



BODY COMPOSITION ANALYSIS IN NEPHROTIC SYNDROME PATIENTS - A CASE CONTROL STUDY IN A TERTIARY CARE HOSPITAL OF HARYANA

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ABSTRACT

Background: Nephrotic syndrome is the state of massive proteinuria, hypoalbuminemia, hyperlipidemia and oedema. Various body composition changes occur with disease itself and use of long term steroid too. Until now the difference between body composition in nephrotic and healthy children has not been evaluated.

Aims and objective: The aim of this study was to know different body composition in nephrotic children with bioelectrical impedance analyser (Inbody S10) and compare it with concurrent healthy children.

Material and method: Body composition analysis of 30 patient newly diagnosed as Nephrotic syndrome or relapse with oedema and 30 healthy control attending paediatrics outdoor of Bhagat Phool Singh Medical college Khanpur kalan Sonapat, Haryana was done by IN body S10 analyser after taking anthropometry and prior consent.

Results: Protein mass and skeletal muscle mass was significantly less $p=0.000$ and $p=0.008$ respectively in nephrotic cases. Percentage body fat and mineral mass was not significantly affected in NS as compare to healthy control. Extracellular water/total body water was significantly higher ($p=.000$) in Nephrotic, which rule out hypovolemic state in NS and BMI was more ($p=0.003$) in nephrotic children as compare to control.

Conclusion: We observed that Nephrotic syndrome is state of higher BMI, low protein and skeletal muscle mass and without hypovolemia although percentage body fat and mineral mass is not affected by disease.

KEYWORDS :

INTRODUCTION

Nephrotic syndrome is a disorder of the kidneys that results from increased permeability of the glomerular filtration barrier. It is characterized by 4 major clinical characteristics that are used in establishing the diagnosis: proteinuria, hypoalbuminemia, oedema, and hyperlipidaemia [1]. The pathogenesis of the development of oedema is still debated, and 2 different mechanisms have been proposed. According to the under fill theory, NS patients initially are hypovolemic, which triggers water and sodium reabsorption secondary to renin-angiotensin-aldosterone system activation. Conversely, the overfill theory has also been proposed, which posits that hypervolemia arising from water and sodium reabsorption in the kidneys causes oedema [2, 3]. Hyperlipidaemia also occur due to loss of lipoprotein lipase in urine [1]. Long term glucocorticoid use for treatment of nephrotic syndrome impairs growth, suppress bone formation and induce obesity. Amongst body composition assessment techniques, bioelectric impedance analysis (BIA) and dual-energy X-ray absorptiometry (DXA) are the most commonly used. DXA provides acceptable accuracy in measuring body composition among children [4]. However, since measuring body composition using the DXA requires expertise, is expensive, and is often not available in clinical and epidemiological settings, the BIA is a preferred tool [5]. Very little is known about various body compositions in paediatric patient with nephrotic syndrome specially no Indian study has been done so far in nephrotic syndrome paediatric patient to know total and extracellular body water status, percentage body fat, skeletal muscle mass, protein mass and body mass index by non-invasive bioelectrical impedance analyser. Henceforth this study is planned to know different body composition in nephrotic cases by body composition analyser in comparison to matched healthy children.

MATERIAL AND METHOD

All Nephrotic patient with oedema either diagnosed as first

case or relapse admitted or visited outdoor of department of paediatrics, BPS government Medical college, Khanpur kalan, Sonapat (Haryana), aged 3-15 years were taken as cases in study and similar age group paediatric patient visiting paediatric outdoor for some common illness like common cold, viral fever were taken as control. Height and weight was recorded. Written consent was taken from parents or caregiver. Ethical clearance was taken from BPS government medical college institution ethical committee.

Body compositions of the subjects were measured by BIA Model In body S10 analyser. The S10 Body Composition Analyser measures body composition using a multi frequency current from 1kHz to 1 MHz. After taking height and weight, subjects were kept in supine position. Then the eight point tactile electrodes were positioned so that electric current was supplied from the electrodes on the tips of the middle fingers and thumbs of both hands and toes and ankle joints of both feet, and resistance and reactance were measured. Body analyser measures body composition as protein mass, percentage body fat, skeletal muscle mass, extra cellular body water/total body water, mineral mass and body mass index by measuring bioelectrical impedance in the body.

STATISTICAL ANALYSES

Statistical analyses were performed using R statistical software. First, descriptive statistics were computed and the results were described in terms of mean and standard deviation (SD) for continuous variables and were presented in the form of frequency and proportion for categorical variable. For the comparisons between the case group and the control group, the independent samples *t*-test was used for the parameters with normal distribution and the Mann-Whitney-test was used for the parameters with non-normal distribution. The *p* values below 0.05 were considered as statistically significant. The difference in the proportion of males and females were tested using the chi-square test.

RESULTS

Total 30 cases with nephrotic syndrome and 30 healthy control cases were enrolled in study. Table 1 reveals that there was equal gender distribution among cases (13 female ,17male) and control (11female ,19male) and this was found to be statistically non-significant $\chi^2=0.278,p=0.598$. As we know Nephrotic syndrome is state of hypo proteinemia, in our study also protein mass in nephrotic cases (mean 3.22.SD1.263) is less as compare to control (mean 5.18, SD-1.57) and it is found highly statistically significant (p=0.000).Skeletal muscle mass measured by BIA analyser in nephrotic cases is significantly less as comparison to control group (mean 7.17 SD -3.86,),(mean 10.40 SD-3.75) respectively with p=0.008.

