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CASE REPORT **Open Access**

Congenital Nephrotic Syndrome: A Case Report

Sitti Rahma[1]
[1]Clinical Pathology Department, Faculty of Medicine, Universitas Negeri Gorontalo, Gorontalo, Indonesia

*Corresponding author. Email : rahmasyam82@gmail.com, Telp: +62-81244221727

ABSTRACT

Congenital nephrotic syndrome (CNS) is a rare disorder characterized by massive proteinuria, hypoalbuminemia, hyperlipidemia, and edema that occurs in the first three months of life. The incidence of CNS is about 1.5% of all cases of nephrotic syndrome in children, while the incidence in children is about 2 per 100,000. The pathogenesis of CNS is thought to be due to genetic defects in the components of the glomerular filtration barrier, particularly nephrin and podocin, which cause most similar cases. A perinatal infection may also cause CNS. The most common type of primary CNS is the Finnish type, inherited in an autosomal recessive manner. We report a case of a six-month-old male patient who presented with swelling of the face, abdomen, and genitals since the age of 3 months, which had worsened a week before admission to the hospital. There was no history of nausea, vomiting, fever, or seizures, and the child could drink milk. Physical examination revealed ascites with positive shifting dullness and pretibial, dorsum pedis, and scrotum edema. The liver and spleen were difficult to assess. Laboratory examination revealed leukocytosis ($27.8x10^3/\mu L$), anemia (7.7 g/dL), thrombocytosis ($537x10^3/\mu L$), hypoalbuminemia (1.5 g/dL), dyslipidemia (total cholesterol 374 mg/dL, HDL 7 mg/dL, LDL 69 mg/dL, triglycerides 1196 mg/dL), proteinuria (+3/300), and hematuria (+3/200). A history of urological ultrasound showed right and left nephropathy with mild hydronephrosis and ascites. To sum up, we reported male patient 6 months with congenital nephrotic syndrome. Chromosomal analysis is recommended in this case.

Keywords : Congenital nephrotic syndrome, glomerular filtration membrane defect, gene mutation

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Email:
jmhsj@ung.ac.id

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Introduction

Congenital Nephrotic Syndrome (CNS) is a rare renal disorder that primarily affects infants within the first three months of life. It is characterized by excessive proteinuria, hypoalbuminemia, hyperlipidemia, and edema. CNS is classified into two types: primary and secondary. Primary CNS is linked to genetic mutations that affect the glomerular filtration membrane. The most common types of primary CNS are Finnish-type, diffuse mesangial sclerosis, and focal segmental glomerulosclerosis. Secondary CNS is usually associated with congenital infections or malignancies. Various factors can cause secondary CNS, including maternal systemic lupus erythematosus (SLE), autoimmune disorders, and neonatal autoantibodies. It is crucial to diagnose CNS early to prevent complications such as infections, thrombosis, and malnutrition.[1–3]

This medical condition can result in severe and life-threatening complications such as acute kidney injury, thrombotic disease, and infection. Therefore, it is crucial to provide appropriate treatment to replace the loss of fluid, protein, and electrolytes, regardless of the disease's symptoms and underlying cause. Infections can also cause CNS, so it is essential to rule out any infectious cause for better treatment outcomes. Patients with genetic causes of CNS have a poorer prognosis. In most cases, patients with CNS develop end-stage renal disease within the first few years to decades of life. The primary treatment goal is to reduce proteinuria, ensure proper nutrition, and prevent infection and thrombosis. ACE inhibitors, angiotensin receptor blockers, or indomethacin can help reduce protein excretion. Additionally, RAS blockade might help stabilize podocyte function in the CNS.[4]

Case

A 6-month-old boy came with swelling on the face, stomach, and genitals for three months before being admitted to the hospital, getting worse one week before being admitted to the hospital. There was no nausea, vomiting, fever, or seizures. He wants to drink milk with normal defecation and urination. His mother had pregnant him as a fifth child at the age of 37 years with routine pregnancy control at the obstetrician and regularly consumed vitamins and blood supplement tablets. There was no history of illness during pregnancy. His parents had two times cousins relationship. He was born spontaneously and cried immediately with an APGAR Score unknown. At delivery, he had a birth weight of 3.2 kilograms and a birth length of 48 centimeters. He had been drinking formula milk since birth and received Hepatitis 2, Polio l, Diphtheria Pertussis, Tetanus l, Haemophilus influenza I,

and BCG vaccines. There was no history of hypertension, frequent pallor, hair loss, joint pain, erythematous, oral ulcers, frequent fevers, and reddish urination. There was no family history of autoimmune disease, decreased consciousness, and photosensitivity. His mother had given birth to 5 children, and the patient's two brothers died at the ages of one year and three years with a history of swelling.

