

Neurological Manifestations of Renal Diseases in Children at Zagazig University Hospital

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ABSTRACT

Background: Chronic renal failure (CRF) may have many effects on the nervous system and manifest as headache, seizure, dialysis disequilibrium syndrome, cerebral hemorrhage, hypertensive encephalopathy, uremic neuropathy.

Objectives: This study aimed to identify the neurological manifestations in children with renal diseases at Zagazig University hospital.

Subjects and methods: This is cross-sectional was carried out in the Pediatrics Department, Zagazig University Hospitals, on 270 Children with renal diseases during the period from January 2019 till June 2019. All patients included in the study were subjected to history taking, detailed data about renal diseases.

Results: our results revealed that Frequency of neurological manifestations in renal disease patients was (3%), Common presentations of renal diseases was (7.4%) had dysuria, (70.37%) had edema, (3,7 %) had hematuria, (18.51%) had hypertension and 8 cases (3%) had neurological presentations, of whom, 5 had febrile seizures, 2 had cerebral thromboembolism, and 1 encephalopathy.

Conclusion: Neurological manifestations of pediatric renal diseases still are common and the neurological presentations in 3 % of children with renal diseases, and febrile seizures were the most common presentation.

Keywords: Renal disease, Children, Neurological manifestations.

INTRODUCTION

Renal diseases are one of the most common causes of referrals and admissions of children. Common renal diseases include Urinary Tract Infection (UTI), nephrotic syndrome, and glomerulonephritis such as Post-Streptococcal Glomerulonephritis (PSGN). Urinary tract infection is one of the most common diseases in children. Delayed diagnosis and treatment can cause permanent complications such as renal scarring, hypertension, and renal failure ⁽¹⁾.

Nephrotic syndrome is another disease that can be associated with neurological complications. The prevalence of the nephrotic syndrome is about 16/100,000 children per year ⁽²⁾.

It is identified with a triad of proteinuria, edema, and hypoalbuminemia. One of the major complications of nephrotic syndrome is a thromboembolic event. PSGN is the most common form of glomerulonephritis in children characterized by the sudden onset of gross hematuria, edema, and hypertension following streptococcal infection ⁽³⁾. Common presentations of renal diseases are frequency, dysuria, edema, hematuria, and hypertension ⁽⁴⁾.

Neurological symptoms are an important presentation in children with renal diseases, which include febrile seizures, encephalopathy, and cerebral thromboembolism. Some children with UTI present with febrile seizures ⁽⁵⁾.

Given the importance of recognizing uncommon symptoms of renal diseases, this study aimed to identify the neurological manifestations in children with renal diseases at Zagazig University hospital.

PATIENTS AND METHODS

This Cross-sectional prospective study was carried out in the Nephrology Unit of Pediatrics Department, Zagazig University Hospitals (from January 2019 till June 2019). On 270 Children with a confirmed diagnosis of renal disease by pediatric nephrologists.

Ethical consideration:

Written informed consent was obtained from all children's parents, **the study was approved by the research ethics committee of the Faculty of Medicine, Zagazig University. The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.**

Inclusion criteria:

The inclusion criteria were the age between one month to 15 years old and the existence of a renal disease.

Exclusion criteria for cases: patients with diseases other than renal diseases were excluded.

Sampling:

The participants were chosen by systematic random sampling from Patients admitted in the Nephrology Unit of Pediatrics Department, Zagazig University Hospitals.

All patients included in the study were subjected to the following:

- **History taking:**
- **Personal history:** name, age, and gender, residence, and consanguinity.



