

Epidemiologic Features of the First Flare of Nephrotic Syndrome in Children in Bamako Pediatric Hospitals

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Abstract

Introduction: The most frequent glomerular pathology in children, nephrotic syndrome (NS) is a cosmopolitan affection. It is an immunological disease and certain environmental factors, in particular viral infections and allergens, influence its occurrence. The climatic and environmental differences coupled with the frequency of infectious pathologies signing the African particularity and the absence of data in Mali on this affection, motivated us to carry out this work. **Objective:** To study the epidemiological aspects of nephrotic syndrome in hospitalized children aged 0 - 15 years. **Patients and Methods:** This was a descriptive prospective study from January 1 to December 31, 2021 in the Pediatrics Department of the University Teaching Hospital (UTH) Gabriel Touré, anational pediatric reference service in Mali. Diagnostic confirmation was provided by biology. Results: In one year, 120 children were hospitalized for nephrotic syndrome with a sex ratio of 2.75. Male exclusivity was observed at the ages of one year, eight years and 14 years and a reversal at 13 years (sex-ratio = 0.33). The median age was 6 years for an average age of 6.4 years \pm 2.4 years with extremes ranging from one year to 14 years. The first attack of nephrotic syndrome occurred outside the classic age (<1 year and >10 years) in 16.67%. Nephrotic syndrome is observed throughout the year with two peaks in summer (July to September) and winter (December to February). Many ethnic groups were affected by this condition with a high frequency among ethnic groups where endogamy is common. All patients were melanoderms. No cases of NS were recorded in Caucasian children from Northern Mali. The patients came from Bamako in 47.5% of cases. Two

brothers from the same siblings had had their first attack of nephrotic syndrome the same year, ten months apart. Conclusion: Nephrotic syndrome in pediatric hospitals of Bamako occurs at a median age of six years all along the year with a summer and winter peaks. It is more observed in ethnic groups where the practice of endogamy is common and concerns melanoderm children.

Keywords

Epidemiology, Nephrotic Syndrome, Child, University Teaching Hospital
Gabriel Toure

1. Introduction

The most common glomerular pathology in children, nephrotic syndrome (NS) is a universal condition with an annual incidence varying between 2 and 3.7 per 100,000 children in developed countries [1] [2]. The incidence would be higher in children from 1 to 4 years old with a variability of the sex ratio (M/F) according to the zones [1] [2]. It is an immunological disease and certain environmental factors, in particular viral infections and allergens, influence its occurrence [1] [2] [3]. Various research studies on the many aspects of this condition have been carried out in developed countries [1] [2] [3] [4].

Certain regions of Africa have not remained on the sidelines, including West Africa [5] [6] [7] [8] [9]. In addition to the environmental and climatic differences that are the characteristic in Africa, the frequency of infectious pathologies which can increase the secondary forms of NS is common in tropical countries.

The climatic and environmental differences and the absence of data in Mali on this affection motivated us to initiate this work.

Objective: To study the epidemiological aspects of the first attack of nephrotic syndrome in hospitalized children aged 0 - 15 years.

2. Methods and Patients

This was a descriptive prospective study from January 1 to December 31, 2021 in the Pediatrics Department of the CHU Gabriel Touré, a pediatric reference service in Mali. All the children in the first attack (first time) of confirmed nephrotic syndrome (renal edema associated with proteinuria of 24 hours > 50 mg/Kg/24 hours and albuminemia < 30 g/L) were included. Any children with relapsed NS, NS cases with non-consenting parents were excluded.

The data was collected on survey forms after parental consent and confidentiality was the rule in this work. The epidemiological variables studied were:

- the hospital frequency of nephrotic syndrome;
- demographic factors: gender, age;
- environmental factors: period of hospitalization, residence;
- genetic susceptibility factors: ethnicity, existence of family cases.

3. Results

3.1. Hospital Frequency

In one year, 120 cases of nephrotic syndrome were recorded out of a total of 8061 children hospitalized in the pediatric department of the CHU Gabriel Toure in Bamako, either a hospital frequency of 1.5%.