He had a body weight and height of 7.1 Kg and 61 cm, respectively. He had normal nutritional status and stature according to the BW/BH (between the median line and the -2SD percentile), BH/A (between the -2SD and 2SD percentiles), and BW/A (between the -2SD and 2SD percentiles). At present, he appeared moderately ill and conscious. The vital signs were assessed with the following results: BP: 90/60 mmHg, pulse rate 130 times per minute, breath rate 56 times per minute, temperature of 36.8 0C, and oxygen saturation of 98%. Abnormality was not found on the head, neck, chest, and extremities during the physical examination. However, his liver and spleen were difficult to assess regarding the presence of ascites with shifting dullness positive. Moreover, the scrotal edema significantly appeared.

The laboratory examination is depicted in Table 1-4. Severe leukocytosis, moderate anemia, thrombocytosis, hypoalbuminemia, markedly hypercholesterolemia, and hypertriglyceridemia with low HDL and LDL levels had been found. Moreover, significant microscopic hematuria and proteinuria had been revealed on his urinalysis examination.

Table 1. Complete blood count examination results

Parameter	08/03/2022	Unit Measurement	Reference
Leukocyte	27.8	10^3/µL	4.00-10.00
%Neutrophil	63.5	%	52-75
%Lymphocyte	29.9	%	20-40
%Monocyte	5.2	%	2.00-8.00
%Eosinophil	0.3	%	1.00-3.00
%Basophil	1.1	%	0.0-1.0
Erythrocyte	2.96	10^6/µL	4.00-6.00
Hemoglobin	7.7	g/dL	12-16
Hematocryt	24	%	37-48
MCV	82	fL	80-97
MCH	26	pg	26.5-33.5
MCHC	32	g/dL	31.5-35.0
RDW-CV	14.0	%	10.0-15.0
Platelet	537	10^3/µL	150-400
MPV	8.6	fL	6.50-11.0
Plateletcrit	0.46	%	0.15-0.50
PDW	15.8	%	10.0-18.0

MCV: Mean Corpuscular Volume, MCH: Mean Corpuscular Hemoglobin, MCHC: Mean Corpuscular Hemoglobin Concentration, RDW-CV: Red Cell Distribution Width-Corpuscular Volume, MPV: Mean Platelet Volume, PDW: Platelet Distribution Width.

Table 2. Albumin serum measurement (Follow up)

Parameter	08/03/2022	13/03/2022	17/03/2022	Reference
Albumin (gr/dL)	2.0	1.2	1.5	3.5 – 5.0

Table 3. Blood chemistry and electrolyte measurement

Parameter	08/03/2022	Unit Measurement	Reference
Blood Chemistry			
Random Blood Glucose	99	mg/dL	140
Ureum	66	mg/dL	10-50
Creatinine	0.74	mg/dL	L(<1.3);P(<1.1)
AST/SGOT	49	U/L	<38
ALT/SGPT	25	U/L	<41
LDH	589	U/L	210-425
Total Cholesterol	374	mg/dl	200
HDL Cholesterol	7	mg/dl	L(>55);P(>65)
LDL Cholesterol	69	mg/dl	<130
Triglyceride	1196	mg/dl	200
Electrolyte			
Sodium	134	mmol/L	136-145
Potassium	4.4	mmol/L	3.5-5.1
Chloride	116	mmol/L	97-111

Table 4. Urinalysis results

Parameter	09/03/2022	Unit Measurement	Reference
Colour	Dark Yellow		Light Yellow
pH	6.5		4.5-8.0
SG	1,022		1,005-1,035
Protein	3+	mg/dL	Negative
Glucose	Negative	mg/dL	Negative
Bilirubine	Negative		Negative
Urobilinogen	Normal	mg/dL	Normal
Keton	Negative	mg/dL	Negative
Nitrit	Negative	mg/dL	Negative
Blood	3+	RBC/ul	Negative
Leukocyte	Negative	WBC/ul	Negative
Vitamin C	Negative	mg/dL	Negative
Leukocyte Cast	6	HPF	< 5
Erithrocyte Cast	10	HPF	< 5
Cylindris Cast	36	LPF	
Crystal Cast	0	LPF	
Epithelial Cell Cast	51	LPF	
Others Cast	Bacteria = 25	ul	

Kidney ultrasonography on 15th March 2022 was conducted and revealed left and right kidney nephropathy (blurred corticomedullary differentiation), right mild hydronephrosis (dilated PCS), right velocity index 18.8 cm/s, right resistive index 0.75, left velocity index 15.7 cm/s, and left resistive index 0.71. His screened spleen and urinary bladder appeared normal, with visible free fluid in the intraperitoneal space.

