



# NUTRITIONAL STATUS OF CHILDREN WITH NEPHROTIC SYNDROME

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## Abstract

**Introduction:** Nutrition in children with nephrotic syndrome is very important and requires attention. Epidemiological and clinical studies have shown that nutritional deficiencies decrease immune responses and increase the risk of infectious diseases. Nutritional status can relate with the incidence of relapse in children with nephrotic syndrome. This study aims to assess the nutritional status of children with nephrotic syndrome.

**Materials and method:** This study was a descriptive study on two to eighteen years old children with idiopathic nephrotic syndrome in the pediatric outpatient clinic of Dr. Soetomo Hospital Surabaya from January-April 2021. The SPSS application is used to process the data. Diagnosis of nutritional status was made from parameters of weight to height/length, for children aged >5 years based on the 2000 CDC-NCHS curve and for children aged ≤5 years based on the WHO curve.

**Results:** A total of 70 subjects met the inclusion criteria. The majority of the subjects were male and the median age was 9 years (2-18 years). There were 13 subjects with first attack nephrotic syndrome, 31 subjects with steroid dependent nephrotic syndrome (SDNS)/frequent relapse nephrotic syndrome (FRNS) and 26 subjects with steroid resistant nephrotic syndrome (SRNS). Overall, the majority of nutritional status in children with nephrotic syndrome were normal and the possible risk of overweight (64.3%), followed by overweight and obesity (24.2%) and malnutrition (11.5%).

**Conclusion:** The majority nutritional status of all children with nephrotic syndrome is normal and possible risk of overweight, as well as in each type of nephrotic syndrome.

**Keywords:** nutritional status, nephrotic syndrome, children.

## Introduction

Nephrotic syndrome is the most common kidney disease in children, where the main abnormality is increase glomerular permeability leading to massive proteinuria. The damage of glomerular filtration membrane in children with nephrotic syndrome is associated with immunological disorders [1]. Nutrition is one of the main determinants of the immune system. Epidemiological and clinical studies have shown that nutritional deficiencies decrease immune responses and increase the risk of infectious diseases. Malnutrition will cause impaired cell-mediated immunity, phagocyte function, complement system, immunoglobulin antibody secretion, and cytokine production [2].

The incidence of nephrotic syndrome in the United States reaches 2-7 cases per 100,000 in children under 16 years of age. The cumulative prevalence is 16 cases per 100,000 children [1]. The incidence of nephrotic syndrome in Indonesia is reported to be 6 per 100,000 children per year. The ratio between boys and girls is 2:1 [3]. Nutritional impairment in nephrotic syndrome occurs from the disease process, poor dietary intake and steroid therapy. Research on patients with steroid dependent nephrotic syndrome (SDNS) and frequent relapse nephrotic syndrome (FRNS) showed 69% patients with normal nutritional status, while 7% with obesity [4].

There is lack of studies on nutritional status of pediatric nephrotic syndrome in Indonesia in recent past. Though the incidence of nephrotic syndrome is not changed but due to the importance of nutritional status in children with nephrotic syndrome including its relation on the incidence of relapse, we decided to do this study in order to assess nutritional status in children with nephrotic syndrome in Dr. Soetomo Hospital Surabaya.

## Methods

The present study was a descriptive study. The study was carried out at the pediatric outpatient clinic of Dr. Soetomo Hospital Surabaya. Eligible subjects were children with nephrotic syndrome who had been diagnosed by pediatric nephrologist, who met the diagnostic criteria including edema, massive proteinuria at least 3 pluses on urine dipstick, hypoalbuminemia less than 2.5 g/dL and with or without hyperlipidemia, at the first presentation.

The population in this study was children with nephrotic syndrome in the pediatric outpatient clinic of Dr. Soetomo hospital Surabaya. The sample of this research is children with nephrotic syndrome aged 1 to 18 years in the pediatric outpatient clinic of Dr. Soetomo hospital Surabaya who met the inclusion criteria and did not get the exclusion criteria. The inclusion criteria of this study were: Children with nephrotic syndrome aged 1 to 18 years and the parents were willing to participate in the study and signed an informed consent form. The exclusion criteria for this study were children with congenital nephrotic syndrome and secondary nephrotic syndrome.