3.2. Demographics

1) Sex: There were more boys, 88 boys (73.3%) than girls (32, 26.7%) for an overall sex ratio of 2.75. Alongside this overall male predominance, we observed male exclusivity at the ages of one year, eight years and 14 years and an inversion at 13 years (sex-ratio = 0.33) (**Figure 1**).

2) Age: The median age was 6 years for an average of 6.4 years \pm 2.4 years with extremes ranging from one year to 14 years. No case of infantile nephrotic syndrome was recorded and 16.67% of our patients were over 10 years old. Three peaks were observed at the ages of five years (largest peak), seven years and two years (**Figure 1**). Between five and seven years, 36.6% of patients were registered there with a sex ratio of 1.9.

3.3. Environmental Factors

1) Months of hospitalization: The nephrotic syndrome is observed throughout the year (**Figure 2**) with two peaks in the occurrence of cases, the first in summer (July-September) and the second in winter (December-February).

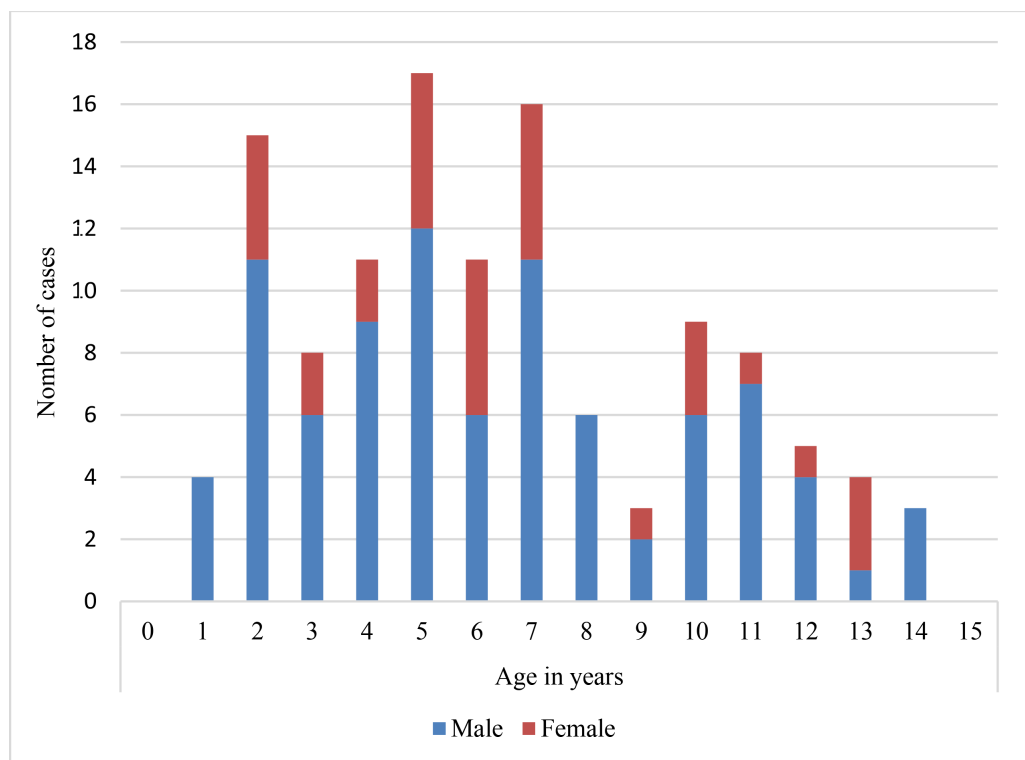


Figure 1. Distribution of children by age and gender.

