Chapter V

RESULTS AND OBSERVATIONS

In the present study prevalence of nephrolithiasis and its correlation with biochemical parameters in patients from Marathwada Region was studied and age, sex matched with normal healthy controls.

In this study biochemical parameters such as urea, creatinine, uric acid, calcium phosphorus, sodium and potassium and chloride in urine and serum were measured.

The total proteins and albumin in serum were also measured. Urinary citrate, oxalate and magnesium were measured. Urinalysis, stone analysis and urine microscopy, culture and sensitivity were performed.

The data obtained was treated with standard statistical methods. The statistical significance of results were measured by t-test. There were changes in some of the parameters in patients when compared to normal healthy control group. The results of these parameters were summarized in Table No. 3, 4, 5 & 6.
5.1 Biochemical Parameter in Serum :-

5.1.1 Blood urea

There was no significant change of blood urea levels in nephrolithiasis patient as compared to normal healthy control group (P > 0.05). The values of blood urea in nephrolithiasis patients was $17.3 \pm 0.713 \text{mg/dl}$ whereas in control group it was $21.9 \pm 2.54 \text{mg/dl}$ (Table No.3).

5.1.2 Serum Creatinine :-

There was no significant change of serum creatinine levels in nephrolithiasis patient as compared to normal healthy control group (P > 0.05). The values of serum creatinine in nephrolithiasis patients was $1.13 \pm 0.051 \text{mg/dl}$ whereas in control group it was $1.12 \pm 0.022 \text{mg/dl}$ (Table No.3).

5.1.3 Serum uric acid :-

Serum uric acid level was significantly elevated in patients of nephrolithiasis than the normal healthy control group (P < 0.005). The values of serum uric acid in nephrolithiasis patients was $5.38 \pm 0.166 \text{mg/dl}$ whereas in normal healthy controls it was $4.71 \pm 0.153 \text{mg/dl}$ (Table No.3, Figure No.1).

5.1.4 Serum calcium :-

Serum calcium level was significantly elevated in patients of nephrolithiasis as compared to the normal healthy control group (P < 0.001). The values of serum calcium in nephrolithiasis patients was $10.1 \pm 0.159 \text{mg/dl}$
Table No.3: Serum values of Biochemical parameters in nephrolithiasis patients and normal healthy controls.

<table>
<thead>
<tr>
<th>Group</th>
<th>Study Subjects</th>
<th>No. of Cases Studied (n)</th>
<th>Biochemical parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Urea (mg/dl)</td>
</tr>
<tr>
<td>I)</td>
<td>Normal healthy</td>
<td>100</td>
<td>21.9±</td>
</tr>
<tr>
<td></td>
<td>Controls</td>
<td></td>
<td>2.54</td>
</tr>
<tr>
<td>II)</td>
<td>Nephrolithiasis</td>
<td>100</td>
<td>17.3±</td>
</tr>
<tr>
<td></td>
<td>Patients</td>
<td></td>
<td>0713#</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± SD  # P > 0.05 Non. Significant

*P < 0.001 Highly Significant **P < 0.005 Significant.
Table No. 4: Serum values of Biochemical parameters in nephrolithiasis patients and normal healthy controls.

<table>
<thead>
<tr>
<th>Group</th>
<th>Study Subjects</th>
<th>No. of Cases Studied (n)</th>
<th>Biochemical parameters</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Calcium (mg/dl)</td>
<td>Inorganic Phosphorus (mg/dl)</td>
</tr>
<tr>
<td>I)</td>
<td>Normal healthy Controls</td>
<td>100</td>
<td>9.47±</td>
<td>3.44±</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.088</td>
<td>0.102</td>
</tr>
<tr>
<td>II)</td>
<td>Nephrolithiasis Patients</td>
<td>100</td>
<td>10.1±</td>
<td>4.93±</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.159*</td>
<td>0.22*</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± SD  # P > 0.05 Non. Significant
*P < 0.001 Highly Significant ** P < 0.005 Significant.
Figure 1: Comparison between serum biochemical parameters in Group I & II

- Uric acid
- Calcium
- Inorganic phosphorus

mg/dl

Control
Patients
whereas in normal healthy controls it was 9.41 ± 0.088 mg/dl (Table No.4, Figure No. 1).

5.1.5 **Serum inorganic phosphorus** :-

The significantly increased levels of serum inorganic phosphorus was observed in patients of nephrolithiasis as compared to normal healthy controls (P < 0.001). The values of serum inorganic phosphorus in nephrolithiasis patients and normal healthy controls were 4.93 ± 0.22 mg/dl and 3.44 ± 0.102 mg/dl respectively (Table No.4, Figure No. 1)

5.1.6 **Serum Sodium, potassium and chloride** :-

There were no significant change of Serum Sodium, potassium & chloride in nephrolithiasis patients as compared to normal healthy control group (P > 0.05).

