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PREVALENCE OF UROLITHIASIS IN MALE PATIENTS AND THEIR DIETARY PATTERN AT ALLIED HOSPITAL FAISALABAD.

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ABSTRACT

BACKGROUND: Urolithiasis is a process of stone formation in kidneys, urinary bladder or urethra urinary tract. The occurrence of urolithiasis may be the cause of different factors e.g., nutritional status, dietary habits and environmental factors like temperature and humidity. Pakistan is one of such countries which fall in geographical zone of stone belts. **OBJECTIVE:** The proposed study was aimed to determine dietary pattern of male patients with urolithiasis, the minerals contents Calcium, Phosphorous and Magnesium, pH and creatinine of urine and serum in male urolithiasis patients between the ages of 35 to 65 years and determine incidence of urolithiasis in male patients at Faisalabad. **METHODOLOGY:** The proposed study was aimed at selecting male patients at random having urinary stones at Allied Hospital Faisalabad before surgery. The research work was carried out between ten control and twenty urolithiasis patients to determine the pH by using pH strips and minerals Calcium, Magnesium and Phosphorous content in serum and urine of male urolithiasis patients spectrophotometrically and also to assess the dietary pattern in patients through Dietary Performa. The creatinine level in urine of the male patients was taken from their medical record. **RESULTS:** The obtained data analyzed statistically using analysis of variance ANOVA to interpret the result. The results for the prevalence of male urolithiasis patients at Faisalabad of the present study were fifty three percent, dietary pattern of male urolithiasis patients was highly significant and quite different from controls. Urinary pH and creatinine of subjects and controls were non-significant. The mineral contents calcium in serum of male urolithiasis patients was highly significant between the group 1 control and group 2 male urolithiasis patients. In magnesium and phosphorous, it was non-significant and in urine, calcium and phosphorous was highly significant and magnesium was non-significant. **CONCLUSION:** The conclusion of the proposed study was that the prevalence and incidence of urolithiasis in male patients at Faisalabad were increasing day by day.

KEYWORDS: Urolithiasis, male patient's urolithiasis.

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INTRODUCTION

The production of stones in the kidney, ureter, urethra or urinary bladder is known as Urolithiasis. The formation of these stones in man has been documented as early as 4000 B.C. It is globally the most prevalent type of urological disease affecting about 12% of people worldwide, with men being more susceptible than women [1]. Individual and family history, gender, age, medical records, medications, environmental factors, changes in disease comorbidities, social interactions, climatic conditions, dietary habits and sedentary lifestyle have led to an increase in the occurrence of urolithiasis. Hence it can be stated that its causes are multifactorial and complex [2].

Their production is an elaborate process which includes multiple biochemical events. They comprise of super-saturation of the urine with elevated levels of crystals making up the stone, that later go through nucleation and crystallize in the kidneys, giving rise to renal calculi. The aggregate increases in size and may flow towards the ureter. If it blocks the path of the urine through the ureter, the patient experiences hydronephrosis along with enlargement of the ureter and renal pelvis [3].

There are numerous types of kidney stones such as struvite, calcium phosphate, cysteine, calcium oxalate, uric acid, and mixed stones types; based on the kind of material they are composed of. However, the most frequent kidney stone encountered are made up of calcium oxalate [4].

Pakistan lies in the Stone belt, and has shown a prevalence of 16% for urolithiasis throughout the nation [5]. It is responsible for 10-15% of all cases in the urology department. A study conducted in 2022 stated that people belonging to age group 50 and 60s were more prone to the development of kidney stones, with an incidence higher in men than in women. The main causes were identified as diabetes mellitus and inadequate fluid intake [6]. Excessive sweating due to hot weather leads to passing of minute quantity of urine which is highly concentrated, leading to the production of kidney stones. High salt intake, decreased intake of dietary fibers, increased intake of oxalates, animal protein, and refined carbohydrates along with insufficient oral hydration have been recognized as leading factors of stone formation in kidneys [7].

