants of the case group diagnosed urolithiasis in 11-15 years. 85% participants of the case group have urinary stone in kidney, 11.7% in the ureter and 3.3% in the urinary bladder.

Table 3: Distribution of participants based on confirmatory method of diagnosis n=60

Cases		
Clinical variables	**f**	**%**
Confirmatory method		
KUB X ray	-	-
Ultrasonography	21	35.0
CT abdomen	38	63.3
MRI	2	1.7

Table 3 indicates that 35% participants of the case group confirmed urolithiasis by Ultrasonography. 63.3% participants in the case group confirmed urolithiasis by CT abdomen and 1.7% by MRI

Table 4: Distribution of participants based on BMI n=120

	Cases		Control	
Clinical variables	**f**	**%**	**f**	**%**
Body mass index				
<18.5 (underweight)	5	8.3	16	26.7
18.6-24.9 (normal	35	58.3	34	56.7
weight)	19	31.7	10	16.7
25.0-29.9 (Over weight)	1	1.7	-	-
30.0-34.9 (class 1				
obesity)				

Table 4 indicates that the 8.3% participants in the case group and 26.7% participants in the control group belong to underweight. 58.3% participants in the case group and 56.7% participants in the control group belong to normal weight. 31.7% participants in the case group and 16,7% in the control group belongs to overweight.1.7% participants in the case group belongs to class 1 obesity

Section II: Risk factors of urolithiasis

This section deals with the distribution of participants based on risk factors of urolithiasis which are organized under the following headings such as as family history of urolithiasis, co morbidities, lifestyle factors, mobility status, food habits, medications. The findings are presented in tables from 5 to 25.

Table 5: Distribution of participants based on family history of urolithiasis. n=120

Variables	Group			
	Cases		Control	
	f	%	f	%
Family history of Urinary stone				
Yes	12	20	4	6.7
No	48	80	56	93.3

Table 5 depicts that 80% participants in the case group and 93.3% participants in the control group had no family history of urolithiasis. 20% participants in the case group and 6.7% participants in the control group had family history of urolithiasis.

Co morbidities

Co morbidities include diabetes mellitus, hypertension, hypercholesterolemia, cancer, stroke, history of frequent urinary tract infection, gout, GI disorders and other diseases if any were tabulated in the table from 6-9

Table 6: Distribution of participants based on presence of co morbidities: diabetes mellitus and hypertension n=120

Variables	Group			
	Cases		Control	
	f	%	f	%
Diabetes mellitus				
No	38	63.3	33	55
<1 year	10	16.7	12	20
1-5 years	8	13.3	11	18.3
6-10 years	4	6.7	4	6.7
>11 years	-	-	-	-
Hypertension				
No	45	75.0	31	51.7
<1 year	4	6.7	18	30
1-5 years	8	13.3	10	16.7
6-10 years	2	3.3	4	1.7
>11 years	1	1.7	-	-

Table 6 depicts that 63.3% of the participants in the case group and 55% participants of the control group have no diabetes mellitus. 16.7% of the participants in the case group and 20% participants of the control group have diabetes mellitus since<1 year. 13.3% of the participants in the case group and 18.3% participants of the control group have diabetes mellitus since 1-5 years. 6.7% of the participants in the case group and 6.7% participants of the control group have diabetes mellitus 6-10 years.75% of the participants in the case group and 31% participants of the control group have no hypertension. 6.7% of the participants in the case group and 30% participants of the control group have hypertension since<1 year. 13.3% of the participants in the case group and 16.7% participants of the control group have hypertension since 1-5 years. 3.3% of the participants in the case group and 1.7% participants of the control group have hypertension since 6-10 years. 1.7% of the participants in the case group had hypertension since >11 years.

Table 7: Distribution of participants based on presence of morbidities: Hypercholesterolemia n=120

Variables	Group			
	Cases		Control	
	f	%	f	%
Hypercholesterolemia				
No	5	86.7	52	86.7
<1 year	5	8.3	7	11.7
1-5 years	3	5.0	3	1.7
6-10 years	-	-	-	-
>10 years	-	-	-	-

Table 7 indicates that 86.7% of the participants in both case group and control group have no hypercholesterolemia. 8.3% of the participants in the case group and 11.7% participants of the control group have hypercholesterolemia since<1 year. 5% of the participants in the case group and 1.7% participants of the control group have hypercholesterolemia since 1-5 years.