We classified the types of nephrotic syndrome into first attack nephrotic syndrome, steroid dependent nephrotic syndrome (SDNS)/frequent relapse nephrotic syndrome (FRNS) and steroid resistant nephrotic syndrome (SRNS). Nutritional status in this study was determined based on parameters of weight to height/length, for children aged >5 years based on the 2000 CDC-NCHS curve and for children aged ≤5 years based on the WHO curve. The classification of nutritional status was divided into three groups: normal nutrition and possible risk of overweight; overweight and obesity; and malnutrition.

The data collection instrument used in this study was a data collection sheet. Sources of primary data are obtained from medical records and interviews. The data from each examination result is ensured to be complete and relevant prior to further processing. Re-examination is required before further management. The research data are presented in the form of tables and text. The collection of research subjects was carried out at the pediatric outpatient clinic of Dr. Soetomo hospital Surabaya from January to April 2021. The subjects included in this study were children with nephrotic syndrome who were taken by consecutive sampling. Collected data were tabulated. Data analysis was conducted using descriptive statistic analysis in SPSS version 21.0 (IBM Corp., Armonk, New York). Legal guardians of all recruited subjects had received information about this study and signed an informed consent. Ethical clearance was issued by the Health Research Ethics Committee of Dr. Soetomo General Hospital, Surabaya (No. 0100/KEPK/XI/2020).

## Results

The number of samples that entered the inclusion criteria was 70 children, most of the subjects were male (67.1%) with the majority age of onset was ≤6 years old (52.9%). The median age of the subjects was 9 years with an age range of 2 years to 18 years. The research subjects were presented based on basic characteristics, namely gender, age of onset, type of nephrotic syndrome and nutritional status. The basic characteristics of research subjects are presented in Table 1.

Table 1. Basic characteristics of research subjects

Characteristics	Frequency	Percentage
Sex		
Male	47	67.1
Female	23	32.9
Age of onset		
≤6 years old	37	52.9
>6 years old	33	47.1
Type of nephrotic syndrome		
First attack nephrotic syndrome	13	18.6
Steroid dependent nephrotic syndrome (SDNS)/ Frequent relapse nephrotic syndrome (FRNS)	31	44.3
Steroid resistant nephrotic syndrome (SRNS)	26	37.1
Nutritional status		
Malnutrition	8	11.4
Normal nutrition and possible risk of overweight	45	64.3
Overweight and obesity	17	24.3

This study found that the most common nutritional status of each type of nephrotic syndrome were normal and possible risk of overweight (Table 2).

Table 2. Incidence of GER in exclusively breastfed group versus non-exclusively breastfed group

Nutritional status	First attack NS	SDNS/ FRNS	SRNS	Total
Malnutrition	2 (2.9)	3 (4.3)	3 (4.3)	8 (11.5)
Normal and possible risk of overweight	10 (14.3)	20 (28.6)	15 (21.4)	45 (64.3)
Overweight and obesity	1 (1.4)	8 (11.4)	8 (11.4)	17 (24.2)

## Discussion

The number of patients with nephrotic syndrome in the pediatric outpatient clinic of Dr. Soetomo Hospital Surabaya during the study period of this research, from January-April 2021 were 70 patients. A total of 67.1% were male while 32.9% were female. The majority of patients at the time of diagnosis were less than 6 years old.

The incidence of nephrotic syndrome varies by ethnicity and geography. Research conducted on children aged 18 years in the Netherlands showed an incidence of 1.52/100,000 children per year, studies in New Zealand in children 15 years showed an incidence of 1.9/100,000. The proportion by sex shows that there are more men than women, in a study in New Zealand showing the ratio between men and women is 2.5:1 [5,6].