Numerous foods have been classified as, stone favorable and stone unfavorable, by the guidelines provided by The American Urological Association [8]. According to them, dietary counseling forms the basis of kidney stone prevention. National Kidney Foundation of America recommends the same in addition to emphasizing the importance of dietary calcium intake, and avoiding large doses of vitamin C and calcium supplementation [9].

MATERIALS AND METHODS

Area of sample collection

The blood and urine samples of twenty male urolithiasis patients were collected from Allied Hospital, Faisalabad. And ten healthy males were randomly selected as a control from the urban population of Faisalabad. To assess the prevalence and incidence of urolithiasis, the data was collected from OPD Out Patient Department and Urology and Kidney Transplant Unit of Allied Hospital, Faisalabad.

Place of research

The samples were analyzed in the Clinical Laboratory of PINUM Punjab Institute of Nuclear Medicine Cancer Hospital, Faisalabad.

Experimental design

Following groups were included for this study.

Group 1: Control healthy persons
35-65 years

Group 2: Subjects urolithiasis patients
35-65 years

Parameter studied

Following parameter were studied

A. dietary pattern

B. Estimation of minerals Calcium, Magnesium and Phosphorous from serum and urine.

C. pH of urine

D. Creatinine level in urine

A. Dietary pattern

Complete dietary pattern of controls and experimental subjects were assessed by a questionnaire which included the type of food, quality of food per day and times per day. The information was collected by a twenty-four-hour recall method especially for bread and cereals, meat and meat products, milk and milk products, vegetables, fruits and fluid intake Chughtai and Khan 1960.

B. Estimation of minerals Calcium, Magnesium and Phosphorous from serum and urine.

Minerals were estimated by spectrophotometer either in urine or serum.

Collection of samples

A total of **twenty** subject blood and urine samples were collected from urolithiasis patients and **ten** male control's blood and urine samples were collected from randomly selected healthy male.

Serum

Five milliliter venous blood samples were collected from each male subject and male control with the help of sterile syringe and then transferred it to the sterilized test tube. Serum was separated by centrifuging the samples at 4000rpm for fifteen minutes. The serum was preserved in freezer at -20°C.

b Urine

Fifty milliliter urine samples were collected from both the experimental subjects and controls. Urine was preserved at -20°C till analysis. For calcium analysis, twenty-four-hour urine sample collected by adding ten percent acetic acid solution as a preservative.

Levels of Calcium, Magnesium and Phosphorous analysis in serum

It was analyzed by using commercially available kit in the hospital pharmacy at the time.

Calcium, Magnesium and Phosphorous analysis in urine

It was analyzed by using commercially available kit in the hospital pharmacy at the time.

C. pH of urine

The urine pH was estimated by pH strips just after the sample of urine collected from the subjects or controls.

D. Creatinine level in urine

Creatinine was taken from the medical reports/records of patient.

RESULTS

The study was conducted to assess the prevalence, incidence and parameters and compared the male healthy and age matched control group 1 with experimental urolithiasis subjects group 2 between the ages of thirty- five to sixty-five years.

Test volunteers

For the determination of dietary pattern, minerals, pH and creatinine, group of ten control and twenty experimental urolithiasis subjects were selected.

Normal volunteers

Ten healthy male volunteers were randomly selected from the local population of

Faisalabad. Their ages were thirty-five to sixty-five.

Urolithiasis subjects

A group of twenty male urolithiasis patients aged thirty-five to sixty-five selected randomly from Allied Hospital, Faisalabad as described in the methods. The samples of urine and blood were collected from them for estimation of parameter. Their dietary pattern was taken through dietary proforma.

Prevalence

Prevalence of male urolithiasis patients at Faisalabad, was estimated taking the data from admission register of the urology and kidney transplant unit of Allied hospital, from June 2009 to June 2010. The total number of patients was one thousand three hundred and forty-three and the prevalence of urolithiasis in male at Faisalabad were seven hundred and forty-three and percentage was fifty three percent.