Table 8: Distribution of participants based on presence of co morbidities: Stroke and history of frequent UTI n=120

Variables		Group		
	Cases		Control	
	f	%	f	%
Stroke				
No	58	96.7	60	100
<1 year	1	1.7	-	-
1-5 years	1	1.6	-	-
6-10 years	-	-	-	-
>10 years	-	-	-	-
History of Frequent UTI				
No	52	86.7	59	98.3
<1 year	8	13.3	1	1.7
1-5 years	-	-	-	-
6-10 years	-	-	-	-
>10 years	-	-	-	-

Table 8 indicates that 96.7% participants in the case group no history of stroke. None of the participants in the control group had stroke. 1.7% participants in the case group had the history of stroke since<1 year. 1.6% participants in the

case group had the history of stroke since 1-5 years. 86.7% participants in the case group and 98.3% participants in the control group have no history of frequent UTI. 13.3% participants in the case group and 1.7% in the control group have frequent UTI<1 year.

Table 9: Distribution of participants based on presence of co morbidities: GI disorders and others n=120

Variables	Group			
	Cases		Control	
	f	%	f	%
GI disorders				
No	55	91.7	35	58.3
<1 year	4	6.7	21	35
1-5 years	1	1.6	4	6.7
6-10 years	-	-	-	-
>10 years	-	-	-	-
Others				
No	59	98.3	26	43.3
<1 year	1	1.7	31	51.7
1-5 years	-	-	3	5
6-10 years	-	-	-	-
>10 years	-	-	-	-

Table 9 indicates that 91.7% participants of the case group and 58.3% participants of the control group have no GI disorders. 6.7% participants of the case group and 35% participants of the control group have GI disorders since 1-5 years. 1.6% participants of the case group and 6.7% participants of the control group have GI disorders since 1-5 years. 98.3% participants of the case group and 43.3% participants of the control group have no other diseases. 1.7% participants of the case group and 51.7% participants of the control group have other diseases like asthma, viral infections since 1-5 years.

Table 10: Distribution of participants based on history of congenital anomaly of urinary system n=120

Variables	Group			
	Cases		Control	
	f	%	f	%
Congenital anomalies of urinary system				
Yes	4	6.7	1	1.7
No	56	93.3	59	98.3

Table 10 depicts that 6.7% in the case group and 1.7% participants in the control group have the congenital anomaly of urinary system. 93.3% of the case group and 98.3% of participants in the control group have no any history of congenital anomaly of urinary system.

Table 11: Distribution of participants based on life style factors: smoking and Alcoholism n=120

Variables		Group		
	Cases		Control	
	f	%	f	%
Smoking				
Yes	10	16.7	5	8.3
No	41	68.3	51	85
Ex-smoker	9	15.0	4	6.7
Alcoholism				
Yes	11	18.3	5	8.3
No	43	71.7	51	85
Ex-alcoholic	6	10.0	4	6.7

Table 11 indicates that 16.7% of the participants in the case group and 8.3% participants in the control group have the habit of smoking. 68.3% participants in the case group and 85% of the participants in the control group have no habit of smoking. 15% participants in the case group and 6.7% participants in the control group are ex-smoker. 18.3% of the participants in the case group and 8.3% participants in the control group have the habit of alcoholism. 71.7% participants in the case group and 85% of the participants in the control group have no habit of alcoholism. 10% participants in the case group and 6.7% participants in the control group are ex-alcoholic.

Table 12: Distribution of participants based on life style factor: long travel and use of Air conditioner n=120

Variables	Group			
	Cases		Control	
	f	%	f	%
Long travel				
Yes	6	10	4	6.7
No	54	90	56	93.3
Use of AC/day				
No	54	90	58	96.7
<8 hours	3	5	2	3.3
>8 hours	3	5	-	-

Table 12 indicates that 10% of the participants in the case group and 6.7% of the control group have long travel. 90% of the participants in the case group and 93.3% participants in the control group not travel long. 90% participants in the case group and 96.7% participants in the control group does not use AC. 5% participants in the case group and 3.3% participants in the control group use AC<8 hours. 5% participants in the case group use AC for > 8 hours. None of the participants in the control group had the habit of using air conditioner >8 hours.

