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Sociodemographic, Clinical & Biochemical Features in Children with Nephrotic Syndrome: A Study in a Tertiary Care Hospital of Bangladesh

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Abstract **Original Research Article**

Background: The estimated incidence of nephrotic syndrome is between 2-7 per 100,000 children worldwide, with higher rates reported among those with African and South Asian ancestry. There is a significant gap in the literature on the role of socio-demographic modifiers of nephrotic syndrome in children in the long term. This study aimed to evaluate the sociodemographic & clinical features in children with nephrotic syndrome. ***Methods:*** This descriptive study was conducted at the Department of Pediatric Nephrology in the National Institute of Kidney Diseases & Urology (NIKDU), Sher-E-Bangla Nagar, Dhaka, from November 2019 to June 2021. Children of age group 1-12 years with primary NS enrolled in this study and a total of 108 patients were included. Informed written consent was taken from the parents. Ethical clearance was obtained from the institutional ethical committee. A purposive sampling technique was used in this study. On entry into the study, a detailed history was taken & proper physical examinations were done. Routine investigations such as complete blood count, CRP, serum albumin, serum cholesterol, serum creatinine, Mantoux test, screening tests for hepatitis-B & hepatitis-C, urine RME and culture sensitivity, X-ray chest, and serum C3 level were done. All investigation was done from NIKDU except the MT test that was done from Dhaka Shishu Hospital. Infection was screened out and appropriate measures were taken. The data were collected and preserved in a case record form (CRF). The collected data were analyzed using Statistical Package for Social Sciences (SPSS) software, version 23.0. ***Results:*** The majority of the patients (50, 46.29%) were 5 to 8 years old, followed by (40, 37.03%) 1-4 years old. Mean ±SD 5.42±2.67. Most of the patients (73, 67.6%) were male and the rest (35, 32.4%) were female, the majority (71%) belonged to rural areas. Regarding socioeconomic status, the majority of the patients (80, 74.08%) belonged to low-income families. Only a few (8, 7.40%) patients' family had a monthly income of >20000 BDT. Most of the parents of the children (50, 46.29%) had a primary level of education, followed by, (35, 32.40%) below primary education. Regarding number of family members, majority (68, 62.97%) of the children family had more than 4 family members in their residence. In terms of clinical features, all the subjects (100.0%) had edema and ascites, followed by (86, 79.62%) experienced oliguria, and hypertension (22, 20.37%), hematuria (10, 9.26%), abdominal pain (08, 7.40). ***Conclusion:*** This study concluded that the mean age of the patients was 5.42±2.67 years with a male preponderance of children with nephrotic syndrome. The majority of the study population belonged to the poor socioeconomic status of rural areas of Bangladesh. Concerning the clinical features, all study subjects experienced edema and ascites, followed by oliguria and hypertension.

Keywords: Nephrotic Syndrome, Edema, Ascites, Proteinuria.