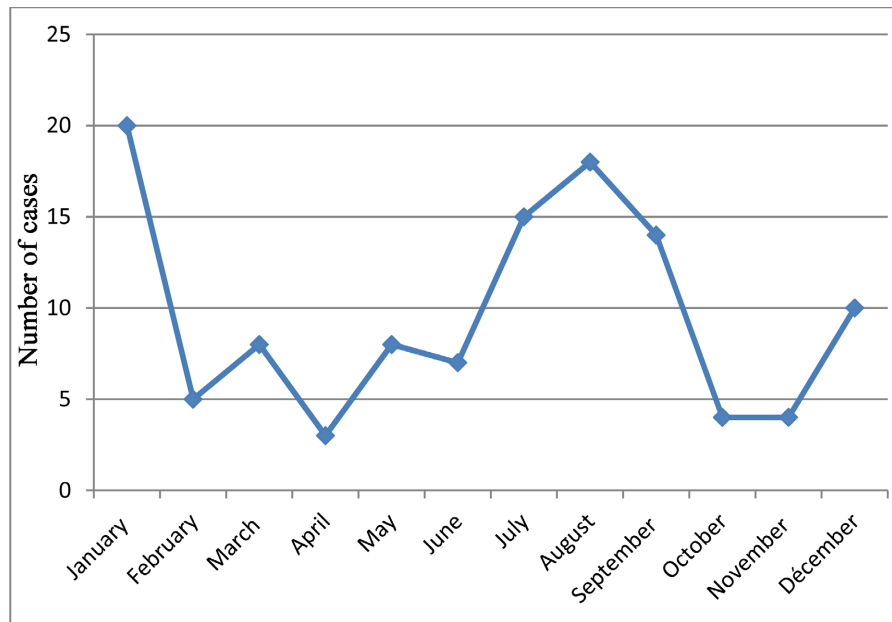


Figure 2. Distribution of patients by month of admission.

2) Origin: The patients came from the capital and from all regions of Mali: Bamako (47.5%), Koulikoro (19.2%), Kayes (13.2%), Sikasso (8.3%), Ségou (5.8%) and the central and northern regions of Mali (5.9%).

3.4. Genetic Susceptibility Factors

1) Ethnic groups: The main ethnic groups were the Bambara (40.8%), the Peulh (23.3%), the Sarakolé (11.7%), the Minianka-Sénoufos (10.9%) and the Malinké (9.2%). %, all melanoderms. No case of nephrotic syndrome has been recorded among Caucasian children in northern Mali.

2) Family cases: Two brothers from the same siblings had their first attack of nephrotic syndrome the same year, ten months apart.

4. Comments and Discussion

Nephrotic syndrome is the most common glomerular nephropathy in children [1] [2]. It is an immunological disease and certain environmental factors, in particular viral infections and allergens, influence its occurrence [1] [2] [3].

4.1. Hospital Frequency of Nephrotic Syndrome

Our hospital frequency was 1.5% (or 120 cases in one year) and was identical to that found by Keita Y at Aristide-Le-Dantec hospital in Dakar [8]. Our frequency was respectively higher than that found by NDongo A in Senegal (0.27% in two pediatric teaching hospitals) and that obtained by Savadogo H in Burkina-Faso (41 cases in two years) [9] [10]. This difference could be explained by the fact that the Gabriel TouréTouré UTH in Bamako is the national reference for the care of sick children and the non-feasibility of certain complementary examinations to confirm this pathology in remote areas of Mali.

4.2. Environmental Factors

A temporal variation in the frequency of NS (**Figure 2, Table 1**): This condition is rife throughout the year with a remarkable summer (June to August) and winter (December to February) periodicity. A summer peak was also found in Senegal and Iran [9] [11]. Our winter peak is similar to that of Tunisia [12]. In Mali, these peaks occur respectively in the rainy season during which we record a high prevalence of malaria and in the cool season when viral infections, particularly respiratory ones, are common [13]. Further investigations will be useful in order to specify the real place of these pathologies (factor triggering the first attack or as being a secondary etiology of the NS). According to Yap et al, a trivial viral infection, particularly of the upper airways, precedes the diagnosis of NS in one out of two cases [14]. According to Deschenes G et al, viral primary infections could be the environmental agents that trigger the disease when a specific genetic background is present [2].