Table 13: Distribution of participants based on life style factors: water intake and urine output n=120

Variables	Group			
	Cases		Control	
	f	%	f	%
Fluid intake/day				
<1 litre	32	53.3	12	20
1-2 litre	23	38.3	35	58.3
>2 litre	5	8.4	13	21.7
Habit of soft drink intake				
Never	28	46.7	24	40
seldom	11	18.3	23	38.3
Often	20	33.3	13	21.7
Daily	1	1.7	-	-
Habit of fasting				
Yes	4	6.7	1	1.7
No	56	93.3	59	98.3

Table 13 depicts that 53.3% participants in the case group and 20% participants in the control group take<1 litre of fluids. 38.3% participants in the case group and 58.3% participants in the control group takes 1-2 litre of fluids. 8.4% participants in the case group and 21.7% in the control group takes >2 liter of fluids. 46.7% of the participants in the case group and 40% participants in the control group have no habit of soft drink intake. 18.3% of the participants in the case group and 38.3% participants in the control group seldom take soft drinks. 33.3% of the participants in the case group and 21.7% participants in the control group often take soft drinks. 1.7% participants in the case group takes soft drinks daily. None of the participants in the control group takes soft drinks daily. 6.7% participants in the case group and 1.7% participants in the control group have the habit of fasting.93.3% participants in the case group and 98.3% participants in the control group does not have the habit of fasting.

Table 14: Distribution of participants based on life style factors: urine output and frequency of urination n=120

Variables	Group			
	Cases		Control	
	f	%	f	%
Urine output/day				
<1 litre	42	70	16	26.7
1-2 litre	17	28.3	36	60
>2 litre	1	1.7	8	13.3
Frequency of urination				
<2 hours	11	18.3	19	31.7
2-4 hours	35	58.3	39	65
4-6 hours	14	23.4	2	3.3
6-8 hours	-	-	-	-

Table 14 depicts that 70% participants in the case group and 26.7% participants in the control group have<1 litre of urine output. 28.3% participants in the case group and 60% in the control group have 1-2 litre of urine output. 1.7% participants in the case group and 13.3% participants in the control group have >2 litre of urine output. 18.3% participants in the case group and 31.7% participants in the control group have<2 hours of frequency of urination. 58.3% participants in the case group and 65% participants in the control group have 2-4 hours of frequency of urination. 23.4% participants in the case group and 3.3% participants in the control group have 4-6 hours frequency of urination. None of the participants in case and control group have 6-8 hours frequency of urination**.**

Table 15: Distribution of participants based on dietary habit: red meat, salted foods and pickles n=120

Variables	Group			
	Cases		Control	
	f	%	f	%
Use of Red meat				
Never	7	11.7	13	21.7
Seldom	29	48.3	28	46.7
Often	24	40.0	14	23.3
Daily	-	-	5	8.3
Use of Salted foods				
Never	17	28.3	19	31.7
Seldom	27	45	18	30
Often	12	20	20	33.3
Daily	4	6.7	5	5
Use of Pickles				
Never	14	23.2	10	16.7
Seldom	28	46.7	31	51.7
Often	13	21.7	17	28.3
Daily	5	8.3	2	3.3

Table 15 depicts that 11.7% of the participants in the case group and 21.7% participants in the control group have no habit of red meat intake. 48.3% of the participants in the case group and 46.7% participants in the control group seldom take red meat. 40% of the participants in the case group and 23.3% participants in the control group often takes red meat. 8.3% participants in the control group takes red meat daily. None of the participants in the case group takes red meat daily. 28.3% of the participants in the case group and 31.7% participants in the control group have no habit of salted food intake. 45% of the participants in the case group and 30% participants in the control group seldom take salted foods. 20% of the participants in the case group and 33.3% participants in the control group often takes salted foods. 6.7% participants in the control group and 5% participants in the case group takes red salted foods. 23.2% of the participants in the case group and 16.7% participants in the control group have no habit of taking pickles. 46.7% of the participants in the case group and 51.7% participants in the control group seldom take pickles. 21.7% of the participants in the case group and 28.3% participants in the control group often takes red meat. 8.3% participants in the control group and 3.3% participants in the case group takes red meat daily.

