A Clinical Study of Nephrotic Syndrome with Special Reference to Serum Lipid Profile

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Abstract: Background and Objective: Nephrotic syndrome is an important chronic renal disease in children characterized by minimal change disease in the majority. The objectives of present study were: (1) To study the clinical features of nephrotic syndrome. (2) To study the levels of serum cholesterol, serum triglycerides, HDL, LDL and VLDL in nephrotic syndrome. Methodology: A prospective study which included 50 children with nephrotic syndrome, aged between 2-12 years. They were clinically examined and lipid profile was done at the onset and during remission. Thirty children without liver and kidney disorders were taken as controls. Results: Among 50 cases studied, maximum number of cases (60%) were in the age group of 2-6 years. 29 (58%) were male and 21 (42%) were female with male: female ratio of 1.38:1. Generalised edema was present in all cases (100%), abdominal distension in 40 (80%) cases and decreased urine output in 23 (46%) cases. Ascites was present in 40 (80%) cases. Hypoproteinemia and hypoalbuminemia was present in all patients (100%). Serum globulins were normal in all patients. Mean serum total proteins and serum albumin were significantly (.000) lower in study group compared to control group. There was highly significant (p = .000) increase in mean serum cholesterol (420.32 ± 122.69 mg/dL), Triglycerides (297.90 ± 93.09 mg/dL), LDL (323.75 ± 100.98 mg/dL) and VLDL (61.79 ± 19.78 mg/dL). However, there was no significant (p = .234) change in HDL cholesterol. In relapse cases of nephrotic syndrome there was significantly higher serum cholesterol (p = .000), Triglycerides (p = .003), LDL (p = .000) and VLDL (p = .011) when compared to first episode. Interpretation and Conclusion: The present study shows that in nephrotic syndrome, there is generalised hyperlipidemia. There was significantly higher hyperlipidemia in relapse cases compared to first episode nephrotic syndrome.

Keywords: Serum cholesterol; Serum triglycerides; Serum albumin; Serum globulin; Serum LDL; Serum VLDL; Nephrotic syndrome

1. Introduction

Nephrotic syndrome is an important chronic renal disease in children, characterized by minimal change disease in the majority.¹ Hyperlipidemia is an important characteristic of idiopathic nephrotic syndrome in children and is usually observed during the active phase of the disease and disappears with the resolution of the proteinuria.² The persistence and severity of lipid changes in serum correlate well with the duration and frequency of the relapses, even during the remission in patients of the nephrotic syndrome. The intensity of hyperlipidemia is usually related to the severity of proteinuria and hypoalbuminemia.³ Hyperlipidemia increases the risk of atherosclerosis and may also be important in the development of glomerulosclerosis and progressive renal injury. It may be possible to control it by using lipid lowering drugs.³

2. Aims & Objectives

1) To study the clinical features of nephrotic syndrome.
2) To study the levels of serum cholesterol, serum triglycerides, HDL, VLDL in nephrotic syndrome.

3. Methodology

Study design: Prospective, Hospital based, descriptive study.

Source of Data: Patients with nephrotic syndrome admitted to Paediatrics department, King George Hospital, Visakhapatnam during the period between January 2017 to June 2018.

Inclusion Criteria
1) Children in the age group of 2-12 years with typical features of nephrotic syndrome.
2) Patients were studied at onset of nephrotic syndrome, during remission and relapses.

Exclusion Criteria
1) Children with features that make minimal change disease less likely (hematuria, hypertension, renal insufficiency).
2) Patients with prior history of diabetes mellitus, hypothyroidism and familial hypercholesterolemia.

Methods of Collection of Data
Data was collected by using pre-tested proforma meeting the objectives of the study. Fifty patients were taken into study who were clinically diagnosed as nephrotic syndrome. Thirty cases who were age-matched and without liver and kidney disorders were taken as control group. Detailed history was taken.

Thorough clinical examination was done.

Laboratory Procedures

1) Urine Examination
(a) Presence of proteinuria
   This was done by sulfosalicylic acid test.

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Data analysis was done by Descriptive Statistics using One sample t-test Contingency table analysis (cross tabs) and Chi-square test.

4. Results

Fifty children in the age group of 2-12 years with nephrotic syndrome were included in the study. They were studied during the onset and remission. Patients were considered in remission when urine albumin nil or trace or proteinuria < 4 mg/m²/hr for three consecutive days.

