

Study of Serum Calcium, Vitamin D as Bone Markers with Other Biochemical Parameters in Childhood Nephrotic Syndrome

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Abstract

Background: Nephrotic syndrome causes a great morbidity and mortality among the children. It is characterized by massive loss of urinary protein along with risk of altered calcium metabolism. The aim of present study was to assess the serum calcium and vitamin D level in childhood Nephrotic Syndrome and try to find out correlation of biochemical parameters as severity in same subjects.

Material and Methods: The present study was case-control study. Total 110 subjects were included and divided into two groups. Group I consisted 55 subjects of childhood Nephrotic Syndrome in the age group 1-10 years while Group II consisted of age and sex matched 55 normal healthy individuals who served as control with no history of childhood Nephrotic Syndrome. Serum levels of calcium, vitamin D were estimated in all the subjects under study. Other biochemical parameters like serum total protein, albumin, and creatinine were measured in all subjects. Values were expressed as mean \pm standard deviation. SYSTAT version 12 software was used for statistical analysis. Comparisons of study groups to control groups were done by applying student t test.

Results: Serum calcium and vitamin D level were decreased a childhood Nephrotic Syndrome compared with controls. Mean values of serum total protein, albumin, and creatinine were significantly ($p < 0.0001$) lower in childhood Nephrotic Syndrome compared with controls.

Conclusion: In the present study, It can be concluded that, childhood Nephrotic Syndrome is associated with abnormalities in the level of serum calcium and vitamin D. Serum total protein, albumin, and creatinine may be used as biochemical markers to determine severity of childhood Nephrotic Syndrome and it may be beneficial for better management and for developing new treatment strategies.

Keywords: Childhood Nephrotic Syndrome; Calcium; Vitamin D.

Introduction

Nephrotic syndrome is a clinical entity characterized by substantial urinary protein loss primary albuminuria results in hypoproteinemia [1]

(i.e. hypoalbuminemia) and edema. It may be a systematic manifestation of general kidney disease [2] and prevalence is near about 16 cases per 100,000 cases [3].

The underlying nephrotic syndrome pathophysiology is not entirely clear. Although in children with acute nephrotic syndrome, the primary mechanism may be the more intuitive under-fill edema mechanism due to decreased oncotic pressure caused by proteinuria [4].

The loss of vitamin D metabolites in urine

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combined with the detrimental effect of corticosteroids often leads to disturbances in calcium and vitamin D metabolism in nephrotic children [5].

Intestinal malabsorption as well as excessive urinary losses of various vitamin D metabolites and their binding proteins which leads to decrease bone mineral density. Thus the present study was designed to study serum calcium and vitamin D along with various biochemical parameters in childhood nephrotic syndrome [6].

Materials and Methods

The present study was conducted at Department of Biochemistry and Department of Pediatrics DVVPPF's Medical College Ahmednagar. The study was approved by Institutional Ethics Committee. All participants providing informed consent and utmost care was taken during experimental procedure according to the declaration of Helsinki 1975.

Study type

Case- Control study.

Study Design

Total 110 samples were enrolled in the present study.

Control group

Fifty five (55) healthy age and sex matched individuals without any evidence of Nephrotic syndrome as per clinical examination were taken as control subjects.

Patients group

The study included total 55 patients between age group 1-10 years of essential Nephrotic syndrome.

Inclusion criteria

a) Patients with Idiopathic nephrotic syndrome attending pediatrics output patients.

b) Controls are healthy individuals, age and sex matched without any major illness and not on any medication.

Exclusion criteria

Patients with Tuberculosis, HIV-AIDS, liver diseases and history of any other medical or surgical illness were excluded.

Method of collection of data

A pre-structured and pre-tested proforma was used to collect the data. Informed consent was taken from all cases and control subjects. Baseline data including age, sex, detailed medical history, clinical examinations and relevant investigations were included as part of methodology.

Collection of blood sample

About 5 ml of venous blood was drawn from subjects under aseptic precautions, using a sterile disposable syringe and collected in clot activator and fluoride EDTA vacuum evacuated tubes. After an hour, the samples were centrifuged at 3000 rpm for 10 minutes to separate serum and used for analysis of calcium, Vitamin D and other biochemical parameters.