Percentage body fat measured in Nephrotic cases with mean of 21.20 and SD-10.69 is supposed to be more as hyperlipidemia is known in nephrotic but not found statistically significant as compare to control group with mean 18.01, SD-4.93 and 4 p value of 0.1439(p>.05).

We observed Extra cellular water /Total body water in nephrotic cases was found statically significantly higher than control group with p =0.000.body mass index of nephrotic patient was more in comparison to control group children and it is found statistically significant with p value of 0.003. No significant correlation was found in distribution of mineral mass analysed in cases and control group p=0.66.

Table 1:- Sex distribution

			Case	Control	Total
	Female	Count	13	11	24
			54.2%	45.8%	100.0%
	Male	Count	17	19	36
			47.2%	52.8%	100.0%
Total		Count	30	30	60
			50.0%	50.0%	100.0%

Group Statistics						
	Case	N	Mean	Std. Deviation	Std. Error Mean	p-value
protein mass	Case	30	3.233	1.2653	.2310	
	Control	30	5.180	1.5771	.2879	0.000
skeletal muscle mass	Case	30	7.717	3.8631	.7053	
	Control	30	10.400	3.7546	.6855	0.008
percentage body fat	Case	30	21.207	10.6935	1.9524	0.1439
	Control	30	18.010	4.9340	.9008	
ECW/TBW	Case	30	.40220	.035626	.006504	
	Control	30	.37653	.006124	.001118	0.000
Mineral mass	Case	30	1.1600	.71570	.13067	
	Control	30	1.2240	.34305	.06263	0.66
BMI	Case	30	17.010	2.3508	.4292	
	Control	30	15.473	1.3102	.2392	0.003

DISCUSSION

The method of electrical bio impedance used in the study is becoming more and more important due to the reproducibility of the results, low cost of single measurement, non-invasive testing and the ability to be carried out in every age group, including children. This method enables to measure total body water, body fat percentage and skeletal muscle mass along with mineral mass and BMI. BIA came into use already at the beginning of the twentieth century, initially using direct and later alternating current. This method better reflects body composition than single anthropometric measurements, such as body weight and growth [7]. In addition, BIA analysis is a more accurate method of assessing body fat than body mass index (BMI) or skin fold measurement [8,9,10], which can be very important when diagnosing eating and endocrine disorders [11]. BMI has limited usefulness in determining

body fat, which dynamically changes during puberty and is related to sex. Furthermore, it does not reflect the changes in fat content in the body in such an efficient way as BIA [6].

Hypo proteinemia due to proteinuria was a known state in nephrotic patient and in our study also protein mass is significantly less as compare to healthy control. we concluded that skeletal muscle mass was also significantly less in nephrotic cases as compare to control group though they look overweight due to oedema or overweight due to chronic steroid uses.

With Body composition analyser one can monitor the dynamics of body fat and hydration changes in the patient, which may be used to evaluate changes in body fluid spaces in children with nephrotic syndrome and on dialysis [12]. BIA centile charts developed in healthy children could be a good point of reference for monitoring basic parameters of hydration in patients with chronic diseases. in our study we observed that percentage body fat in nephrotic patient is not significantly higher as compare to healthy children.in a study by Sashi et al [4] BIA underestimated percentage body fat by 6.7 (3.8%) as compared to DXA measurements in apparently healthy children and adolescents, it overestimated fat-free mass, lean mass (muscle mass) and bone mass as compared to DXA. An underestimation of percentage body fat of 2 to 12 % by BIA over DXA also reported in children [13, 14]. The underestimation by BIA may also be due to the use of non-population-specific prediction equations by BIA models for estimating fat and fat free mass from total body water [15].

Several methods including clinical signs and symptoms, neurohumoral hormone assays, blood volume measurement with radioactive labelling techniques and IVC measurements have been utilized in NS patients to assess the hydration status [16, 17, 18].in our study we have not observed any hypovolemia in patient with nephrotic syndrome as ECW/TBW was significantly high as compare to healthy control similar to Hulya Nalcacioglu et al [19]. Özdemir et al.[20] evaluated the clinical findings, echocardiographic measurements (IVC index and IVC collapsibility index and BIA to determine the volume status of 34 children with NS and controls. The authors concluded that BIS may be a superior technique to echocardiography since the sensitivity and specificity of BIA is relatively higher.

In present study we found that body mass index was significantly higher in nephrotic children as compare to healthy control similar to Olivier a et al, and elzebita et al [21,22],who concluded that long term at least six months glucocorticoid therapy is responsible for higher body mass index in patient with Nephrotic syndrome [22].

We found that mineral mass was not significantly affected in nephrotic children and similar result was found by El-Mashad et al. and Mishra O P et al. [23, 24]

The weakness of study was we have not subdivided the nephrotic patient as first case or frequent and infrequent relapser and we have not compare the oedema state with remission or long term follow up measurement.

To date there is no Indian study evaluating body composition in Nephrotic children by bio electric impedance analyser was done in comparison to healthy children ,here we concluded that protein mass and skeletal muscle mass is significantly less in patient of nephrotic children , body mass index is significantly higher in Nephrotic cases but percentage body fat and mineral mass is not significantly affected in Nephrotic children.to date we use diuretics with precaution in Nephrotic cases with oedema because of known hypovolemic state but our study added that extracellular water is significantly higher

in Nephrotic patients ruling out hypovolemia , however multicentral trial requires to confirm the hypothesis.

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