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Study group</th>
<th>Control group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-6</td>
<td>30</td>
<td>60</td>
<td>48</td>
</tr>
<tr>
<td>7-12</td>
<td>20</td>
<td>40</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

CC=0.000; p=1.0 (NS); CC=Contingency Coefficient; NS = Not significant

A non-significant association was observed between age groups in study and control groups. Maximum number of cases 60% was found in age group of 2-6 years.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Study group</th>
<th>Control group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>29</td>
<td>19</td>
<td>48</td>
</tr>
<tr>
<td>Female</td>
<td>21</td>
<td>31</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

C=0.053; p=0.637; CC=Contingency Coefficient; NS = Not significant

In the present study there were 29 male and 21 female children with a male to female ratio of 1.38:1.

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Number</th>
<th>Percentage</th>
<th>Chi-square</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generalised edema</td>
<td>50</td>
<td>100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Abdominal distension</td>
<td>40</td>
<td>80</td>
<td>18.00</td>
<td>.000</td>
</tr>
<tr>
<td>Decreased urine output</td>
<td>23</td>
<td>46</td>
<td>15.68</td>
<td>.000</td>
</tr>
<tr>
<td>Fever</td>
<td>15</td>
<td>30</td>
<td>9.68</td>
<td>.002</td>
</tr>
<tr>
<td>Cough</td>
<td>8</td>
<td>16</td>
<td>23.12</td>
<td>.000</td>
</tr>
<tr>
<td>Scrotal swelling</td>
<td>2</td>
<td>4</td>
<td>46.08</td>
<td>.000</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>2</td>
<td>4</td>
<td>42.32</td>
<td>.000</td>
</tr>
<tr>
<td>Breathlessness</td>
<td>1</td>
<td>2</td>
<td>42.32</td>
<td>.000</td>
</tr>
</tbody>
</table>

Degree of freedom (df) = 1

In the present study, generalised edema was present in all cases (100%).

Abdominal distension in 80% of cases.

<table>
<thead>
<tr>
<th>Proteinuria</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate (+++)</td>
<td>24</td>
<td>48</td>
</tr>
<tr>
<td>Severe (++++)</td>
<td>26</td>
<td>52</td>
</tr>
</tbody>
</table>
The mean value of serum total proteins in study group was 4.61 g/dL, while in control group it was 6.86 g/dL. The p-value (.000) was highly significant. The mean value of serum albumin in study group was 2.00 g/dL, while in control group it was 4.19 g/dL. The p-value (.000) was highly significant. The mean value of serum cholesterol in study group was 420.32 mg/dL, while in control group it was 297.90 mg/dL. The p-value (.000) was highly significant. The mean value of serum triglycerides in study group was 279.90 mg/dL, while in control group it was 94.10 mg/dL. The p-value (.000) was highly significant. The mean value of serum total low density lipoprotein (mg/dL) and VLDL (57.24 mg/dL) were significantly elevated compared to the mean values during remission for cholesterol (282.74 mg/dL), triglycerides (178.15 mg/dL), LDL (191.46 mg/dL) and VLDL (47.19 mg/dL). Mean value of HDL at the onset was 54.79 mg/dL, while in remission it was 49.43 mg/dL. The p-value (.000) was highly significant.

Degree of freedom=48; HS=Highly significant;
S=Significant; NS=Not significant

Mean values at the onset in first episode nephrotic syndrome for cholesterol (372.82 mg/dL), triglycerides (273.37 mg/dL), LDL (289.72 mg/dL) and VLDL (57.24 mg/dL) were significantly elevated compared to the mean values during remission for cholesterol (282.74 mg/dL), triglycerides (178.15 mg/dL), LDL (191.46 mg/dL) and VLDL (47.19 mg/dL). Mean value of HDL at the onset was 54.79 mg/dL, while in remission it was 49.43 mg/dL. The p-value (.000) was highly significant.