Methods

1) Serum calcium was determined by Trinders method:

2) Estimation of Vitamin D was done by Chemiluminescence method:

Sample antigen and purified 25-OH Vitamin D antigen competes to combine with 25-OH vitamin D monoclonal antibody to form antibody-antigen complex with starter reagent, the flash chemiluminescent reaction is initiated. The light reaction is measured by a photomultiplier which is proportional to the concentration of vitamin D present in sample.

3) Estimation of serum total protein was measured by biuret method, Albumin by Bromocresol green method, serum creatinine by Jaffe's method.

Statistical Analysis

Statistical software SYSTAT version-12 (by Cranes software, Bangalore) was used to analyze the data. The result were expressed in Mean \pm Standard Deviation (Mean \pm SD) Data was analyzed by descriptive statistics as mean, SD, percentage etc. Comparisons of study group to control group by using the Students't' test. p - Values of <0.0001 was considered as statistically significant.

Results

Table 1 showed that, the mean serum calcium and serum Vitamin D levels in childhood nephrotic

syndrome were significantly decreased when compared with normal healthy controls.

Table 1 also the mean serum Total protein, albumin and serum creatinine levels in childhood nephrotic syndrome were significantly lower ($p < 0.0001$) when compared with normal healthy controls.

Table 1: Comparison of various variables between cases & controls.

Variables	Cases n=55 (Mean + SD)	Controls n=55 (Mean+ SD)	p-value
Age (Years)	1 to 10	1 to 10	---
Weight (Kg)	17.69 + 3.99	19.58 + 6.8	---
Height (Cm)	105.41 + 8.4	107.17 + 12.01	---
Sr. Total protein Gm/dl	3.2 + 0.42	6.97 + 0.5	0.0001
Sr. Albumin Gm/dl	1.45 + 0.22	4.0 + 0.7	0.0001
Sr. Globulin Gm/dl	2.1 + 0.38	2.9 + 0.4	0.0001
Sr. Creatinine (mg/dl)	0.60 + 0.13	0.60 + 0.15	0.65
Sr. Calcium	9.10 + 0.62	9.72 + 0.27	0.52
Sr. vitamin D ng/ml	12.9 + 4.73	15.01 + 03.11	0.31

Discussion

Nephrotic syndrome can be caused by variety of glomerular and systemic diseases. It is estimated that, 2 to 7 new cases of Nephrotic Syndrome per 100,000 children in western hemisphere countries [7].

Kidneys most important function in blood filtration by glomeruli which enables fluid and waste products to be excrete. It retains most blood proteins and all blood cells within the vasculature. According to previous study, hypocalcemia is common finding in patients with Nephrotic syndrome during active disease [8].

Nephrotic syndrome children are prone to biochemical derangement in vitamin D and calcium metabolism caused by the disease as well as glucocorticoid therapy [5].

In current study, the mean serum calcium and serum Vitamin D levels in childhood nephrotic syndrome were significantly decreased when compared with normal healthy controls.

Our results are exactly coordinated with Poonam Mehta et al., and Naresh Manne et al. According to both study hypocalcemia and decreased vitamin D is a common finding in children with nephrotic syndrome. It may due to

urinary loss of these metabolites or their carrier proteins or secondary corticosteroid therapy, but the exact biochemical basis for these changes remains speculative [5,9].

In present study, the mean serum Total protein, albumin and serum creatinine levels in childhood nephrotic syndrome were significantly lower ($p < 0.0001$) when compared with normal healthy controls. Our results are matched with previous study of David Gitlin et al. According to their study hypoalbuminemia in children with Nephrotic syndrome is due to an increase in the fractional rate of loss of albumin. Decreased total protein mainly Hypoalbuminemia in Nephrotic syndrome may be due to decreased rate of albumin synthesis, changes in albumin distribution, decreased intake of dietary protein [10,11].

Conclusion

In the present study, It can be concluded that, childhood Nephrotic Syndrome is associated with abnormalities in the level of serum calcium and vitamin D may be due to increases their urinary loss. Altered serum total protein, albumin, and creatinine might be used as biochemical markers to determine severity of childhood Nephrotic Syndrome and along with vitamin D and calcium it may be beneficial for better management and for developing new treatment strategies.

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