ORIGINAL ARTICLE

Serum Vitamin D Level in New Cases and Relapse Cases of Nephrotic Syndrome: A Comparative Study

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ABSTRACT

Background: Nephrotic syndrome is a disease of relapse and remission requiring recurrent cycles of steroid medication. Prolonged steroid leads to decrease serum vitamin D and calcium level. Calcium homeostasis and bone metabolism both depend on vitamin D. To retain healthy bones and other organ systems, maintaining enough doses of vitamin D is advised for nephrotic syndrome patients. The purpose of this study was to measure the levels of serum 25 (OH) D in children with Nephrotic Syndrome, and to compare the levels in new cases and relapse cases of Nephrotic Syndrome.
Methods: From July 2023 to June 2024, a cross-sectional study was done at the Department of Paediatrics of Rangpur Medical College Hospital, Rangpur. Total number of 100 subjects were selected after satisfactory inclusion and exclusion criteria from admitted patients of Department of Paediatrics, Rangpur Medical College Hospital, Rangpur, Bangladesh. They were divided into two group, Group-A - new cases of Nephrotic Syndrome and Group-B - Relapse cases of Nephrotic Syndrome. For statistical analysis student 't' test were performed by computer-based software SPSS-27.0 version for windows. Significance for the statistical test were predetermined at $p < 0.05$. Quality was assured through avoidance of missed data, filling of code, regular entry of data and careful data analysis.
Results: Results showed that serum creatinine, serum cholesterol, serum calcium showed no difference in both groups. But serum vitamin D deficiency was more common among relapse cases of nephrotic syndrome.
Conclusion: In this study, no difference found in serum creatinine, serum cholesterol and serum calcium levels between new cases and relapse cases of nephrotic syndrome. But serum vitamin D deficiency was more common among relapse cases of nephrotic syndrome.

Key Words: Nephrotic syndrome, serum 25 (OH), Initial presentation, Relapse cases.

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INTRODUCTION

Nephrotic Syndrome is a clinical manifestation of glomerular disease associated with heavy (nephrotic range) proteinuria. Nephrotic range proteinuria is defined as proteinuria >3.5g/24 hour or a urine protein creatinine ratio of > 2. Triad of clinical findings associated with Nephrotic Syndrome arising from the large urinary losses of protein are hypoalbuminemia (<2.5g/dl), edema, hyperlipidemia (cholesterol > 200mg/dl) [1]. Nephrotic Syndrome affects 1-3 per lac children less than 16 years of age per year [1].

Nephrotic Syndrome was first documented in 1484 by Cornelius Roleans of Mecheln, Belgium (1450–1525). In his work "Liber de aegritudinibusinfantiumum," which was published in 1484, he listed 52 children, in which he described Swelling of the whole body in child due to Nephrotic Syndrome [2].

Glomerular filtration barrier plays the key role in pathogenesis of proteinuria in Nephrotic Syndrome. Glomerular filtration barrier is consisting of fenestrated capillary endothelium, glomerular basement membrane, podocytes (with foot process and intercalated slit diaphragm). GFB selectively permits ultrafiltration of solutes and water. Large molecular weight molecules (>40000 Dalton), such as albumin and clotting factors are prevented from passing through

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the ultrafiltration process. In Nephrotic Syndrome increase permeability of GFB due to damage of podocytes (effacement of foot process). As a result, increase the passes of albumin across GFR into urinary space [3].

Glucocorticoid therapy is the standard therapy for Nephrotic Syndrome[4]. Corticosteroid have been used to treat childhood Nephrotic Syndrome since 1950. It causes diuresis, loss of edema and proteinuria. Corticosteroid usage has reduced the mortality rate in childhood Nephrotic Syndrome to around 3%. In new cases of Nephrotic Syndrome, approximately 80% will achieve remission with 12 weeks corticosteroid therapy. In relapse cases of Nephrotic Syndrome corticosteroid is used 9-18 months [5].Use of steroid on long term basis can cause growth impairment, cataracts, excessive weight gain or obesity, osteoporosis and affect bone mineral density [6]. Corticosteroid can be direct inhibition of the bone forming osteoblast. Its prolonged uses increase 24-hydroxylase activity. The 24-hydroxylase enzyme break down the active form of vitamin D, called 1,25- dihydroxy vitamin D3 or calcitriol to an inactive form when the vitamin is longer needed[7] Vitamin D is not really a vitamin. It behaves like a hormone and carries out essential biological functions through endocrine, paracrine and intracrine mechanisms. Maintenances of adequate level of vitamin D recommended, not only to maintain good bone health, but also to provide for its non-osseous function [8]. Many physiological processes depend on vitamin D and it's lack is linked to a variety of acute and chronic diseases, such as problems with calcium metabolism, autoimmune disorders, some malignancies, type 2 diabetes mellitus, infections, and cardiovascular diseases [8].