### Table 5: Mean values of Various Laboratory Parameters among Study and Control Groups

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Study group</th>
<th>Control group</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Serum Total Protein (g/dL)</td>
<td>Mean=4.6</td>
<td>Mean=6.86</td>
<td>-18.60</td>
<td>0.000(HS)</td>
</tr>
<tr>
<td></td>
<td>Standard deviation=0.51</td>
<td>Standard deviation=0.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Serum Total Albumin(g/dL)</td>
<td>Mean=2.00</td>
<td>Mean=4.19</td>
<td>-31.96</td>
<td>0.000(HS)</td>
</tr>
<tr>
<td></td>
<td>Standard deviation=0.31</td>
<td>Standard deviation=0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Serum Total Cholesterol (mg/dL)</td>
<td>Mean=42.32</td>
<td>Mean=175.37</td>
<td>10.82</td>
<td>0.000(HS)</td>
</tr>
<tr>
<td></td>
<td>Standard deviation=122.69</td>
<td>Standard deviation=18.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Serum total Triglycerides(mg/dL)</td>
<td>Mean=297.90</td>
<td>Mean=94.10</td>
<td>11.81</td>
<td>0.000(HS)</td>
</tr>
<tr>
<td></td>
<td>Standard deviation=93.05</td>
<td>Standard deviation=19.39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean serum total low density lipoprotein (mg/dL)</td>
<td>Mean=323.75</td>
<td>Mean=107.33</td>
<td>11.62</td>
<td>0.000(HS)</td>
</tr>
<tr>
<td></td>
<td>Standard deviation=100.94</td>
<td>Standard deviation=16.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean serum total very low density lipoprotein(mg/dL)</td>
<td>Mean=61.79</td>
<td>Mean=24.00</td>
<td>9.79</td>
<td>0.000(HS)</td>
</tr>
<tr>
<td></td>
<td>Standard deviation=19.78</td>
<td>Standard deviation=9.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean serum total High density lipoprotein(mg/dL)</td>
<td>Mean=49.48</td>
<td>Mean=54.16</td>
<td>.234</td>
<td></td>
</tr>
</tbody>
</table>

### Table 6: Comparison of lipid profile at the onset and during remission in first episode nephrotic syndrome (n=35)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Study group</th>
<th>Control group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the onset</td>
<td>During remission</td>
<td>Standard Deviation</td>
<td></td>
</tr>
<tr>
<td>At the onset</td>
<td>During remission</td>
<td>Standard Deviation</td>
<td></td>
</tr>
<tr>
<td>Cholesterol</td>
<td>Mean=35</td>
<td>Mean=172.9</td>
<td>0.000(HS)</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>Mean=35</td>
<td>Mean=91.48</td>
<td>0.000(HS)</td>
</tr>
<tr>
<td>Low density lipoprotein</td>
<td>Mean=35</td>
<td>Mean=79.89</td>
<td>0.000(HS)</td>
</tr>
<tr>
<td>Very low density lipoprotein</td>
<td>Mean=35</td>
<td>Mean=47.19</td>
<td>.002(S)</td>
</tr>
<tr>
<td>HDL</td>
<td>Mean=35</td>
<td>Mean=4.93</td>
<td>.426(NS)</td>
</tr>
<tr>
<td>Mean=372.82</td>
<td>Mean=191.46</td>
<td>Mean=282.74</td>
<td>.426(NS)</td>
</tr>
<tr>
<td>Mean=273.37</td>
<td>Mean=90.18</td>
<td>Mean=178.15</td>
<td>.000(HS)</td>
</tr>
<tr>
<td>Mean=289.72</td>
<td>Mean=59.18</td>
<td>Mean=191.46</td>
<td>.000(HS)</td>
</tr>
<tr>
<td>Mean=57.24</td>
<td>Mean=18.86</td>
<td>Mean=47.19</td>
<td>.000(HS)</td>
</tr>
<tr>
<td>Mean=49.33</td>
<td>Mean=20.20</td>
<td>Mean=54.75</td>
<td>.426(NS)</td>
</tr>
</tbody>
</table>

