

Research Article

A study on thyroid function test in children with nephrotic syndrome

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ABSTRACT

Background: This is a comparative study which was conducted to find out any impact of nephrotic syndrome on status of thyroid hormone level in children with nephrotic syndrome.

Methods: Study was done from December 2014 to December 2015 at a tertiary care hospital in BBSR, Odisha. The study was carried out in total of 60 children of age between 1-8 years out of which 30 children (N group) were admitted for reason other than nephrotic syndrome (excluding known cases of thyroid disorder) and 30 children were suffering from nephrotic syndrome (NS group). Thyroid hormone level (T₃, T₄ and TSH) was tested in all children.

Results: The T₄ and T₃ levels in nephrotic syndrome (NS group) patients were low. TSH level were high in NS group. T₄ level was low in NS group in comparison to N group which was statistically significant. Hypothyroidism was found more in younger children <6 years of age in comparison to children >6 years which was statistically significant.

Conclusions: This study concluded that incidence of hypothyroidism was more in children with nephrotic syndrome.

Keywords: Hypothyroidism, Nephrotic syndrome, T₃, T₄, TSH

INTRODUCTION

Epstein in 1917 first reported possibility of hypothyroidism in nephrotic syndrome. Thyroid hormones are necessary for growth and development of the kidney and for the maintenance of water and electrolyte homeostasis.^{1,2} Thyroid hormone in the circulation is bound to proteins, mainly thyroid binding globulin, prealbumin and albumin.^{3,4} Renal albumin excretion is not compensated by increased liver albumin production in patients with nephrotic syndrome that lead to decreased albumin level.⁵ Several studies have shown renal excretion of thyroid hormones and thyroid binding globulin in subjects with nephrotic syndrome, but TSH, free tri iodothyronine and free thyroxine level remain more or less normal.⁶ In some patients with sustained nephrotic syndrome and prolonged proteinuria continuous excretion of TBG can reduce level of free

thyroid hormone level and increase TSH level. So early diagnosis of hypothyroidism must be made to prevent physical and mental retardation in children. Our study was done to find out the thyroid status of children with nephrotic syndrome in comparison to children without nephrotic children.

METHODS

This comparative study was carried out on 60 children of age between 1-8 years of either sex at a tertiary care hospital in BBSR, Odisha. Out of 60, 30 children (N group) were admitted for reason other than nephrotic syndrome (excluding known cases of thyroid disorder) and 30 children were suffering from nephrotic syndrome (NS group). Study was done from December 2014 to December 2015.

Patients with possible secondary causes of nephrotic syndrome, age <1 year, patients with hypothalamopituitary axis derangement, pituitary tumors, grave's disease, thyroid gland tumors, hashimottos disease, hypothyroidism or hyperthyroidism before the onset of nephrotic syndrome were excluded from the study. Written informed consent was taken from the legal guardian or parent of all participants. A thorough history and elaborate clinical examination were done. Biochemical and other necessary investigations were done to fulfill the criteria for diagnosis of nephrotic syndrome. Serum T₃, T₄ and TSH were measured in all 60 children. Statistical analysis for each sub group was done by ANOVA and represented as mean±standard deviation. Data were analyzed using SPSS statistical software.

RESULTS

In our study we have compared thyroid profile of 30 normal children with 30 children with nephrotic syndrome. Thyroid profiles in normal children were in normal range. The T₄ and T₃ levels in nephrotic syndrome (NS group) patients were low. TSH level were high in NS group. T₄ level was low in NS group in comparison to N group which was statistically significant (Table 1). Hypothyroidism was found more in <6 year children in comparison to >6 year children which was statistically significant (Table 2).

Table 1: Comparison of thyroid profile in both group.

Variable	Group	Mean ±SD	p
T ₃	N	1.83±0.34	0.14
	NS	1.48±0.14	
T ₄	N	8.24±1.25	0.01
	NS	4.75±2.10	
TSH	N	3.55±3.15	0.46
	NS	3.85±2.82	

Table 2: Distribution of incidence of hypothyroidism in patients in NS group.

Age in years	n=30		Hypothyroid state	
	n	%	n	%
<6 years	12	40	7	58.33
>6 years	18	60	8	44.44
Total	30	100	15	50

DISCUSSION

Nephrotic syndrome causes changes in the concentrations of thyroid hormones primarily due to loss of protein in the urine. Acute kidney injury and chronic kidney disease have notable effects on the hypothalamus-pituitary-thyroid axis.⁷ Previous studies have reported that in nephrotic syndrome, thyroid hormone levels decrease while serum thyroid stimulating hormone (TSH) levels increase. Also several studies have found a correlation

between proteinuria and serum TSH and urinary T₄ levels. Mattoo TK et al has shown the existence of a hypothyroid state in some infants with nephrotic syndrome. They recommended routine thyroid screening and early replacement therapy.⁸ Ito et al have studied thyroid profile in children with untreated nephrotic syndrome and found massive urinary losses of T₄, T₃ TBG, free T₄ and free T₃ in the untreated nephrotic children. These findings provide evidence of mild hypothyroidism in children with untreated nephrotic syndrome because of losses of T₄, T₃ free T₄ free T₃ and TBG into the urine.⁹

B.U. Sawant et al in his study suggested that nephrotic syndrome patient have an increased risk of subclinical hypothyroidism. Thyroid profile becomes normal when the non-thyroid illness is resolved.¹⁰

Gilles et al reported that abnormalities in thyroid function are seen in patients with proteinuria. Specifically, TSH levels were higher in patients with proteinuric renal diseases when compared with controls.¹¹ Iglesias et al in his study concluded that proteinuria results in loss of thyroid hormone, stimulating TSH production. Thyroid function returns to the normal when the non-thyroid illness is resolved.¹²

Afroz S et al in 2011 found that mean value of stimulating hormone (TSH) was higher than normal level during nephrosis. This study concluded that nephrotic syndrome have a state of mild or subclinical hypothyroidism during proteinuria although they are clinically euthyroid.¹³ Our findings suggest that nephrotic syndrome patients have an increased risk of subclinical hypothyroidism particularly in younger children. Proteinuria results in loss of thyroid hormones, most probably caused by loss of thyroxine-binding globulin.

Kaptein et al in his study showed that nephrotic syndrome is associated with changes in serum TSH levels.¹⁴ Urinary losses of binding proteins, such as TBG, transthyretin or prealbumin, albumin, result in reduction in serum total thyroxine and sometimes, in total T₃ levels. These hormonal changes are related both to the degree of proteinuria and to serum albumin levels.

Kapoor et al has studied children with nephrotic syndrome by checking serum levels of FT₃, FT₄ and TSH in 20 children aged 1-16 years with steroid resistant nephrotic syndrome (SRNS) and similar number of controls. They found an overt hypothyroidism with low FT₄ (normal values: 0.7-2.0 ng/mL) and elevated serum TSH above reference values (0.45-mIU/L).¹⁵ Hypothyroidism should be actively sought for in patients with nephrotic syndrome as it is a treatable complication which increases morbidity in children. Given the urinary losses of multiple proteins in addition to albumin, it is important to monitor all children with nephrosis for secondary metabolic complications and to treat these complications at the earliest.

CONCLUSION

We concluded from this study that nephrotic syndrome commonly have a state of mild or subclinical hypothyroidism during proteinuria although they are clinically euthyroid. This temporary hypothyroid state improves with remission and needs no treatment in older children but early treatment may be considered in younger children to prevent physical and mental sub normality.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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