Incidence

Incidence was estimated by taking the data from the record of the OPD Out Patient Department. It was taken between the months of January to June 2010. The total number patient was one thousand eighty and the incidence of urolithiasis in male at Faisalabad we three hundred and ninety-eight and percentage was thirty seven percent.

Percentage distribution of dietary pattern of control group 1 and experimental urolithiasis subjects group 2.

The highly significant of χ 2 88.89 indicates that dietary pattern of patients was quite different from the dietary pattern of healthy people.

Mean ± SD of urinary pH values of control group 1 and experimental urolithiasis subjects group 2.

Mean ± SD of urinary pH values of control group 1 and experimental urolithiasis subjects group 2 were 6.150 ± 0.883 and 6.065 ± 0.742 respectively.

Analysis of variance of urinary pH values of control group 1 and experimental urolithiasis subjects group 2

The Analysis of variance of urinary pH decomposed the data into two components: a between-group component and a within-group component. The F-ratio, which in this case equals .077, was a ratio of the between-group estimate to the within-group estimate. Since the P- value of the F-test was greater than or equal to 0.05, there was not a statistically significant difference between the means of the variables at the 95.0% confidence interval.

Mean ± SD of urinary creatinine values of control group 1 and experimental urolithiasis subjects group 2.

Mean ± SD of urinary creatinine values of control group 1 and experimental urolithiasis subjects group 2 were 0.890 ± 0.281 and 1.075 ± 0.497 respectively.

Analysis of variance of urinary creatinine values of control group 1 and experimental urolithiasis subjects group 2.

The Analysis of variance of urinary creatinine decomposed the data into two components: a between group component and a within group component. The F-ratio, which in this case equals 1.182, was a ratio of the between-group estimate to the with-in group estimate. Since the P- value of the F-test was greater than or equal to 0.05, there was not a statistically significant difference between the means of the variables at the 95.0% confidence interval.

Mean ± SD of calcium in serum values of control group 1 and experimental urolithiasis subjects group 2.

Mean ± SD of calcium in serum values of control group 1 and experimental urolithiasis subjects group 2 were 8.950 ± 0.685 and 6.365 ± 2.200 respectively.

Analysis of variance of calcium in serum values of control group 1 and experimental urolithiasis subjects group 2.

The Analysis of variance of calcium in serum decomposed the data into two components: a between-group component and a within-group component. The F-ratio, which in this case equals 12.965, was a ratio of the between- group estimate to the with-in group estimate. Since the P-value of the F-test was less than or equal to 0.01, there was a highly significant difference between the means of the variables at the 95.0% confidence interval.

Mean ± SD of magnesium in serum values of control group 1 and experimental urolithiasis subjects group 2.

Mean ± SD of magnesium in serum values of control group 1 and experimental urolithiasis subjects group 2 were 2.410 ± 0.007, 2.435 ± 0.005 respectively.

Analysis of variance of magnesium in serum values of control group 1 and experimental urolithiasis subjects group 2.

The Analysis of variance of magnesium in serum decomposed the data into two components: a between-group component and a within-group component. The F- which in this case equals 1.019, was a ratio of the between-group estimate to the with- group estimate. Since the P-value of the F-test was greater than or equal to 0.01, there was a statistically significant difference between the means of the variables at the 95.0% confidence interval.

Mean ± SD of phosphorus in serum values of control group 1 and experimental urolithiasis subjects group 2.

Mean ± SD of phosphorus in serum values of control group 1 and experimental urolithiasis subjects group 2 were 3.540 ± 0.566 and 3.283 ± 1.024 respectively.

Analysis of variance of phosphorus in serum values of control group 1 and experimental urolithiasis subjects group 2.