### Table 7: Comparison of lipid profile at the onset and during remission in relapse (n=15)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Study group</th>
<th>Control group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the onset</td>
<td>During remission</td>
<td>Standard Deviation</td>
<td></td>
</tr>
<tr>
<td>At the onset</td>
<td>During remission</td>
<td>Standard Deviation</td>
<td></td>
</tr>
<tr>
<td>Cholesterol</td>
<td>Mean=15</td>
<td>Mean=283.97</td>
<td>0.000(HS)</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>Mean=15</td>
<td>Mean=262.44</td>
<td>0.000(HS)</td>
</tr>
<tr>
<td>Low density lipoprotein</td>
<td>Mean=15</td>
<td>Mean=203.66</td>
<td>0.000(HS)</td>
</tr>
<tr>
<td>Very low density lipoprotein</td>
<td>Mean=15</td>
<td>Mean=64.85</td>
<td>.003(S)</td>
</tr>
<tr>
<td>HDL</td>
<td>Mean=15</td>
<td>Mean=55.06</td>
<td>.560(NS)</td>
</tr>
<tr>
<td>Mean=531.17</td>
<td>Mean=89.97</td>
<td>Mean=407.98</td>
<td>.000(HS)</td>
</tr>
<tr>
<td>Mean=355.14</td>
<td>Mean=79.29</td>
<td>Mean=262.44</td>
<td>.000(HS)</td>
</tr>
<tr>
<td>Mean=403.17</td>
<td>Mean=79.29</td>
<td>Mean=203.66</td>
<td>.000(HS)</td>
</tr>
<tr>
<td>Mean=72.40</td>
<td>Mean=18.26</td>
<td>Mean=64.85</td>
<td>.000(HS)</td>
</tr>
<tr>
<td>Mean=49.20</td>
<td>Mean=20.23</td>
<td>Mean=55.06</td>
<td>.560(NS)</td>
</tr>
</tbody>
</table>

### Table 8: Complications in study group

<table>
<thead>
<tr>
<th>Complications</th>
<th>Number of cases</th>
<th>Percentage</th>
<th>Chi-square</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory tract infection</td>
<td>10 (URTI-7; Pneumonia-3)</td>
<td>20</td>
<td>18.00</td>
<td>.000</td>
</tr>
<tr>
<td>Pulmonary tuberculosis</td>
<td>1</td>
<td>2</td>
<td>46.08</td>
<td>.000</td>
</tr>
<tr>
<td>URTI</td>
<td>9</td>
<td>18</td>
<td>20.48</td>
<td>.000</td>
</tr>
<tr>
<td>Cellulitis</td>
<td>2</td>
<td>4</td>
<td>42.32</td>
<td>.000</td>
</tr>
</tbody>
</table>

Degree of freedom = 1; URTI = Upper respiratory tract

In the present study, respiratory infection was the commonest complication seen in 20%, out of which 14% were upper respiratory tract infection and 6% were pneumonia. UTI was the next common complication seen in 20%, out of which 14% were upper respiratory tract infection and 6% were pneumonia. UTI was the next common complication seen in 20%, out of which 14% were upper respiratory tract infection and 6% were pneumonia.

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5. Discussion

After studying 50 cases of nephrotic syndrome along with 30 age matched controls, the observations revealed the following results. The maximum incidence was in the age group between 2-6 years (60%). The male to female ratio was 1.38:1. Generalised edema (100%), abdominal distension (80%) and decreased urine output (46%) were commonest clinical presentation. Generalised edema (100%), ascites (80%), hepatomegaly (22%) and anemia (8%) were commonest clinical findings. Respiratory infection (20%) was the commonest complication. Other complications were UTI (18%), cellulitis (4%) and pulmonary tuberculosis (2%). Severe proteinuria was present in 52%, moderate proteinuria in 48% of cases. Pus cells were present in 22% of cases and granular casts in 4% of cases. Urinary culture was positive in 18% of cases. Hypoproteinemina and hypoalbuminemia was present in all patients (100%). Serum globulin values were normal in all patients. Mean serum total proteins and serum albumin were significantly (.000) lower in study group compared to control group. Hypercholesterolemia, hypertriglyceridemia, elevated LDL, elevated VLDL seen in all cases (100%). The p-value was 0.000 (HS). HDL was normal in 52% of cases, increased in 26% of cases and decreased in 22% of cases. Hypoalbuminemia was inversely proportional to hypercholesterolemia. The p-value (.000) was significant. The mean serum cholesterol, triglycerides, LDL and VLDL was significantly higher in relapse cases compared to first episode nephrotic syndrome. Serum cholesterol, triglycerides, LDL and VLDL were raised even during remission, more so in relapse cases.

6. Conclusion

The present study shows that in nephrotic syndrome, there are elevated levels of hyperlipidemia even during remission. There was significantly higher hyperlipidemia in relapse cases compared to first episode of nephrotic syndrome.

In the present study, there is generalised hyperlipidemia which may lead to the risk of atherosclerosis and the progression for chronic renal failure, which calls for modalities to reduce the lipoprotein levels in the management of nephrotic syndrome.

References