The values of serum sodium, potassium and chloride in nephrolithiasis patients were 151 ± 11.0 m Eq/L, 4.58 ± 0.09 m Eq/L and 106 ± 1.20 m.Eq/L respectively. The values of serum sodium, potassium and chloride in normal healthy controls were 155 ± 11.1 m Eq/L, 4.09 ± 00.4 m Eq./L and 107 ± 0.864 m Eq/L respectively (Table No. 4)

5.1.7 **Serum Total protein and albumin** :-

There was no significant change of serum total protein levels in patients of nephrolithiasis as compared to normal healthy control group (P > 0.05). The serum albumin level was significantly increased in nephrolithiasis patients than the normal healthy controls (P < 0.01). The values of serum total
proteins and albumin in nephrolithiasis patients were $6.97 \pm 0.09$ gm/dl and $4.46 \pm 0.076$ gm/dl respectively, whereas in normal healthy controls were $6.85 \pm 0.067$ gm/dl and $4.06 \pm 0.044$ gm/dl respectively (Table no. 3).

5.2 Biochemical parameters in urine :-

5.2.1 Urinary urea: -

There was no significant change of urinary urea levels in nephrolithiasis patient as compared to normal healthy controls ($P > 0.05$). The values of urinary urea in nephrolithiasis patients was $20.1 \pm 0.819$ gm/24hr., whereas in normal healthy control group it was $21.3 \pm 0.529$ gm/24hr. (Table No.5)

5.2.2 Urinary creatinine :-

There was significantly decreased levels of urinary creatinine in nephrolithiasis patients as compared to normal healthy control group ($P < 0.05$). The values of urinary creatinine in nephrolithiasis patients was $1.58 \pm 0.0334$ gm/24hrs, where as in control group it was $1.69 \pm 0.294$ gm/24 hrs (Table No. 5)

5.2.3 Urinary uric acid :-

The urinary uric acid was significantly elevated in nephrolithiasis patients as compared to normal healthy control group ($P < 0.01$). The values of urinary uric acid in nephrothiasis patients and normal healthy controls were $485.9 \pm 31.64$ mg/24hrs and $266.1 \pm 8.962$ mg/24hrs respectively (Table No. 5, Figure No. 2-a).
### Table No.5: Urinary values of Biochemical parameters in nephrolithiasis patients and normal healthy controls.

<table>
<thead>
<tr>
<th>Group</th>
<th>Study Subjects</th>
<th>No.of Cases Studied</th>
<th>Biochemical parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(n)</td>
<td>Urea (g/day)</td>
</tr>
<tr>
<td>I) Normal healthy Controls</td>
<td>100</td>
<td>21.3 ± 0.529</td>
<td>1.69 ± 0.294</td>
</tr>
<tr>
<td>II) Nephrolithiasis Patients</td>
<td>100</td>
<td>20.1 ± 0.819#</td>
<td>1.58 ± 0.033**</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± SD  
# P > 0.05 Non. Significant

*P < 0.001 Highly Significant ** P < 0.005 Significant.
Table No.6 :- Urinary values of Biochemical parameters in nephrolithiasis patients and normal healthy controls.

<table>
<thead>
<tr>
<th>Group</th>
<th>Study</th>
<th>No.of Cases</th>
<th>Biochemical parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Calcium (mg/day)</td>
</tr>
<tr>
<td>I) Normal healthy</td>
<td>100</td>
<td>90.39±</td>
<td>427±</td>
</tr>
<tr>
<td>(Controls)</td>
<td></td>
<td>2.712</td>
<td>8.02</td>
</tr>
<tr>
<td>II) Nephrolithiasis</td>
<td>100</td>
<td>182 ±</td>
<td>226 ±</td>
</tr>
<tr>
<td>Patients</td>
<td></td>
<td>8.726*</td>
<td>14.4*</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± SD  # P > 0.05 Non. Significant

*P < 0.001 Highly Significant ** P < 0.005 Significant.
5.2.4 Urinary calcium, magnesium and inorganic phosphorus:

The urinary calcium level was significantly increased in nephrolithiasis patients as compared to normal healthy control group (P < 0.001). The urinary magnesium (P < 0.05) and inorganic phosphorus (P < 0.001) levels in nephrolithiasis patients were significantly decreased compared to normal healthy control group.