The Analysis of variance of phosphorus in serum decomposed the data into two components: a between group component and a within group component. The F- which in this case equals 0.541, was a ratio of the between-group estimate to the with- group estimate. Since the P-value of the F-test was

greater than or equal to 0.01, there was statistically significant difference between the means of the variables at the 95.0%confidence interval.

Mean ± SD of urinary calcium values of control group 1 and experimental urolithiasis subjects group 2.

Mean ± SD of urinary calcium values of control group 1 and experimental Urolithiasis subjects group 2 were 0.592 ± 0.212 and 3.525 ± 2.791 respectively.

Analysis of variance of urinary calcium values of control group 1 and experimental urolithiasis subjects group 2.

The Analysis of variance of urinary calcium decomposed the data into two components: a between group component and a within group component. The F-ratio, which this case equals 10.819, was a ratio of the between-group estimate to the with-in group estimate. Since the P-value of the F-test was less than or equal to 0.01, there was a highly significant difference between the means of the variables at the 95.0% confidence interval.

Mean ± SD of urinary magnesium values of control group 1 and experimental urolithiasis subjects group 2.

Mean ± SD urinary magnesium values of control group 1 and experimental urolithiasis subjects group 2 were 1.0800±0.537484 and 11.000 ± 0.688 respectively.

Analysis of variance of urinary magnesium values of control group 1 and experimental urolithiasis subjects group 2.

The Analysis of variance of urinary magnesium decomposed the data into No components: a between group component and a within group component. The F-ratio, which in this case equals 0.644, was a ratio of the between-group estimate to the with-in group estimate. Since the P-value of the F-test was greater than or equal to 0.01, there was not a statistically significant difference between the means of the variables at the 95.0% confidence interval.

Mean ± SD of urinary phosphorus values of control group 1 and experimental urolithiasis subjects group 2.

Mean ± SD of urinary phosphorus values of control group 1 and experimental urolithiasis subjects group 2 were 123.800 + 3.4253 and 19.809 ± 8.980 respectively.

Analysis of variance of urinary phosphorus values of control group 1 and experimental urolithiasis subjects group 2.

The Analysis of variance of urinary phosphorus decomposed the data into two components: a between group component and a within group component. The F-ratio, which in this case equals 1232.589, was a ratio of the between-group estimate to the with-in group estimate. Since the P-value of the F-test was less than or equal to 0.01, there was a statistically highly significant difference between the means of the variables at the 95.0% confidence interval.

Table 1. *Percentage distribution of dietary pattern of control group 1 and experimental urolithiasis subjects group 2*

Groups	Control 35-65 years	Subject 35-65 years
Milk %	55	45
Meat %	35	55
Fruits %	55	45
Vegetables %	35	65
Bread and Cereals %	60	40
Fluid intake %	70	30

The highly significant of χ^2 88.89 indicates that dietary pattern of patients was quite different from the dietary pattern of healthy people under study has been shown in table 1.

Figure 1.1. *Column chart of dietary pattern of control group 1 and experimental urolithasis subjects group 2*