The residence: The patients came from the capital and from all regions of Mali: Bamako (47.5%), Koulikoro (19.2%), Kayes (13.2%), Sikasso (8.3%), Ségou (5.8%) and the central and northern regions of Mali (5.9%). This disparate geographical distribution could be explained by the local population and endogamy in certain localities.

The temporal-spatial and ethnic variability of the SN suggests genetic determinism and environmental factors [1] [2] [3].

4.3. Demographic Factors

Sex: The overall sex ratio in our work was 2.75 higher than those observed by NDongo A (1.7) and Savadogo H (1.3) respectively from Senegal and Burkina Faso [9] [10]. In some populations, the sex ratio is three boys for one girl and this suggests the involvement of one or more genes carried by the X chromosome [1] [3].

Age: The distribution of age at onset is common across studies. In Bamako, nephrotic syndrome in children occurs at all ages but it is rare before one year of life. The median age of onset of 6 years is lower than that observed in Senegal which was 7.4 years and still lower than the average age in Burkina Faso which was 8.3 years [9] [10]. Further analysis is needed to understand this difference

Table 1. Frequency of nephrotic syndrome according to the period of hospitalization.

Months	Percentage			
	Our study in 2018	Senegal in 2016 [9]	Iran in 2009 [11]	Tunisia in 2011 [12]
March to may	15.8	37.6	34.1	45
June to august	33.3	29.4	25	15
September to november	18.3	17.4	22.7	15
December to february	29.2	15.6	18.2	25

between these Sahelian countries. In France, the median age of SNI was 4, which is lower than ours [3]. The analysis of **Figure 1** in our work shows the precocity of the onset of this condition in Mali and 16.67% of our patients were over 10 years old. While in Burkina-Faso, adolescents aged 11 - 15 were predominant, which is a factor impacting the initial response to corticosteroids according to Savadogo [10].

4.4. Genetic Susceptibility Factors

Ethnic groups: The variability of incidence according to ethnic origin has been reported in several studies [15] [16]. Thus, in Mali many ethnic groups are concerned with two major findings:

- fairly high frequencies were observed among ethnic groups where the practice of endogamy is common (Peulh, Sarakolé and Miniaka/Sénoufo) [17]. A high prevalence of sickle cell disease has been associated with ethnic groups with high endogamy in Mali [18].
- a remarkable rarity of SN among children in northern Mali (leucoderma subjects) has been found.

Further studies will be needed to determine the link between endogamy, leucoderma, sickle cell disease and nephrotic syndrome in Mali.

Familial cases: The existence of familial cases suggests oligogenic determinism without Mendelian monogenic inheritance in most cases [1] [2] [3].

5. Conclusion

Nephrotic syndrome in pediatric hospitals of Bamako occurs at a median age of six years all along the year with a summer and winter peaks. It is more observed in ethnic groups where endogamy is common and concerns melanodermic children.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Deschenes, G. and Leclerc, A. (2010) Epidemiology of Nephrotic Syndrome in Children. *Archives of Pediatrics*, **17**, 622-623.
[https://doi.org/10.1016/S0929-693X\(10\)70028-2](https://doi.org/10.1016/S0929-693X(10)70028-2)
- [2] Deschenes, G. (2011) Immunopathology of Idiopathic Nephrotic Syndrome. In: Cochat, P. and Berard, E., Eds., *Pediatric Nephrology*, Doin, Paris, 185-192.
- [3] Dossier, C., Jamin, A. and Deschênes, G. (2010) Epidemiology and Pathophysiology of Idiopathic Nephrotic Syndrome. In: Bachetta, J. and Boyer, O., Eds., *Child Nephrology*, Elsevier Masson, Paris, 121-123.
- [4] Deschenes, G. and Dossier, C. (2015) Pathophysiology of Idiopathic Nephrotic Syndrome. *Mountain Pediatrics*, **18**, 195-202.
- [5] Adonis-Koffy, L.Y., Timité-Konan, A.M., Yoda, M. and Gnionsahe, D.A. (2000)