In this study, the majority of subjects were aged 6 years at diagnosis with a median age of 9 years (range 2-18 years). This result is in line with a study in SDNS and FRNS patients, the median age was 9 years (range 5-18.5 years) [4]. Previous studies have shown that the mean age at diagnosis of nephrotic syndrome is  $4.87 \pm 3.24$  years [7]. Research in New Zealand and Saudi Arabia also showed a relatively young mean age when patients were diagnosed with nephrotic syndrome,  $5.4 \pm 3.9$  years and  $4.3 \pm 3.1$  years [8,9]. A study showed that boys diagnosed with nephrotic syndrome at age 6 years had a higher incidence of steroid resistance [10].

T cell clones that produce chemical mediators resulting in increased basal membrane permeability and proteinuria. Abnormal T cell clones are thought to be present in the thymus gland, which will undergo ablation when get older, this explains the greater incidence of nephrotic syndrome at a young age [11]. Thymic disorders are more common in boy, which explains why nephrotic syndrome is more common in boy [12].

In this study, subjects with diagnosis of SDNS/FRNS were the most diagnosed group, followed by a group of subjects with a diagnosis of SNRS. Nephrotic syndrome is often classified according to response to steroid treatment to determine the diagnosis and prognosis. Classification of nephrotic syndrome based on response to steroid therapy is easier than performing a kidney biopsy even though kidney biopsy is the gold standard [13].

Most children with nephrotic syndrome are classified as steroid sensitive and only about 20% of children are classified as steroid resistant. Although the initial response in children with steroid sensitive nephrotic syndrome (SSNS) is up to 90%-95%, relapse can occur in about 60-90% of patients. Common patterns of relapse in SSNS include infrequent relapse (1 time relapse in 6 months or 1-3 times relapses in 12 months), frequent relapse (2 times or more relapses within 6 months of initial response or 4 times or more relapses in 12 months) and steroid dependent (2 consecutive relapses during steroid therapy or within 2 weeks of steroid discontinuation). Approximately 50-60% of children with SSNS are frequent relapse or steroid dependent [14]. Steroid resistant nephrotic syndrome is defined as failure to achieve remission despite 4 weeks of initial therapy. Although the prevalence of patients with SRNS is less, this group is more difficult to treat and 36%-50% can develop end-stage chronic kidney disease within 10 years [15].

Nutritional status in this study was determined based on parameters of weight to height, for children aged >5 years based on the CDC-NCHS 2000 curve and for children aged ≤5 years based on the WHO curve. The nutritional status of the subjects in this study showed that the majority of the subjects had normal nutritional status and possible risk of overweight. The group of subjects based on the diagnosis also showed the same thing, the majority with normal nutritional status and possible risk of overweight, while the nutritional status of overweight and obesity were the same in subjects with SDNS/FRNS and SRNS.

A study in Makassar on 142 children with nephrotic syndrome, showed that 56% of them had normal nutritional status [16]. The same results were shown by a study in 73 patients with SNDS/SNFR, 69% with normal nutritional status, while 7% with obesity nutritional status, namely BMI percentile 95 [4]. This result is different from the results of previous studies, which showed the prevalence of obesity in patients with SNSS was quite high, 20%-40% [17]. This difference in results may be due to differences in the inclusion criteria used. This study included all patients with idiopathic nephrotic syndrome, both new and long-term steroid therapy. Whereas in previous studies, there was a time limit for the administration of steroids.

## Conclusion

In conclusion, the majority nutritional status of all children with nephrotic syndrome is normal and possible risk of overweight 64.3%, followed by overweight and obesity 24.2% and malnutrition 11.5%. As well as in each type of nephrotic syndrome, the most common nutritional status in each type of nephrotic syndrome was normal and the possible risk of overweight.

The weakness of this study is the limitation of the number of samples studied. However, this study showed the importance of evaluating the nutritional status of children with nephrotic syndrome, since many findings of children being at possible risk of obesity. Growth impairment is a major challenge in children with nephrotic syndrome. There is need for routine growth assessment, early identification and dietician involvement for nutritional counselling for achieve optimal growth.

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