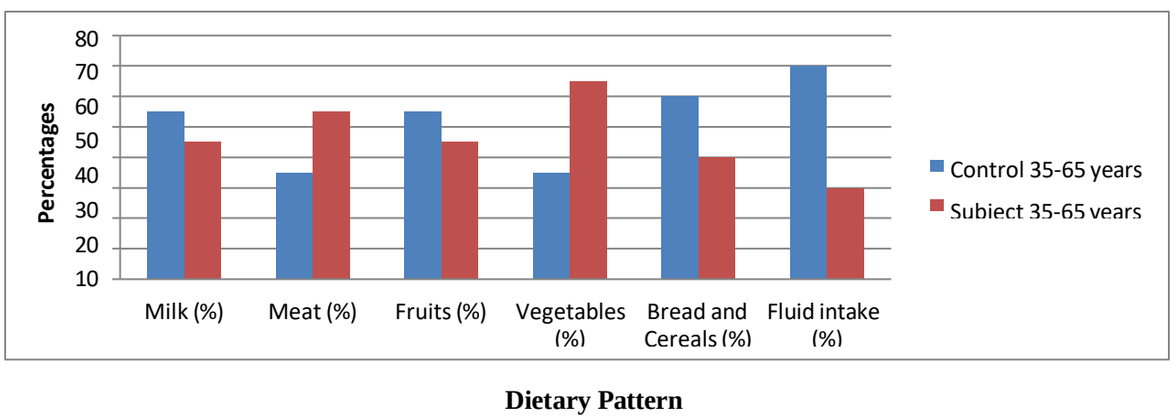

Table 2. *Mean ± SD of urinary pH values of control group 1 and experimental urolithiasis subjects group 2*

Groups	Control 35-65 years	Subject 35-65 years	Total
No. of volunteers	10	20	30
Mean ± SD	6.150 + 0.883	6.065 + 0.742	6.093 + 0.778
Minimun	4.5	4.5	4.5
Maximum	7.5	8.0	8.0

Mean ± SD of urinary pH values of control group 1 and experimental urolithiasis subjects group 2 were 6.150 ± 0.883 and 6.065 ± 0.742 respectively.

Table 3. *Comparison between Mean ± SD of urinary creatinine, calcium, magnesium and phosphorous values of control group 1 and experimental urolithiasis subjects group 2*

MaleGroups	Control35-65 years	Subject35-65 years	Total
No. of volunteers	10	20	30
Mean ± SD of urinary creatinine	0.890 ± 0.281	1.075 ± 0. 497	1.013 ± 0.441
Minimum urinary creatinine	0.6	0.6	0.6
Maximum urinary creatinine	1.3	3.0	3.0
Mean ± SD of urinary calcium	0.592 ± 0.212	3.525 ± 2.791	2.547 ± 2.664
Minimum urinary calcium	0.2	0.1	0.1
Maximum urinary calcium	0.8	9.2	9.2
Mean ± SD of urinary magnesium	10.800 ± 0.537	11.000 ± 0.688	10.933 ± 0.640
Minimum urinary magnesium	10.0	10.0	10.0
Maximum urinary magnesium	11.5	13.0	13.0
Mean ± SD of urinary Phosphorous	123.800 ± 3.425	19.809 ± 8.980	54.472 ± 50.423
Minimum urinary Phosphorous	120.0	1.3	1.3
Maximum urinary Phosphorous	131.0	32.1	131.0

Mean ± SD of urinary creatinine, calcium, magnesium and phosphorous values of control group 1 and experimental urolithiasis subjects group 2 were 0.890 ± 0.281 and 1.075 ± 0. 497, 0.592 ± 0.212 and 3.525 ± 2.791, 10.800 ± 0.537 and 11.000 ± 0.688, 123.800 ± 3.425 and 19.809 ± 8.980 respectively.

Table 4. *Comparison between Mean ± SD of Serum Calcium, Magnesium and Phosphorous values of control group 1 and experimental urolithiasis subjects group 2*

Male Groups	Control35-65 years	Subject35-65 years	Total
No. of volunteers	10	20	30
Mean ± SD of serum calcium	8.950 ± 0.685	6.365 ± 2.200	7.227 ± 2.203
Minimum serum calcium	8.0	1.7	1.7

Maximum serum calcium	10.0	9.0	10.0
Mean ± SD of serum magnesium	2.410 ± 0.007	2.435 ± 0.005	2.427 ± 0.006
Minimum serum magnesium	2.3	2.3	2.3
Maximum serum magnesium	2.5	2.5	2.5
Mean ± SD of serum Phosphorous	3.540 ± 0.566	3.283 ± 1.024	3.369 ± 0.895
Minimum serum Phosphorous	2.5	1.1	1.1
Maximum serum Phosphorous	4.2	4.9	4.9

Mean ± SD of serum calcium, magnesium and phosphorous values of control group 1 and experimental urolithiasis subjects group 2 were 8.950 ± 0.685 and 6.365 ± 2.200, 2.410 ± 0.007 and 2.435 ± 0.005, 3.540 ± 0.566 and 3.283 ± 1.024 respectively.

