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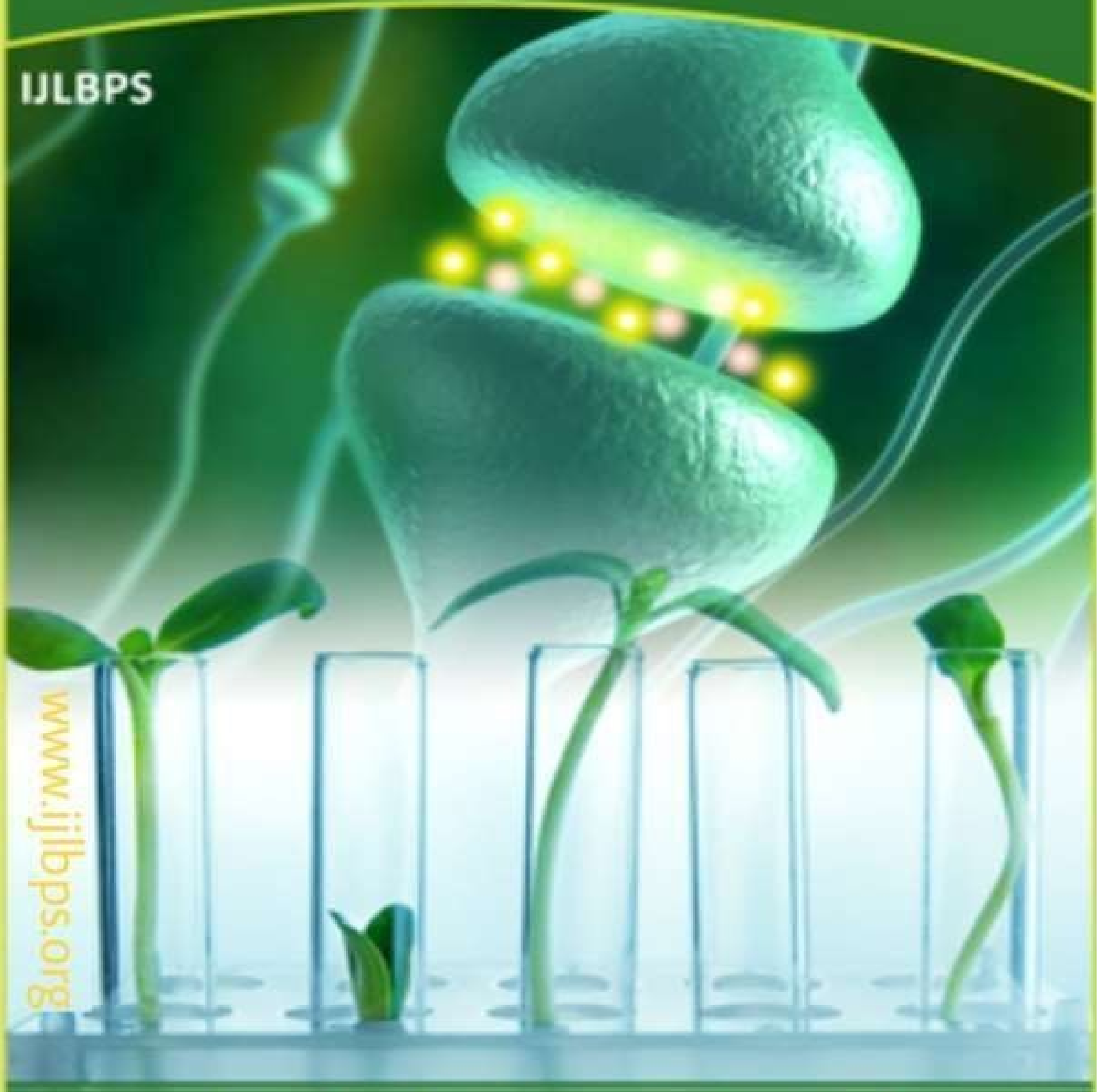

E-mail: editorijlbps@gmail.com editor@ijlbps.org

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Analysis of renal stone chemical composition

Dr. Sai Kiran

Assistant Professor, Department of Biochemistry, Era's Lucknow Medical College, Lucknow, Uttar Pradesh, India