In order to promote bone health, the Endocrine Society Clinical Practice Guideline recommends that children and infants aged 0 to 1 year require at least 400 IU/d (IU = 25 ng) of vitamin D and older child require at least 600 IU/d. However, it may take at least 1000 IU/d of vitamin D to consistently increase the blood level of 25(OH)D above 30 ng/ml. In order to meet their body's vitamin D needs, there is additional recommendation that patients using glucocorticoids obtain two to three times the recommended amount of vitamin D for their age group [9].

Vitamin D (25 hydroxyvitamin D) is bounded to vitamin D binding protein (DBP). Vitamin D and its metabolites are transported from the site of production to target tissue by binding with Vitamin D binding protein (DBP). DBP maintain adequate Vitamin D level in blood. It has anti-inflammatory, anti-oxidant properties that play a role in disease prevention and treatment. It is involved in the regulation of calcium metabolism which is critical for maintaining healthy bones and it regulates immune function, helps in removal of toxin and pathogen from blood and have anti-cancer properties in the form of Vitamin D binding protein macrophage activating factor (DBP-MAF) [10]. The patient with Nephrotic Syndrome loses 25 hydroxy D along with the binding protein in urine [11].

Deficiency of 25(OH) vitamin D may lead to hypocalcemia, hyperparathyroidism, diminished bone mineral density. According to several research, taking calcium and vitamin D supplements can help to stop bone resorption. High doses of vitamin D3 may be utilized to treat the abnormalities, suggesting that vitamin D3 can be administered in children with Nephrotic Syndrome [12].

MTERIALS & METHODS

This cross-sectional study was carried out at the Department of Paediatrics of Rangpur Medical College Hospital, Rangpur from July 2022 to June 2024. Ethical clearance was taken from ethical review board. After taking informed written consent after briefing about objectives of the study, a total 100 patient were included in this study. They were be divided into two group, Group-A 50 patients of new cases of Nephrotic Syndrome & Group-B 50 patients of Relapse cases of Nephrotic Syndrome by purposive sampling technique. Patient who had history of protein energy malnutrition (PEM), Lymphoma and Chronic liver disease (CLD) were excluded.

Here Laboratory variables were studied. Data were coded, edited and entered into computer and were analyzed by using SPSS program. Independent sample 't' test was used to analyze data and $p < 0.05$ was taken as significant. The considered normal value of different laboratory parameter includes serum creatinine 0.6-1.2mg/dl, serum cholesterol < 200mg/dl, serum calcium 8.5-10.5 mg/dl and serum vitamin D 20-50 ng/ml.

RESULTS

Age range of the patients was 2 to 8 year. In group A 25 were male and 25 were female whereas in group B 24 were male and 26 were female.

Table I: Comparisons of the Laboratory parameter in the two group in study patient

Variables	Group-A (mean±SD)	Group-B (mean±SD)	*p*-Value
Serum creatinine (mg/dl)	0.54±0.18	0.54±0.18	a0.891ns
Serum cholesterol (mg/dl)	359±71.3	350±51.8	^{a}0.496^{ns}
Serum calcium (mg/dl)	10.14±1.41	10.08±1.16	^{a}0.805^{ns}
Serum Vitamin D (ng/ml)	32.96±6.96	12.36±4.54	^{a}**<0.001**^{s}

Group-A: New cases of Nephrotic Syndrome
Group-B: Relapse cases of Nephrotic Syndrome.
s = significant, ns = not significant.
^{a}p = value reached from independent sample 't' test.

Results of the independent sample t-test showed that the mean vitamin D level of new cases of nephrotic syndrome affected patient [32.9632± 6.96282] and relapse cases of nephrotic syndrome were [12.3630±4.54372] was statistically significant at the 0.05 level of significance (t = 17.520, df = 98, p<0.001). The [Mean difference = 20.60020, 95% CI (18.26685, 22.93355)]. The null hypothesis which suggested that there was significant difference in vitamin D level in between group-A and group-B of nephrotic syndrome affected children is rejected. Vitamin D deficiency occurs more commonly among relapse cases of nephrotic syndrome.

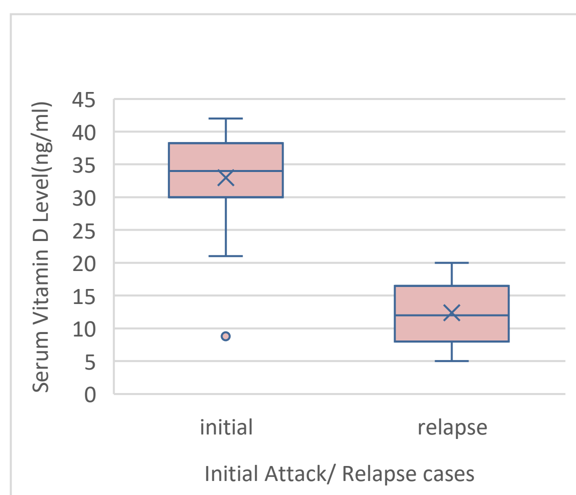

Figure 1: Box plot showing Vitamin D level(ng/ml) between initial attack and relapse case of nephrotic syndrome patients

DISCUSSION

Cross sectional study was carried out with an aim to find out the serum vitamin D level in new cases and relapse case of nephrotic syndrome. This study also shows socio-demographic picture, urine routine examination, urine culture, serum creatinine, serum cholesterol, serum calcium level differences among new cases and relapse cases of nephrotic syndrome.