DISCUSSION

Pakistan is one such country which falls in geographical zone of a stone belt's nation and a high incidence of urolithiasis has been reported throughout the country [10]

According to the present study, the prevalence of urolithiasis in male at Faisalabad was fifty three percent. The rate was double in men than in women between the ages of thirty-five to sixty-five years. The prevalence rates of urolithiasis in the population of Faisalabad increased gradually with age in men varying from to fifty three percent in the thirty-five to sixty-five years age group. Among patients with confirmed urolithiasis, the incidence is slightly higher in males. The rate was slightly higher in men than in women in almost all age groups, although this was not statistically significant. Stamatiou concluded that the prevalence of urolithiasis in the rural population of Thebes was 15% [11]

Although the incidence of bladder stones appears to be mostly related to malnutrition in underdeveloped countries, and historically, improvement in the diet over the years has led to changes in urinary stones from bladder to kidney [12.] In the present study, Faisalabad is the industrial city of Pakistan and the incidence rate of urolithiasis in the city was increasing day by day due to the changing in global environment and other factors like dietary habits, etc. As the prevalence of urinary stones rises in industrialized nations, understanding the pathogenesis and treatment of hypercalciuria becomes increasingly important [13].

In industrial countries, kidney stones are major common problem affecting one person in thousand annually and incidence was increasing in tropical developing countries [14]. The present study was carried out in an industrial city Faisalabad, it was observed that due to climate, unhygienic conditions, pollution, lack of resources for proper discharge of industrial waste material, mineral contents present in water, type of food, type of work and carbonated drinks etc. Mostly people who were interacted with this disease belong to lower middle class or laborer class had more urinary stones than those people who were less exposure to the sun. Though in early consider, the issues were quite common due to climate, living conditions of the individual and financial viewpoints [15].

Ramello higher rate of renal stone disease was reported in males than in females, about three males were afflicted for every female. In the present study, the male to female ratio was double. It depends on dietary pattern of male and working conditions [16].

Because male had more exposure to sun than female. Male perspire more than female, so the urine of male was more concentrated.

Renal lithiasis was a multifactorial disease. In the present study, the results were highly significant, which means that dietary pattern of patients subjects were quite different from the dietary pattern of healthy people and directly related to diet. Under the present findings, patients were taking more restricted diet than healthy males. Felix et al. said in study that an important number of etiologic factors can be adequately modified through diet, since it must be considered that the urine composition was directly related to diet. In fact, changing unhealthy eating habits should be an important measure to prevent kidney stones. Different diets liquid intake, pH, calcium, phosphate, oxalate, citrate, phytate, urate and vitamins have been associated with all type of kidney stone calcium oxalate monohydrate papillary, calcium oxalate monohydrate unattached, calcium oxalate dihydrate, calcium oxalate dihydrate/hydroxyapatite, hydroxyapatite, struvite infectious, brushite, uric acid, calcium oxalate/uric acid and cystine [17].

4.6 - 8.0 is the normal range of ph. In the present study, the mean pH of control and experimental urolithiasis subjects were lying in normal range.

According to the analysis of variance, the comparisons of pH values between Group 1control and Group2 subjects were non-significant. Due to these results, my study showed that, there was no significant relationship of pH and urolithiasis in control and experimental subject group. Charles et al. studied that there was no significant difference in urinary calcium, oxalate, uric acid, citrate, pH, total volume, sodium, potassium, sulfate or phosphorus. According to the whole study on urinary pH and urolithiasis, I concluded that urinary pH did not affect the normal or urolithiasis patients. There was another factor which helped stone formation in subjects [18].