The values of urinary calcium, magnesium and inorganic phosphorus in nephrolithiasis patients were 182 ± 8.726 mg/24hrs., 113 ± 12.5 mg/24hrs. and 226 ±14.4 mg/24hrs. respectively. The values of urinary calcium magnesium and inorganic phosphorus in normal healthy controls were 90.39 ± 2.712 mg/24hrs., 150 ± 11.8 mg/24hrs. and 427 ± 8.02 mg/24 hrs. respectively. (Table No. 6, Figure No. 2-a & 2-c)

5.2.5 Urinary sodium, potassium and chloride:

The urinary sodium level was significantly increased (P < 0.001) in nephrolithiasis patients as compared to normal healthy controls whereas urinary potassium (P <0.05) and chloride (P < 0.001) were significantly decreased in patients of nephrolithiasis as compared to normal healthy controls.

The values of urinary sodium in nephrolithiasis patients and controls were 211 ± 3.73 m Eq/24 hrs and 172 ± 3.25 m Eq / 24hrs. respectively. The values of urinary potassium and chloride in nephrolithiasis
Figure 2-a: Comparison between urinary biochemical parameters in Group I & II

- Uric acid
- Calcium
- Oxalate

Figure 2-b: Comparison between urinary biochemical parameters in Group I & II

- Sodium
- Potassium
- Chloride

Figure 2-c: Comparison between urinary biochemical parameters in Group I & II

- Magnesium
- Citrate
- Phosphorus
1.019 to 1.029 in patients and normal healthy controls respectively. The blood and protein were absent in urine of nephrolithiasis patients and normal healthy controls.

The urinary pH of nephrolithiasis patients was significantly decreased (P < 0.001) as compared to normal healthy controls. The values of urinary pH in nephrolithiasis patients and normal healthy controls were 6.10 ± 0.054 and 6.48 ± 0.041 respectively (Table no. 7)

5.4 Urine microscopy

In the present study urine microscopy was performed in nephrolithiasis patients and in controls, there were no any abnormalities in urine microscopy of normal healthy controls whereas in nephrolithiasis patients crystals of calcium oxalates were detected.

The crystals of calcium oxalate were colourless, octahedral and appears as a small squares crossed by two diagonal lines (Envelope Shaped) and also dumbbell shaped. These crystals varies in size.

5.5 Urine culture and sensitivity :

The urine culture was sterile in both nephrolithiasis patients and normal healthy controls (Table No.7). Hence sensitivity was not checked.
1.019 to 1.029 in patients and normal healthy controls respectively. The blood and protein were absent in urine of nephrolithiasis patients and normal healthy controls.

The urinary pH of nephrolithiasis patients was significantly decreased (P < 0.001) as compared to normal healthy controls. The values of urinary pH in nephrolithiasis patients and normal healthy controls were 6.10 ± 0.054 and 6.48 ± 0.041 respectively (Table no. 7).

5.4 Urine microscopy

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5.5 Urine culture and sensitivity :-

The urine culture was sterile in both nephrolithiasis patients and normal healthy controls (Table No.7). Hence sensitivity was not checked.
Table No.7: Urinalysis, urine microscopy and urine culture and sensitivity in nephrolithiasis patient and normal healthy controls.

<table>
<thead>
<tr>
<th>Group</th>
<th>Study Subjects</th>
<th>No of Cases Studied (n)</th>
<th>24 Hr. urinary Volume (Lt)</th>
<th>pH</th>
<th>Specific gravity</th>
<th>Blood</th>
<th>Protein</th>
<th>Urine Microscopy</th>
<th>Urine Culture &amp; Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>I)</td>
<td>Normal healthy Controls</td>
<td>100</td>
<td>1-2</td>
<td>6.48 ± 0.041</td>
<td>1.019 - 1.030</td>
<td>Nil</td>
<td>Nil</td>
<td>Not abnormality detected</td>
<td>Sterile</td>
</tr>
<tr>
<td>II)</td>
<td>Nephrolithiasis Patients</td>
<td>100</td>
<td>0.6 - 1.5</td>
<td>6.10* ± 0.05</td>
<td>1.091 - 1.029</td>
<td>Nil</td>
<td>Nil</td>
<td>Crystals of calcium oxalate detected</td>
<td>Sterile</td>
</tr>
</tbody>
</table>

Comparision between group I and II P < 0.001*
5.6 Stone analysis: -

In the present study qualitative stone analysis was carried out for 50 renal stones. The qualitative analysis shows that the maximum renal stones were composed of calcium oxalate (about 78%), calcium oxalate with phosphorus (20%) and calcium oxalate with uric acid nucleus (2%), (Table no. 8)

Table No. 8: Composition of renal stone with its percentage.

<table>
<thead>
<tr>
<th>Total no. of stone studied</th>
<th>Calcium oxalate</th>
<th>Calcium oxalate with phosphate</th>
<th>Calcium oxalate with uric acid nucleus</th>
<th>Uric acid</th>
<th>Struvite</th>
<th>Cystein &amp; other</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>39 (78%)</td>
<td>10 (20%)</td>
<td>01 (2%)</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
</tr>
</tbody>
</table>