INTRODUCTION

Primary nephrotic syndrome (PNS) is the most common glomerular illness in children, accounting for almost 90% of all nephrotic syndrome cases [1]. It is one of the most commonly diagnosed kidney diseases in childhood and its progressive forms can lead to chronic kidney disease (CKD) and/or end-stage renal disease (ESRD). Nephrotic syndrome occurs when changes in the barrier of the glomerular capillary wall can no longer restrict the loss of protein to a minimal level, thus resulting in massive protein loss through the urine [2]. Nephrotic syndrome can affect children of any age, from infancy to adolescence, and is most commonly seen among school-aged children. The prevalence worldwide is approximately 16 cases per 100000 children with an incidence of 2 to 7 per 100000 children. Males appear to be more affected than females at a ratio of 2:1 in children but the scenario is not the same in terms of adolescents [3]. Socio-demographic factors such as economic status, child quality of life, and parental well-being may account for the variability in incidence and progression rates among various ethnic groups [4]. Childhood nephrotic syndrome is heterogeneous and the incidence and clinical presentations vary across geographic regions, depending on genetics and environmental influences [5-7]. In Europe and North America, about 90% of CNS are idiopathic. Furthermore, minimal change disease (MCD) accounts for 85% of the cases with steroid responsiveness seen in more than 90% of the MCD [8-10]. NS is categorized into primary and secondary forms. The primary NS (PNS) occurs without any previous disease and in some circles, the older designation of idiopathic NS (INS), but both terms denote a similar vagueness as to cause. The term secondary NS relates to some clinical diseases such as systemic lupus erythematosus, diabetes mellitus, sickle cell disease, or syphilis. Secondary NS is rare in children. Minimal change NS is the most common form in children, and its prevalence is inversely proportional to age (i.e., the younger the child, the more likely the histology will show minimal abnormalities on light microscopic evaluation of glomerular histology) [11]. The characteristics of children presenting with nephrotic syndrome have changed over recent decades with greater frequency of the challenging condition focal segmental glomerulosclerosis and a greater prevalence of obesity and diabetes mellitus, which may be resistant to glucocorticoids in the former and exacerbated by long-term glucocorticoid therapy in the latter 2 conditions [12]. The classic presentation is a child between the ages of 3 and 9 years with sudden-onset gravity-dependent edema. Other children can present without any classic signs of edema but have nephrotic range proteinuria (protein level >50 mg/kg/d or a spot urine protein: creatinine ratio of >2,000 mg/g) on urinalysis. The onset of nephrotic syndrome may sometimes follow a recent illness, such as an upper respiratory tract infection [3]. Considering these issues, the present study aimed to evaluate the sociodemographic & presenting features in children with nephrotic syndrome.

OBJECTIVE

- To evaluate the sociodemographic & clinical features in children with nephrotic syndrome.

METHODS

This descriptive study was conducted at the Department of Pediatric Nephrology in the National Institute of Kidney Diseases & Urology (NIKDU), Sher-E-Bangla Nagar, Dhaka, from November 2019 to June 2021. Children of age group 1-12 years with primary NS enrolled in this study and a total of 108 patients were included. Informed written consent was taken from the parents. Ethical clearance was obtained from the institutional ethical committee. A purposive sampling technique was used in this study. On entry into the study, a detailed history was taken & proper physical examinations were done. Routine investigations such as complete blood count, CRP, serum albumin, serum cholesterol, serum creatinine, Mantoux test, screening tests for hepatitis-B & hepatitis-C, urine RME and culture sensitivity, X-ray chest, and serum C3 level were done. All investigation was done from NIKDU except the MT test that was done from Dhaka Shishu Hospital. Infection was screened out and appropriate measures were taken. The data were collected and preserved in a case record form (CRF). The collected data were analyzed using Statistical Package for Social Sciences (SPSS) software, version 23.0. Independent student t-test and chi-square test were performed to compare the study variables where $p < 0.05$ was considered as the level of significance with 95%CI.

Inclusion Criteria:

- Patients who had nephrotic syndrome aged between 1 to 12 years. (Pediatric age is up to 18 years but we could not include children more than 12 years of age because we have no adolescent ward to admit the patient more than 12 years)

Exclusion Criteria:

- Age below 1 year and more than 12 years of primary NS.
- Children with secondary nephrotic syndrome.
- Patients of NS with impaired renal function.

RESULTS

Table 1: Age distribution of the study children (N=108)

Age (years)	N	%
1-4	40	37.03
5-8	50	46.29
>8	10	9.25
Mean ±SD	5.42±2.67	

Majority of the patients (50, 46.29%) were of 5 to 8 years old, followed by (40, 37.03%) 1-4 years old. Mean ±SD 5.42±2.67 [Table 1].