- Nephrotic Syndrome in the Ivorian Child. Current Clinical and Evolutionary Data. *Le Bulletin de la Société de Pathologie Exotique*, **93**, 68-77.
- [6] Chemli, J. and Harbi, A. (2009) Treatment of Idiopathic Corticosteroid-Resistant Nephrotic Syndrome. *Archives of Pediatrics*, **16**, 260-268. <https://doi.org/10.1016/j.arcped.2008.11.018>
- [7] NDongo, A.A., Sylla, A., Fall, A.L. and Keïta, Y. (2016) Nephrotic Syndrome in Children at the Hospital Center in Dakar. *Archives of Pediatrics*, **23**, 653-657. <https://doi.org/10.1016/j.arcped.2016.03.008>
- [8] Keita, Y., Tall Lemrabott, A., Sylla, A., Niang, B., Fary Ka, E.H., *et al.* (2017) Idiopathic Nephrotic Syndrome (NIS) in Children in Dakar: About 40 Cases. *Pan African Medical Journal*, **26**, 161-167. <https://doi.org/10.11604/pamj.2017.26.161.10130>
- [9] NDongo, A.A., Thiongane, A., Kéïta, Y., Boiro, D., Basse, I., Seck, N., *et al.* (2016) Peculiarities of Nephrotic Syndrome in Children in Senegal. *Review African and Malagasy Committee for Higher Education (AMCHE)*, **2**, 11-14.
- [10] Savadogo, H., Coulibaly, G., Kaboré, A., Koueta, F., Ouedraogo/Yugbare, S.O., Dao, L., *et al.* (2019) Response to Corticosteroid Therapy for Nephrotic Syndrome in Children in Ouagadougou (Burkina Faso). *African and Malagasy Review for Scientific Research/Health Sciences*, **2**, 160-169.
- [11] Safaei, A. and Maleknejad, S. (2009) Spectrum of Childhood Nephrotic Syndrome in Iran: A Single Center Study. *Indian Journal of Nephrology*, **19**, 87-90. <https://doi.org/10.4103/0971-4065.57103>
- [12] Chemli, J., Boussetta, S., Krid, S., *et al.* (2011) Idiopathic Corticosteroid-Resistant Nephrotic Syndrome in Children: Study of 20 Cases. *Tunisie Medicale*, **89**, 522-528.
- [13] MSF (2013) Seasonal Malaria Chemoprophylaxis (CPS), Mali, Koutiala District, Sikasso Region. <https://www.msf.fr/>
- [14] Yap, H.K., Han, E.J., Heng, C.K. and Gong, W.K. (2001) Risk Factors for Steroid Dependency in Children with Idiopathic Nephrotic Syndrome. *Pediatric Nephrology*, **16**, 1049-1052. <https://doi.org/10.1007/s004670100024>
- [15] McKinney, P.A., Feltbower, R.G., Brocklebank, J.T. and Fitzpatrick, M.M. (2001) Time Trends and Ethnic Patterns of Childhood Nephrotic Syndrome in Yorkshire, UK. *Pediatric Nephrology*, **16**, 1040-1044. <https://doi.org/10.1007/s004670100021>
- [16] Sharples, P.M., Poulton, J. and White, R.H. (1985) Steroid Responsive Nephrotic Syndrome Is More Common in Asians. *Archives of Disease in Childhood*, **60**, 1014-1017. <https://doi.org/10.1136/adc.60.11.1014>
- [17] Demographic and Health Survey, Mali, Sixth Edition (DHS VI-Mali). (2019) National Institute of Statistics, Bamako, Mali, 605 p. <http://www.sante.gov.ml/>
- [18] Thiero, T.A., Ag Ignane, A., Doucouré, A. and Traore, M.S. (2011) The Prevalence of Hemoglobin S, C and F in Community Settings in the District of Bamako. *Mali Public Health*, **1**, 32-35.