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Nephrotic Syndrome Outcome in Children: An Epidemiological Study

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Abstract

Background: Nephrotic syndrome (NS) as a glomerular basal membrane disease has different outcomes. The current study aimed at evaluating epidemiologic status in NS and its correlation with the outcome in children.
Methods: The current hospital based study evaluated the patients of pediatric clinic at Amir-Kabir hospital. Demographic information was obtained by interviewing both the physicians and patients. Also, to determine the sesitivityto steroid drugs, children were given prednisolone (2 mg/kg/day with maximum dose of 60 mg/day) for four weeks and syndromes were determined based on children responses to the drug. Patients were divided into four groups of 25. At the end, data were transfered to SPSS program and the correlations between epidemiological information and different types of NS were investigated
Results: Results of the current study showed that steroid responded children with frequent relapse as well as steroid dependent children had better epidemiological and socioeconomic status compared with the steroid resistance ones ($P < 0.05$).
Conclusions: Prognosis of NS or medication responses was related to epidemiological status of children.

Keywords: Nephrotic Syndrome, Epidemiology, Children

1. Background

Nephrotic syndrome (NS) as glioblastoma multiforme (GBM), in medicine and urology has a set of clinical manifestations due to increased glomerular membrane permeability, which occur due to high protein excretion (1, 2). Since non-nephrotic kidney has a low urinary protein excretion (Up/Cr < 0.2 or < 4 mg/m^2/hour), excretion increases and reaches more than 2.0 U PR/Cr or 40 mg/m^2/hour, which leads to some clinical manifestations including edema hypoproteinemia, and lipoproteins (3, 4). In children and young adults, this is almost invariably the continuum clinical counterpart of glomerular diseases in minimal change disease (MCD) and mesangial proliferative GN (MesGN) (5).

This syndrome, based on outcome, is divided into transient, persistent, asymptomatic, symptomatic, orthostatic, and fixed in types (6, 7). Syndrome treatment, independent of the underlying renal pathology, is by continuously taking prednisone for four weeks, as the basic approach of treatment, which in approximately 90% of children with MCD and 20% - 60% of those with focal segmental glomerulosclerosis (FSGS) achieves remission (8, 9). However, after steroid tapering or withdrawal, 60% - 70% of patients relapsed and most of them required repeated prednisone courses to achieve remission. Based on the relapse rate, the patients were classified as frequently relapsing or steroid-dependent; that is patients in most urgent, effective, and safer treatment (7, 10). The current study aimed at evaluating the epidemiological factors and their correlation with nephritic syndrome outcomes including steroid-dependent, frequently relapsing, and steroid resistance.

2. Methods

2.1. Study Setting

It was as a case series study conducted in pediatric clinic of Amirkabir hospital.

2.2. Ethical Considerations

Authors completely observed ethical issues (double publication, including plagiarism, and data fabrication. (In addition, the ethical committee of Arak University of Medical Sciences approved the study protocol.

2.3. Study Population

The patients were selected by representative sampling from children < 15 years old with nephritic syndrome diagnosis. The study data were obtained from patient-physician interviews. The current study considered 100 children with NS diagnosis. To determine the drug responses, each child was given prednisolone (2 mg/kg/day with maximum dose of 60 mg/day) for four weeks; based on their responses to corticosteroids in one month, children were divided into four groups as steroid responded, steroid resistant, frequent relapse, and steroid dependent.

2.4. Statistical Analysis

Data analysis was conducted by chi-square test with SPSS at a significant level of < 0.05.

2.5. Measurements

Epidemiological and clinical information were obtained by physician-patient interviews on admission to hospital.

2.6. Inclusion and Exclusion Criteria

Age less than 15 years, consent to participate in the research project, and absence of another congenital kidney disease were considered as inclusion criteria; in addition, presence of severe liver, kidney, or cardiac diseases, and dissatisfied with personal data utilization in the current study were considered as exclusion criteria.

3. Results

Epidemiological and clinical information of children with NS are shown in Table 1. In some of the variables such as gender (P = 0.004), gestational age (P = 0.001), diabetic nephropathy (P = 0.007), prerenal azotemia (P = 0.001), allergies (P = 0.001), microscopic hematuria (P = 0.001), delivery type (P = 0.001), passive smoking (P = 0.001), child's body mass index (BMI) (P = 0.001), and neonatal jaundice (P = 0.001) a statistically significant difference was observed among the groups (P = 0.007).

Also, about epidemiological and clinical information of children families, indicated in Table 2, a statistically significant difference was observed among the groups in some factors including economic status (P = 0.001), mother's BMI (P = 0.011), mother's pregnancy age (P = 0.04), preeclampsia (P = 0.04), gestational hypertension (P = 0.001), consanguineous marriage (P = 0.001), and passive smoking of mothers (P = 0.001). The results showed a better status of the steroid responded group compared with the other groups.

4. Discussion

The current study investigated the epidemiological and clinical information of children in different types of NS outcomes.