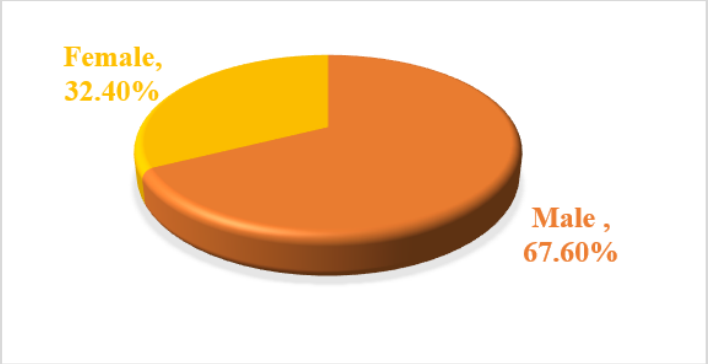

Fig 1: Gender distribution of the respondents (N=108)

In the present study, most of the patients (73, 67.6%) were male and the rest (35, 32.4%) were female. [Fig 1]

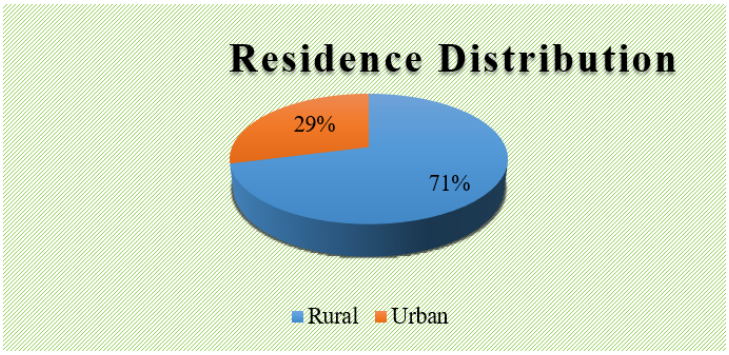

Fig 2: shows the residence distribution of the study children (N=108)

The majority of the patients (71%) belong to rural areas in the study. [Fig 2]

Table 2: Monthly income of the families of study subjects (N=108)

Monthly income (BDT)	N	%
10000-15000	80	74.08
16000-20000	20	18.52
>20000	08	7.40

In this study, the majority of the patients (80, 74.08%) belonged to low-income families. Only a few (8, 7.40%) patients family had a monthly income of >20000 BDT. [Table 2]

Table 3: Parents education and number of family members of the participants family (N=108)

Variables	N	%
Parents education		
Below primary level	35	32.40
Primary school	50	46.29
High school	15	13.90
Graduation	8	7.40
Number of family members		
3-4	40	37.03
>4	68	62.97

In this study, most of the parents of the children (50, 46.29%) had a primary level of education, followed by, (35, 32.40%) below primary education. Regarding number of family members, majority (68, 62.97%) of the children family had more than 4 family members in their residence. [Table 3]

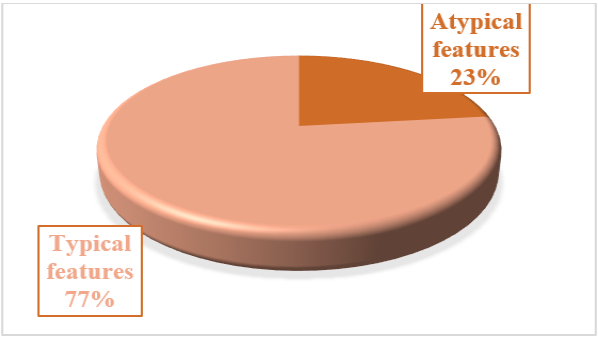

Fig 3: Distribution of respondents according to typical & atypical clinical features (N=108)

*Atypical presentation includes, persistent hypertension, impaired renal function, gross haematuria, low plasma C3 and viral hepatitis B or C. (We did not include children below 1 year and above 12 years)

In this study, most of the patients (77.0%) presented with typical clinical features of nephrotic syndrome. [Fig 3]

Table 4: Clinical features of the study population (N=108)

Features	N	%
Edema	108	100.0
Ascites	108	100.0
Oliguria	86	79.62
Hypertension	22	20.37
Hematuria	10	9.26
Abdominal pain	08	7.40

The present study showed that all the subjects (100.0%) had edema and ascites, followed by (86, 79.62%) experienced oliguria, and hypertension (22, 20.37%), hematuria (10, 9.26%), abdominal pain (08, 7.40). [Table 4]