Total number of 100 consecutive patient of Nephrotic syndrome patients were selected among them 50 patients are allocated in Group-A (new cases of nephrotic syndrome) and 50 patients were allocated in Group-B (Relapse cases of nephrotic syndrome) who came in patient of the Paediatrics Department of Rangpur Medical College Hospital, Rangpur from July 2023 to June 2024. Present study findings were discussed and compared with previously published relevant studies.

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This relatively low vitamin D level in relapse cases may be corticosteroid induced activation of 24-hydroxylase activity in kidney that resulted in increased inactivation of vitamin D.[8] In this regard, in nephrotic syndrome management, whether vitamin D supplementation from the beginning is needed or not, requires further evaluation.

Conclusion

In this study, no difference was found for serum creatinine, serum cholesterol and serum calcium levels between new cases and relapse cases of nephrotic syndrome. But serum vitamin D deficiency was found more common among relapse cases of nephrotic syndrome than the initial cases.

REFERENCES

1. Nelson WE, editor. Nelson textbook of pediatrics. 16th ed. London, England: W B Saunders; 2000.
2. Cameron JS. Five hundred years of the nephrotic syndrome: 1484-1984. Ulster Med J. 1985 Aug;54 Suppl(Suppl):S5-19.
3. Daehn IS, Duffield JS. The glomerular filtration barrier: a structural target for novel kidney therapies. Nat Rev Drug Discov. 2021 Oct;20(10):770-788. doi: 10.1038/s41573-021-00242-0. Epub 2021 Jul 14.
4. Koşan C, Ayar G, Orbak Z. Effects of steroid treatment on bone mineral metabolism in children with glucocorticoid-sensitive nephrotic syndrome. West Indian Med J. 2012 Sep;61(6):627-30.
5. Hahn D, Hodson EM, Willis NS, Craig JC. Corticosteroid therapy for nephrotic syndrome in children. Cochrane Database Syst Rev [Internet]. 2015;(3):CD001533. Available from: http://dx.doi.org/10.1002/14651858.CD001533.pub5
6. RP, Strunk RC; CAMP Research Group. Effect of long-term corticosteroid use on bone mineral density in children: a prospective longitudinal assessment in the childhood Asthma Management Program (CAMP) study. Pediatrics. 2008 Jul;122(1):e53-61. doi: 10.1542/peds.2007-3381.
7. Jones G, Prosser DE, Kaufmann M. 25-Hydroxyvitamin D-24-hydroxylase (CYP24A1): its important role in the degradation of vitamin D. Arch Biochem Biophys. 2012 Jul 1;523(1):9-18. doi: 10.1016/j.abb.2011.11.003. Epub 2011 Nov 12.
8. Gröber U, Spitz J, Reichrath J, Kisters K, Holick MF. Vitamin D: Update 2013: From rickets prophylaxis to general preventive healthcare. Dermatoendocrinol. 2013 Jun 1;5(3):331-47. doi: 10.4161/derm.26738. Epub 2013 Nov 5.
9. Holick MF, Binkley NC, Bischoff-Ferrari HA, Gordon CM, Hanley DA, Heaney RP, Murad MH, Weaver CM; Endocrine Society. Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab. 2011 Jul;96(7):1911-30. doi: 10.1210/jc.2011-0385. Epub 2011 Jun 6. Erratum in: J Clin Endocrinol Metab. 2011 Dec;96(12):3908. Erratum in: J Clin Endocrinol Metab. 2024 Sep 16;109(10):e1991. doi: 10.1210/clinem/dgae373.
10. Delrue C, Speeckaert MM. Vitamin D and Vitamin D-Binding Protein in Health and Disease. Int J Mol Sci. 2023 Feb 28;24(5):4642. doi: 10.3390/ijms24054642.
11. Goldstein DA, Haldimann B, Sherman D, Norman AW, Massry SG. Vitamin D metabolites and calcium metabolism in patients with nephrotic syndrome and normal renal function. J Clin Endocrinol Metab [Internet]. 1981;52(1):116–21. Available from: http://dx.doi.org/10.1210/jcem-52-1-116.
12. Lisa C, Julia M, Kusuma PA, Sadjimin T. Risk factors for low bone density in pediatric nephrotic syndrome. PI [Internet]. 2011Apr.30 [cited 2025Oct.15];51(2):61-5. Available from: https://paediatricaindonesiana.org/index.php/paediatrica-indonesiana/article/view/888.
13. Illalu S, Venkatareddy VS, Fattepur SR. Study of prevalence of vitamin D deficiency in nephrotic syndrome. Int J Contemp Pediatr [Internet]. 2019 Feb. 23 [cited 2025 Oct. 16];6(2):288-94. Available from: https://www.ijpediatrics.com/index.php/ijcp/article/view/2322.

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