Table 16: Distribution of participants based on dietary habit: tea and coffee. n=120

Dietary habit	Group			
	Cases		Control	
	f	%	f	%
Tea				
Never	3	5	4	6.7
Seldom	4	6.7	-	-
Often	2	3.3	8	13.3
Daily	51	85	48	80
Coffee				
Never	32	53.3	32	53.3
Seldom	22	36.7	17	28.3
Often	5	8.3	8	13.4
Daily	1	1.7	3	5

Table 16 depicts that 5% of the participants in the case group and 6.7% participants in the control group have no habit of tea intake. 6.7% of the participants in the case group seldom take tea and none of the participants in the control group seldom take tea. 3.3% of the participants in the case group and 13.3% participants in the control group often take tea. 85% participants in the case group and 80% control group takes tea daily 53.3% of the participants in the case group and control group have no habit of coffee intake. 36.7% of the participants in the case group and 28.3% participants in the control group seldom take coffee. 8.3% of the participants in the case group and 13.4% participants in the control group often take coffee. 1.7% participants in the case group and 5% control group takes coffee daily.

Table 18: Distribution of participants based on dietary habit: fried foods and fast foods n=120

Dietary habit	Group			
	Cases		Control	
	f	%	f	%
Use of Fried foods				
Never	5	8.3	7	11.7
Seldom	12	20	20	33.3
Often	33	55	29	48.3
Daily	10	16.7	4	6.7
Use of Fast foods				
Never	21	35	35	58.3
Seldom	19	31.7	11	18.3
Often	18	30	14	23.4
Daily	2	3.3	-	-

Table 18 depicts that 8.3% of the participants in the case group and 11.7% participants in the control group have no habit of fried foods intake. 20% of the participants in the case group and 33.3% participants in the control group seldom take fried foods. 55% of the participants in the case group and 48.3% participants in the control group often take fried foods. 16.7% participants in the case group and 6.7% participants in the control group takes fried foods daily. 35% of the participants in the case group and 58.3% participants in the control group
have no habit of fast foods intake. 31.7% of the participants in the case group and 18.3% participants in the control group seldom take fast foods. 30% of the participants in the case group and 18.3% participants in the control group often take fast foods. 3.3% participants in the case group and none of the participants in the control group take fast foods daily.

Table 19: Distribution of participants based on drug intake: ascorbic acid, calcium and other drugs n=120

Variables	Group			
	Cases		Control	
	f	%	f	%
Ascorbic acid				
No	60	100	57	95
<1 week	-	-	2	3.3
1-4week	-	-	1	1.7
1-6 months	-	-	-	-
>6 months	-	-	-	-
Calcium				
No	58	96.7	57	95
<1 week	2	3.3	3	5
1-4 week	-	-	-	-
1-6 months	-	-	-	-
>6 months	-	-	-	-
Others				
No	52	86.7	36	60
<1 week	-	-	16	26.7
1-4 week	-	-	2	3.3
1-6 months	8	13.3	-	-
>6 months	-	-	6	10

Table 19 depicts that 95% participants in the control group does not take ascorbic acid drug. 3.3% of the participants in the control group take ascorbic acid since<1weeks. 1.7% participants in the control group take ascorbic acid since 1-4 weeks. 96.7% participants in the case group and 95% of the participants in the control group does not take calcium drug. 3.3% participants in the case group and 5% of the participants in the control group take calcium drugs since<1weeks. 86.7% participants in the case group and 60% of the participants in the control group does not take other drugs. 26.7% of the participants in the control group take other drugs such as metformin, amlodipine, atorvaststin since<1weeks. 3.3% participants in the control group take other drugs since 1-4 weeks. 10% participants in the control group takes other drugs since >6 months.

Table 20: Association between urolithiasis and socio personal variables n=120

Risk factors	χ^2	df	p value
Age	0.000	5	1.000
Sex	0.000	1	1.000
Place of residence	1.841	2	0.398
Religion	1.020	2	0.600
Marital status Education	0.566	2	0.754
Occupation Monthly	1.230	3	0.746
Income History of working abroad	11.330	4	0.023*
BMI	5.250	3	0.154
	9.570	3	0.023*

* Significance p value at 0.05 level

Data from Table 20 shows that there is statistically significant association between urolithiasis and risk factors such as the occupation (p= 0.05), BMI (χ^2= 9.57, p =0.05) significance at 0.05 level. Hence the null hypothesis is rejected and inferred that there is a significant association between the urolithiasis and occupation and BMI.

Conflict of Interest
Not available

Financial Support
Not available

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