Table 5: Biochemical variables of group A and B NS patients at initial episode during induction of treatment (n=54)

Laboratory variables	*Group A (n=27)	#Group B (n=27)	p-value
Hb% (mg/dL)	12.63±1.29	12.60±1.18	0.932
Serum Albumin (gm/dL)	1.72±0.31	1.79±0.26	0.392
Serum Creatinine (mg/dL)	0.48±0.16	0.49±0.12	0.910
Serum Cholesterol (mg/dL)	388.78±100.04	385.89±70.20	0.903
Urine spot protein creatinine ratio	11.27±6.65	9.98±5.23	0.430

*Group A; initial cases who were treated with prednisolone and azithromycin
#Group B; initial cases who were treated with prednisolone only
P value measured by independent samples t-test

There was no significant difference between intervention (group A) and control (group B) patients of initial attack nephrotic syndrome patients regarding laboratory findings. [Table 5]

Table 6: Biochemical variables of group C and D NS patients at initial episode during induction of treatment (n=54)

Laboratory variables	*Group C (n=27)	#Group D (n=27)	p-value
Hb% (mg/dL)	12.21±1.27	12.16±1.35	0.891
Serum Albumin (gm/dL)	1.81±0.39	1.92±0.28	0.221
Serum Creatinine (mg/dL)	0.55±0.13	0.49±0.10	0.069
Serum Cholesterol (mg/dL)	372.74±57.69	392.19±66.31	0.256
Urine spot protein creatinine ratio	11.24±9.06	10.10±6.43	0.595

*Group C; relapse cases who were treated with prednisolone and azithromycin
#Group D; relapse cases who were treated with prednisolone only
P value measured by independent samples t-test

There was no significant difference between intervention (group C) and control (group D) patients of initial attack nephrotic syndrome patients regarding laboratory findings. [Table 6]

DISCUSSION

The present study shows the mean age of the patients was 5.42±2.67 years of which males were 67.6% and females were 32.4%. Another study by Sawires *et al.*, [13] found the mean age of the patient was 8.42±1.5 years which was relatively higher than this study cause may be due to their study of children being steroid-dependent NS only. Another study done by Esezobor, Solarin, and Gbadegesin *et al.*, showed that the mean age of childhood NS is 5.1 years and this mean age is almost similar to the present study [14]. In this study, the majority of children were male (67.6%). A study done by Esezobor, Solarin, and Gbadegesin showed similar sex distribution boys were 60.2% of the study population [14]. The majority of the patients (71%) belonged to rural areas and the majority of the patients (80, 74.08%) belonged to low-income families. Only a few (8, 7.40%) patients' families had a monthly income of >20000 BDT in the present study. Hussain N, Zello JA, *et al.*, conducted a study in Canada and they showed, that nearly one-third of participants were classified as from a low-income family, which was quite similar to the present study [2]. Rahman A, Afroza S, *et al.*, conducted a study in a tertiary-level hospital in Bangladesh. They showed that 67.0% of their study population resided in rural areas which was similar to our study. However, 63.0% of the children came from middle-income families and 27.0% came from low-income families [15]. Another study from Bangladesh showed that, among 50 children, most parents (48%) came from very poor socioeconomic conditions, which was relatable to this study [16]. In this study, most of the parents of the children (50, 46.29%) had a primary level of education, followed by, (35, 32.40%) below primary education. Beanlands H *et al.*, conducted a study and specific informational needs related to understanding the diagnosis and treatment approaches as well as learning to manage NS were identified. They found that, difficulty in getting accurate information about the disease often made diagnosis challenging [17]. Manti P *et al.*, compared educational level of parents between two groups and found that, parents of children with nephrotic syndrome had a low education level while all parents of the children in their control group had at least a medium education level [18]. Regarding number of family members, majority (68, 62.97%) of the children family had more than 4 family members in their residence; similar to another study by Toyabe SI *et al.*, [19] Regarding clinical features, all the subjects (100.0%) had edema and ascites, followed by (86, 79.62%) experienced oliguria, and hypertension (22, 20.37%), hematuria (10, 9.26%), abdominal pain (08, 7.40) in the present study. According to Ahoui S, Vigan J *et al.*, the major reasons for admission in their study included: lower-limb edema related to kidney disease in 33 subjects (89.74%), ascites in 13 (28.21%) and oliguria in eight children (20.51%), which was somewhat similar to the current study. Additionally, children in their study presented with diarrhea (17.95%), fever (12.82%), and abdominal pain (10.26%), for which infection might have been responsible [20]. Although children with nephrotic syndrome most often present with edema, it does not occur in every patient. Periorbital edema is typically noted first and is often misdiagnosed as a manifestation of allergy. The edema is gravity-dependent, so throughout the day, periorbital edema decreases while edema of the lower extremities increases. Niaudet P. *et al.*, stated that, in addition to edema, children with nephrotic syndrome may also present with hypertension, hematuria, and hypovolemia, which was seen in our study [21]. In a study by Okoro BA *et al.*, the major clinical features were generalized edema (100%), hypertension (23%), fever (20%), oliguria (10%), and cough (7%). Haematuria was present in 26% of the patients [22]. Moreover, another study suggested that hypovolemia may occur during a severe relapse or following administration of diuretics, particularly in children with poor oral intake, diarrhea, and vomiting [23].