In a study by Chanchlani et al., on ethnic differences in NS, they reported that drug responses in NS outcomes varied with ethnicity (11). In another study by Huttunen et al., on Finnish type of congenital NS, they observed slight increases in blood urea nitrogen in 14 cases and 50% death of the children before six months without frank uremia developed before death (12). A study on the epidemiology of renal failure (RF) expressed high incidence of RF at PUHC-CDG of Ouagadougou (13). Takahashi et al., conducted a study on relapse triggers in children with steroid dependency; they observed 442 relapses in 2499 patients (14). Yousefichaijan et al., observed no statistically significant correlation between children with attention deficit hyperactivity disorder (ADHD) and steroid-dependent nephrotic syndrome (SDNS), and their healthy counterparts (15), which was not investigated in the current study. Sreenivasa et al., concluded that urinary tract infections (UTIs) are a common infection, which can lead to NS (16). In Feehally et al., concluded that NS was more preponderant in children living in the Leicester city (17). Mangia et al., observed that RF was associated with a wide range of different etiologies and different levels of morbidity, and consequently influenced the outcome of disease (18). Ruggenenti et al., concluded that Rituximab reduces immunosuppression needs in steroid-dependent or frequently relapsing nephrotic syndrome (19). The current study limitation was defective epidemiologic questionnaire completion by parents; after explaining to parents about the effect of NS on kidney and other body systems they agreed to cooperate. Furthermore, it is recommended to confirm the results by further studies.

4.1. Conclusion

Steroid resistant, frequent relapsing, and steroid dependent outcomes of NS in children increased with particular distribution related to epidemiologic factors including gender, gestational age, diabetic nephropathy, prerenal azotemia, allergies, etc. Based on this epidemiological status, modification can influence and increase NS outcomes.

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Table 1. Epidemiological Information of Children with NS

Variable	Steroid Responded	Steroid Dependent	Steroid Resistant	Frequent Relapse	P Value
Gender					0.004
Male	24	76	52	52	
Female	76	24	48	48	
Gestational age					0.001
Term	78	40	26	20	
Preterm	12	48	72	80	
Post-term	12	12	0	0	
Diabetic nephropathy					0.007
Negative	100	100	88	76	
Positive	0	0	12	24	
Hematological disease					0.387
Negative	100	100	100	100	
Positive	0	0	0	0	
Pre-renal azotemia					0.001
Positive	12	56	80	76	
Negative	88	44	20	24	
Allergies					0.001
Positive	0	44	48	76	
Negative	100	56	52	24	
UTI					0.133
Positive	24	36	36	56	
Negative	76	64	64	44	
Microscopic hematuria					0.001
Positive	8	68	76	64	
Negative	92	32	24	36	
Delivery type					0.001
Natural	64	76	52	72	
Cesarean	36	24	48	28	
Passive smoker					0.001
Positive	12	40	72	4	
Negative	88	60	28	96	
Children BMI					0.001
Obesity	4	20	52	16	
Overweight	20	28	20	44	
Normal	56	40	24	8	
Underweight	20	12	4	32	
Neonatal jaundice					0.007
Positive	16	40	64	36	
Negative	84	60	36	64	

Footnote

Conflicts of Interest: The authors declared no conflict of interests.

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Table 2. Familial Epidemiological Information of Children with NS

Variable	Steroid Responded	Steroid Dependent	Steroid Resistant	Frequent Relapse	P Value
Father's occupation					0.062
Unemployed	4	0	8	16	
Self-employed	4	8	4	24	
Worker	16	28	36	24	
Employee	76	64	52	36	
Mother's occupation					0.064
Unemployed	20	28	16	12	
Self-employed	0	0	8	32	
Worker	16	12	32	12	
Employee	64	60	44	44	
Father's education					0.470
Under diploma	0	16	28	16	
Diploma	8	24	20	20	
Associate	20	8	4	8	
Bachelor	52	40	32	40	
Master's degree and higher	20	12	16	16	
Mother's education					0.194
Diploma	28	32	28	28	
Associate	8	8	4	0	
Bachelor	44	36	32	36	
Master's degree and higher	20	16	4	24	
Economic status, US$					0.001
< 250	12	0	4	8	
250 - 500	0	24	28	12	
> 500	88	76	68	80	
Maternal BMI, kg/m^2					0.011
Obesity	4	44	48	40	
Overweight	16	8	20	16	
Normal	68	44	20	32	
Underweight	12	4	12	12	
Maternal pregnancy age, y					0.004
18 >	0	0	4	4	
18 - 24	44	4	4	12	
25 - 29	48	28	12	0	
30 - 34	8	52	44	32	
35 <	0	16	36	52	
Preeclampsia					0.004
Positive	4	4	52	52	
Negative	96	56	48	48	
Eclampsia					0.432
Positive	12	0	4	4	
Negative	88	100	96	96	
Diabetes					0.118
Pre-gestational	8	24	40	20	
Gestational	24	24	36	32	
No diabetes	68	52	24	48	
Gestational HTN					0.001
Positive	8	32	76	68	
Negative	92	68	24	32	
Chronic HTN					0.058
Positive	20	52	56	52	
Negative	80	48	44	48	

Consanguineousmarriage					0.001
Positive	12	40	76	72	
Negative	88	60	24	28	
Living place					0.572
City	76	52	68	60	
Village	24	48	32	40	
Mother's passive smoking					0.001
Positive	20	52	80	72	
Negative	80	48	20	28	