A healthy kidney removes creatinine out of the blood and it is excreted out of the body through urine. Creatinine builds up in the blood and its concentration increases in case the kidneys are not functioning. It is generally viewed that creatinine clearance that the best measures of glomerulus filtration rate GFR [19]. Normal range of creatinine in urine of male is 0.6-1.2 mg/dl. The average mean values of creatinine concentration in urine were
1.013. There was not a statistically significant difference between the means of the variables at the 95.0% confidence interval. Whereas in earlier study; it was 839.88 in urine of male volunteers [20]. As I observed that there was no difference in the urinary creatinine level of healthy and experimental urolithiasis subjects so there were other factors through which my experimental subjects were getting urolithiasis. Schwille et al. studied that serum Calcium was significantly higher in urolithiasis patients than in controls [21]. Same as the earlier study, my results for calcium in serum as was also highly significant. So, it means that the level of calcium in serum of control was always differing from the experimental male subjects. Because the calcium oxalate stones were most common in this area.

In the present study, the total mean of phosphorous in serum of control and experimental urolithiasis subjects were 2.427. And the Analysis of variance shown that, there was not a statistically significant difference between the means of the variables at the 95.0% confidence interval. Keele and Neil elucidated that the rise of serum phosphate which occurs in anuria subject may secondary lower serum calcium [22]. In the present research, the total mean of magnesium in serum of control and experimental subjects were 3.369. And there was not a statistically significant difference between the means of the variables at the 95.0% confidence interval. Due to these results, I concluded that the level of magnesium in serum had no effect on urolithiasis or the level of magnesium in serum of urolithiasis patients was not changed.

Khalifa et al. noted that excretion of calcium, oxalate, and urate did not differ between patients and controls. They concluded that patients excreted significantly more phosphate and had lower twenty- four-hour urine volumes than controls [23]. According to my study, the urinary excretion was more than excretion in serum. There was a highly significant difference between the means of the variables at the 95.0% confidence interval. It depends on their dietary pattern, likeness, style of living, fluid intake, environment and place of living etc. Intake of mild high-calcium diet beneficial to decrease the urinary oxalate excretion and probability of stone formation in patients with idiopathic hypercalciuria [24]. Excess of magnesium was rapidly excreted by the urine. In magnesium deficient states the magnesium reabsorbed rapidly by the kidney tubules and virtually disappears from the urine. In the present study, the total mean of magnesium in urine of control and subjects were 10.933. There was no significant difference between the control and urolithiasis subjects. So, the urinary magnesium of controls was not different from the urolithiasis subjects. Controls had normal urinary value due to normal health and urolithiasis male subjects had also a normal value of excretion of urinary magnesium

In the present study, the total mean of urinary phosphorous of healthy male and male urolithiasis subjects were 5.4472. There was a highly statistically significant difference between the means of the variables of control and experimental subjects at the 95.0% confidence interval. The reason was that, the metabolic rate of experimental subjects was disturbed. So, they did not absorb phosphorus form diet or any other disability in the body.

CONCLUSION

1. Prevalence of urolithiasis was higher in males than in females.
2. Incidence of urolithiasis was increasing rapidly.
3. Diet plays a significant role in the urinary stone formation.
4. The excretion of calcium was more in urolithiasis patients than controls.
5. pH and creatinine have no effect on urolithiasis.
6. Serum calcium, urinary calcium and urinary phosphorus were higher in male urolithiasis patients than controls.
7. Serum magnesium, serum phosphorus, urinary magnesium had no or very low change in the control or urolithiasis subjects.

ETHICS APPROVAL: The ERC gave ethical review approval.

CONSENT TO PARTICIPATE: written and verbal consent was taken from subjects and next of kin.

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AUTHORS' CONTRIBUTIONS: All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated in the work to take public responsibility of this manuscript. All authors read and approved the final manuscript.

CONFLICT OF INTEREST: No competing interest declared.

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