LIMITATIONS OF THE STUDY

The study was conducted in a single center with a small sample size. So, the results may not represent the whole community.

CONCLUSION

This study concluded that the mean age of the patients was 5.42±2.67 years with a male preponderance of children with nephrotic syndrome. The majority of the study population belonged to the poor socioeconomic status of rural areas of Bangladesh. Concerning the clinical features, all subjects experienced edema and ascites, followed by oliguria and hypertension.

RECOMMENDATION

Nephrotic syndrome is an important chronic disease in children. The need for adequate corticosteroid therapy at the initial episode is suggested concerning the clinical features and consultation with a pediatric nephrologist and biopsy before initiation of corticosteroid therapy should be strongly considered for children. Besides this, knowledge and awareness programs about the disease should be carried out with special attention to the population of low socioeconomic status. Moreover, further studies should be conducted to get robust data in this context.

REFERENCES

1. Filler, G., Young, E., Geier, P., Carpenter, B., Drukker, A., & Feber, J. (2003). Kidney Diseases. *American Journal of Kidney Diseases*, *42*(6), 1107-1113.
2. Hussain, N., Zello, J. A., Vasilevska-Ristovska, J., Banh, T. M., Patel, V. P., Patel, P., ... & Parekh, R. S. (2013). The rationale and design of Insight into Nephrotic Syndrome: Investigating Genes, Health and Therapeutics (INSIGHT): a prospective cohort