Discussion

The six-month-old male patient was admitted to the pediatric ward of RSUP Dr. Wahiddin Sudirohusodo Makassar with a final diagnosis of congenital nephrotic syndrome. The patient's diagnosis was based on a thorough medical history, physical examination, and supporting tests. The medical history revealed a noticeable swelling on the face, stomach, and genitals three months prior to admission, which had worsened over the last week. The patient also presented with massive proteinuria, hypoalbuminemia, hyperlipidemia, and edema. These symptoms, along with the results of the supporting tests, led to the diagnosis of congenital nephrotic syndrome.

During the initial screening, regular blood tests revealed the presence of leukocytosis, anemia, and thrombocytosis. Leukocytosis is typically caused by inflammation in the kidney parenchyma, which is also supported by the urinalysis test that shows high thoracic sediment. Anemia in nephrotic syndrome can occur due to changes in iron and transferrin homeostasis, as well as the excretion of erythropoietin in urine. The excretion of iron and transferrin in urine reduces plasma transferrin levels, resulting in decreased plasma iron levels and hypochromic microcytic anemia. Loss of erythropoietin through urine can also cause erythropoietin deficiency anemia. Thrombocytosis can be categorized as primary (essential thrombocytosis) or secondary (reactive thrombocytosis). Although this patient may have reactive thrombocytosis, the possibility of primary thrombocytosis cannot be ruled out since no peripheral blood analysis or bone marrow aspiration has been done. Secondary thrombocytosis is observed relatively frequently in hospitalized children and is an increase in platelets without a primary cause but secondary to an underlying medical condition. According to various studies, essential thrombocytosis is more common in adults than in children by a factor of at least 60.

Nephrotic syndrome is a medical condition that can lead to various complications such as hypovolemia, shock, acute kidney injury, infection, thromboembolism, electrolyte imbalances, endocrine disorders, and anemia. The underlying cause of these complications is the excessive loss of proteins in the urine, including albumin, coagulation factors, immunoglobulins, hormone-binding protein, transferrin, and erythropoietin. Nephrotic

syndrome is characterized by the massive leakage of plasma proteins into the urine, evidenced by the urinalysis test showing triple-positive proteinuria. In most cases, this condition is caused by gene mutations that encode for structural or regulatory proteins of the renal filtration membrane located in the glomerular capillary walls. The Glomerular Basement Membrane (GBM) and the Diaphragmatic Slit play a crucial role in limiting the more significant flow of albumin and plasma proteins, ensuring that the protein content of the ultrafiltrate (primary urine) reaching Bowman's space is very low. There has been considerable debate about the role of the GBM in glomerular selectivity. However, recent studies have established that damage to the slit diaphragm or the GBM can cause proteinuria. This can be detected by high levels of cylindric cast and epithelium in the urinalysis test, indicating damage to the renal parenchyma. It is essential to diagnose and treat nephrotic syndrome promptly to prevent the development of severe complications that can be life-threatening. Medical professionals should be vigilant in monitoring patients with this condition for signs of complications and provide appropriate treatment to manage their symptoms effectively.[3,5,6]

Nephrotic syndrome is a condition that arises when there is an excessive amount of protein in the urine, known as proteinuria, leading to a decrease in the levels of albumin in the blood, a condition known as hypoalbuminemia. This decrease in albumin levels, in turn, reduces the pressure of fluids inside the blood vessels, resulting in fluid seeping into the tissues, leading to edema. Hypoalbuminemia can trigger the production of lipoproteins and reduce fat breakdown, leading to the buildup of cholesterol in the blood. Additionally, the liver cells are stimulated to produce both albumin and lipoproteins. Due to the decreased activity of lipoprotein lipase, the levels of fatty acids in the blood increase, leading to hyperlipidemia. The treatment of nephrotic syndrome involves a combination of non-pharmacological and pharmacological therapies, depending on the underlying cause. Non-pharmacological therapies include dietary modifications, low-salt diet, and fluid restriction. Pharmacological therapies may include corticosteroids, diuretics, and angiotensin-converting enzyme (ACE) inhibitors. In some cases, antibiotic therapy may also be necessary to prevent infections. The prognosis for nephrotic syndrome depends on the underlying cause and can be improved by early diagnosis and adequate management, including nutritional intake, protein supplementation, kidney transplantation, and dialysis. Regular monitoring of blood pressure, lipid levels, and kidney function is essential for optimal management of this condition.[4,7–10]

Conclusion

A 6-month-old male infant has been diagnosed with congenital nephrotic syndrome based on medical history, physical examination, and supportive testing. This syndrome is primarily characterized by proteinuria, hypoalbuminemia, hyperlipidemia, and edema.

Conflict of interest

Nothing to declare

Fundig Sources

Nothing to declare

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