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ABSTRACT

Context: Nephrolithiasis is a common condition that affects many people, especially those in their working years. The incidence of this condition is increasing and varies greatly throughout the world's areas. In order to determine the chemical make-up of kidney stones, the current investigation was carried out. Procedures and Supplies: For this study, 54 individuals with renal stones were chosen. The samples were first swabbed to check for microbes, then rinsed in deionized water and allowed to dry. A variety of morphological traits, such as form, color, and texture, were noted. To determine how opaque the stones were, they were X-rayed. Using a scalpel, the kidney stone's core and surface parts were sliced. In order to obtain a fine, uniform powder for qualitative measurement of different components, it was pounded using a pestle and mortar. Thirty men and twenty-four ladies made up the 54 patients. The chemical composition varied among the participants: 3 men and 2 females tested positive for inorganic compounds, 6 men and 4 females for carbonate, 4 men and 3 females for oxalate, 6 men and 5 females for phosphate, 3 men and 3 females for ammonia, 2 men and 3 females for uric acid, 4 men and 3 females for magnesium, and 2 men and 3 females for organic compounds. ($P > 0.05$) The disparity was not statistically significant. There were 5 males and 3 females with a sterile bacterial profile, 7 males and 6 females with a Proteus profile, 2 males and 2 females with candidain, 1 female with P aeruginosa, 2 males and 1 female with Citrobacter diversus, 2 males and 1 female with Citrobacter Freudenreichii, 6 males and 7 females with Enterobacter species, 1 male and 1 female with staphylococcus aureus, and 5 males and 2 females with contaminated results. ($P > 0.05$) The disparity was not statistically significant. In sum: Patients most often had Proteus spp. infections, which may result from poor urine drainage and cause persistent UTIs, as shown by the presence of $MgNH_4PO_4$ (struvite) stones in their kidneys.

Important terms: phosphate, Citrobacter diversus, and nephrolithiasis.

INTRODUCTION

The incidence of nephrolithiasis is increasing and varies substantially across locations throughout the globe; it mostly affects people of working age. 1 Rates of 10.6% (95% CI, 9.4-11.9) in males and 7.1% (95% CI, 6.4-7.8) in women are recorded in the United States, bringing the overall incidence to 8.8% (95% CI, 8.1-9.5). 2 The typical components of kidney stones are struvite, cysteine, uric acid, and calcium salts. The two most common kinds of stones, calcium oxalate and calcium phosphate, account for around 80% of all instances. 3 After them, struvite(5%), cysteine(1%), and uric acid(5-10%) come in, with traces of other kinds present in the rest of the cases. When we look at the age distribution of calcium stones, we see that they most often occur in males in their 40s. 4

Uric acid stones are more common in men and those who have metabolic syndrome or gout. Struvite stones are common in female patients, especially those requiring chronic bladder dialysis. tube insertion.5 When this stone forms, it may enlarge to occupy the renal pelvis and calyces, giving the patient a telltale "staghorn" look. 6 As a result of water retention, compounds with limited solubility must be excreted by the kidneys. The formation of urinary stones is usually caused by a discordance between the solubility and precipitation of salts, two physically opposed qualities. Normal physiological processes and certain chemicals in the body prevent crystallization in urine, balancing these two opposed physical qualities. 7

The complex and multi-step process of stone production includes steps like crystallization in supersaturated urine as a result of either an increase in the excretion of stone-forming molecules or a reduction in urine volume. A clinical stone forms during crystal nucleation and subsequent recurrent aggregation. 8,9 In order to determine the chemical make-up of kidney stones, the current investigation was carried out.

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MATERIALS & METHODS

In the biochemistry department, 54 individuals with renal stones participated in the research. Everyone who wanted to take part in the research had to sign a waiver.

Name, age, gender, and other personal details were noted. The samples were first swabbed to check for microbes, then rinsed in deionized water and allowed to dry. Color and other morphological traits form, among other features, were noted. To determine how opaque the stones were, they were X-rayed. Using a scalpel, the kidney stone's core and surface parts were sliced. In order to obtain a fine, uniform powder for qualitative measurement of different components, it was pounded using a pestle and mortar. The resulting data was then analyzed statistically. A significant P value was defined as less than 0.05.

RESULTS

Table I Distribution of patients

Total- 54		
Gender	**Male**	**Female**
Number	30	24

Table I shows that out of 54 patients, 30 were males and 24 were females.

Table II Assessment of chemical composition

Composition	Male	Female	P value
Inorganic	3	2	0.73
Carbonate	6	4	
Oxalate	4	3	
Phosphate	6	5	
Ammonia	3	3	
Uric acid	2	3	
Magnesium	4	3	
Organic	2	3	

Table II, graph I shows that chemical composition was inorganic in 3 males and 2 females, carbonate in 6 males and 4 females, oxalate in 4 males and 3 females, phosphate in 6 males and 5 females, ammonia in 3 males and 3 females, uric acid in 2 males and 3 females, magnesium in 4 males and 3 females and organic in 2 males and 3 females. The difference was non- significant (P> 0.05).