study of childhood nephrotic syndrome. *BMC nephrology*, *14*(1), 1-11.
3. Andolino, T.P. & Reid-Adam, J. (2015). Nephrotic syndrome. *Pediatrics in review*;36(3):117-26.
4. Wright, R. O., & Christiani, D. (2010). Gene-environment interaction and children's health and development. *Current opinion in pediatrics*, *22*(2), 197.
5. Hodson, E. M., Willis, N. S., & Craig, J. C. (2008). Non-corticosteroid treatment for nephrotic syndrome in children. *Cochrane Database of Systematic Reviews*, (1).
6. Brodehl, J. (1991). The treatment of minimal change nephrotic syndrome: lessons learned from multicentre co-operative studies. *European journal of pediatrics*, *150*, 380-387.
7. Ali, A., Ali, M. U., & Akhtar, S. Z. (2011). Histological pattern of paediatric renal diseases in Northern Pakistan. *JPMA*, *61*(653).
8. Kliegman, R. M., Behrman, R. E., Jenson, H. B., & Stanton, B. M. (2007). *Nelson textbook of pediatrics e-book*. Elsevier Health Sciences.
9. Hodson, E.M., Knight, J.F., Willis, N.S. & Craig, J.C. (2000). Corticosteroid therapy in nephrotic syndrome: a meta-analysis of randomised controlled trials. *Archives of disease in childhood*;83(1):45-51.
10. Barnett, H. L., Edelmann, C. M., & Greifer, I. (1981). Primary nephrotic syndrome in children: clinical significance of histopathologic variants of minimal change and of diffuse mesangial hypercellularity. A report of the international study of kidney disease in children. *Kidney Int*, *20*(6), 765-771.
11. Safaei, A. A. S. L., & Maleknejad, S. (2010). Clinical and laboratory findings and therapeutic responses in children with nephrotic syndrome. *Indian journal of nephrology*, *20*(2), 68.
12. Gipson, D. S., Massengill, S. F., Yao, L., Nagaraj, S., Smoyer, W. E., Mahan, J. D., ... & Greenbaum, L. A. (2009). Management of childhood onset nephrotic syndrome. *Pediatrics*, *124*(2), 747-757.
13. Sawires, H., Abdelaziz, H., Ahmed, H. M., Botrous, O., & Agban, M. (2019). Randomized controlled trial on immunomodulatory effects of azithromycin in children with steroid-dependent nephrotic syndrome. *Pediatric Nephrology*, *34*, 1591-1597.
14. Esezobor, C. I., Solarin, A. U., & Gbadegesin, R. (2020). Changing epidemiology of nephrotic syndrome in Nigerian children: a cross-sectional study. *Plos one*, *15*(9), e0239300.
15. Rahman, A., Afroza, S., Kabir, L., Banu, N. A., Mahamuduzzaman, A. S. M., Ahmed, S., ... & Habib, R. B. (2022). Pattern of Infection among Children with Nephrotic Syndrome in a Tertiary Level Hospital. *Sch J App Med Sci*, *8*, 1304-1311.
16. Rahman, M., Afroz, S., Ali, R., & Hanif, M. (2016). Health Related Quality of Life in Children with Nephrotic Syndrome in Bangladesh. *Mymensingh medical journal: MMJ*, *25*(4), 703-709.
17. Beanlands, H., Maione, M., Poulton, C., Herreshoff, E., Hladunewich, M. A., Hailperin, M., ... & Gipson, D. S. (2017). Learning to live with nephrotic syndrome: experiences of adult patients and parents of children with nephrotic syndrome. *Nephrology Dialysis Transplantation*, *32*(suppl_1), i98-i105.
18. Manti, P., Giannakopoulos, G., Giouroukou, E., Georgaki-Angelaki, H., Stefanidis, C. J., Mitsioni, A., ... & Kolaitis, G. (2013). Psychosocial and cognitive function in children with nephrotic syndrome: association with disease and treatment variables. *BioPsychoSocial medicine*, *7*(1), 1-7.
19. Toyabe, S. I., Cao, P., Abe, T., Uchiyama, M., & Akazawa, K. (2006). Impact of sociocultural factors on hospital length of stay in children with nephrotic syndrome in Japan. *Health policy*, *76*(3), 259-265.
20. Ahoui, S., Vigan, J., Agboton, B. L., Egounlety, C. H., Dogo, A., & Sekpor, V. (2020). Epidemiological and evolving aspects of nephrotic syndrome in children aged 0-15 years in Tanguiéta District Hospital (Benin). *Int J Nephrol Kidney Fail*, *6*(1), 1-4.
21. Niaudet, P. (2014). Etiology, clinical manifestations, and diagnosis of nephrotic syndrome in children. *Up To Date version*, *16*.
22. Okoro, B. A., Okafor, H. U., & Nnoli, L. U. (2000). Childhood nephrotic syndrome in Enugu, Nigeria. *West African journal of medicine*, *19*(2), 137-141.
23. Rahman, M. H., Jesmin, T., & Muinuddin, G. (2013). An update of Management of idiopathic nephrotic syndrome: a review article. *Bangladesh Journal of Child Health*, *37*(2), 102-121.