Graph IAssessment of chemical composition

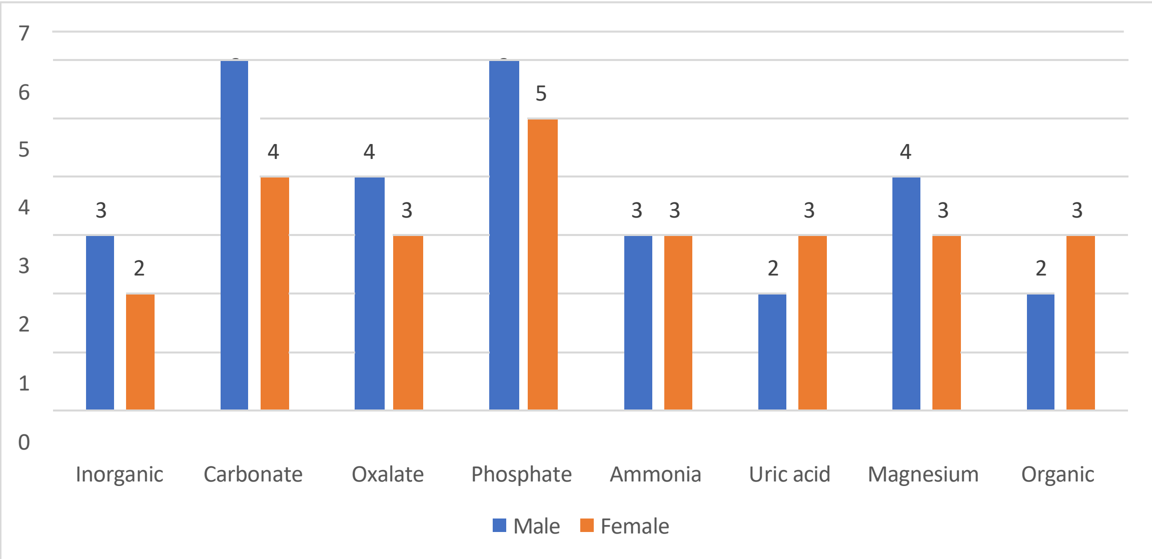

Table III Bacteriological profile of the kidney stone

Profile	Male	Female	P value
Sterile	5	3	0.51
Proteus	7	6	
Candida	2	2	
P aeruginosa	0	1	
Citrobacter diversus	2	1	
Citrobacter freundii	2	1	

Enterobacter species	6	7	
Staphylococcus aureus	1	1	
Contaminated	5	2	

Table III shows that bacteriological profile was sterile in 5 males and 3 females, Proteus in 7 males and 6 females, candida in 2males and 2 females, P aeruginosa in 1 female, Citrobacter diversus in 2 males and 1 female and citrobacterfreundii in 2males and 1 female, Enterobacter species6males and 7 females, staphylococcus aureus in 1male and 1 female and contaminated5males and 2females. The difference was non-significant (P> 0.05).

DISCUSSION

More exact data is required to determine the whole chemical make-up and physical factors driving stone formation. 10, 11There is currently no one analytical method that can accurately quantify urinary calculi. 12 In order to determine the chemical make-up of kidney stones, the current investigation was carried out. Of the 54 individuals we examined, 30 were men and 24 were women. Over the course of thirteen months (July 2005–July 2006), RisalSet al.13 examined the chemical makeup of forty-seven kidney stones taken from surgical patients hospitalized to NMCTH. Every one of the stones was a hybrid. Every every stone had calcium. The percentage of patients with oxalate, phosphate, and uric acid was 95.7%, 87.2%, and 34.0%, respectively. Based on the study, it seems that the majority of the stones are composed of calcium oxalate. Among those under the age of 20, the frequency was notably high. Three men and two females had inorganic chemical compositions, six men and four females had carbonate, four men and three females had oxalate, six men and five females had phosphate, three men and three females had ammonia, two men and three females had uric acid, four men and three females had magnesium, and two men and three females had organic chemical compositions. The results showed that out of the total number of bacteria tested, 5 were sterile, 3 were female, 7 were Proteus, 2 were candida, 1 was P. aeruginosa, 2 were Citrobacter diversus, 1 was Citrobacter freundii, 6 were Enterobacter species, 1 was staphylococcus aureus, and 5 were contaminated. Joe Jawalekar Arrange the fourteen After analyzing 100 stones, the chemical composition was determined to be 25.68 +/- 5.38 for calcium, 32.84 +/- 17.28 for calcium oxalate hydrate crystal, 20.35 +/- 10.70 for oxalic acid, and 41.70 +/- 16.56 for apatite crystal, 8.09 +/- 3.08 for inorganic phosphate. The stones contain 27.12+/- 11.42 milligrams of total uric acid. The main ingredients were magnesium ammonium phosphate hexahydrate 3.3 percent, uric acid 27.1 percent, calcium oxalate 32.8% (monohydrate and dihydrate), phosphate 41.7 percent, and phosphorus. The stone was not pure. Almost every stone had calcium oxalate, and most renal calcium stones have a combination of calcium phosphates and calcium oxalate, with a few also containing uric acid or magnesium ammonium phosphate.

CONCLUSION

Authors found that stones of $MgNH_4PO_4$ (struvite) were the most frequently observed type of renal calculi in patients, signifying a Proteus spp. infection that can arise from impaired urinary drainage and lead to chronic UTIs.

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