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- **Collected data will include renal diseases** as causes of renal diseases, neurologic findings related to metabolic abnormality cause diverse CNS disturbance namely uremic encephalopathy dysequilibrium syndrome hypertensive encephalopathy, hemorrhagic stroke, seizures.
- **Neurological Examination:**
- **Mental status:** (Consciousness, Emotion.(e.g. apathy) , Behavior (calm-irritable)
- **Cranial nerves examination:**
- Sign of meningeal irritation: (Neck stiffness, Back stiffness, +ve kernig's sing, +ve Brudzinski' neck sign, +ve Brudzinski' leg sign.
- **Motor system** (-Posture. -Involuntary movement-coordination, Gait. – Muscle (status-tone –power).
- **Sensory system** (Superficial sensation: pain-tough-temp, Deep sensation: (joint sense, vibration sense, deep sense).
- **Reflexes** (superficial-deep).
- **Laboratory investigations:** (Complete blood count, Urine analysis, Kidney Function Test, Serum electrolytes).

The following definitions were considered for renal diseases: Urinary tract infection:

A positive urine culture was defined as more than 100,000 colonies of 1 or 2 uropathogenic bacteria per mL of urine at 48 hours ⁽⁶⁾.

Nephrotic syndrome was defined as generalized edema, massive proteinuria (>40 mg/m²/h), hypoalbuminemia (<2.5 g/dl) hypercholesterolemia (>250 mg/dl), and increase of triglyceride ⁽⁴⁾.

Acute glomerulonephritis was considered as a pathological process that may be manifested clinically as an acute nephritic syndrome or rapidly progressive glomerulonephritis.

Post streptococcal glomerulonephritis (PSGN) is a classic example of the acute nephrotic syndrome characterized by the sudden onset of gross hematuria, edema, hypertension, and renal insufficiency ⁽⁷⁾.

Hemolytic uremic syndrome (HUS) was defined as thrombotic microangiopathy characterized by three primary symptoms: hemolytic anemia with fragment bytes, low platelet count, and acute renal failure ⁽⁸⁾.

The febrile seizure was defined as a type of seizures accompanied by fever (t≥38oC) seen in children aged 6 months to 5 yr with no history of electrolyte imbalance, infection in the central nervous, and metabolic disorders. Simple febrile seizures are generalized, last for <15 min, and do not recur within 24 h. Complex febrile seizures are more prolonged (>15 min), focal, and recur within 24 h ⁽⁹⁾.

Thrombosis: was defined as intravascular blood coagulation that leads to thrombus formation. Embolism was defined as a portion of the thrombus that breaks free and flows downstream in the circulation and blocks flow to vital organs. Collectively these phenomena were considered thromboembolism ⁽¹⁰⁾.

The encephalopathy was defined as the reversible global change in brain function manifesting with intentional impairment, sleep-wake cycle disturbances, deficits in memory and mental data processing, and changes in arousal (hyper- or hypoactive)⁽¹¹⁾.

Statistical analysis

Data were collected, tabulated, and analyzed by SPSS 20 software. According to the type of data qualitative represent as number and percentage, quantitative continuous group represent by mean±SD, the following tests were used to test differences for significance, difference, and association of qualitative variable by Chi-square test (X²). Differences between quantitative independent groups by t-test. The significance level was considered at P < 0.05.

RESULTS

Table (1): Socio-demographic characteristics of parents of children.

Characteristic	Frequency N=270	%
1-Education of father		
Illiterate	60	22.2
Secondary	185	68.5
High	25	9.3
2- Education of mother		
Illiterate	110	40.75
Secondary	145	53.7
High	15	5.6
3-Residence		
Rural	210	77.8
Urban	60	22.2
4-Occupation of mother		
Not working	150	55.6
Working	120	44.4
5-Occupation of father		
Not working	90	33.3
Working	180	66.7
6-Income		
Not enough	210	77.8
Enough	60	22.2
7- Social class		
low	215	79.6
Moderate	55	20.4

Table (1), showed demographic characteristics of parents of children, where the secondary education was found among (53.7%) of studied mothers and (68.5%) of their husband's education.77.8 %) of the studied children from the rural area reported (77.8) enough income. And (79.6%) were of low social class.

Table (2): Frequency of neurological manifestations in renal disease patients.

Neurological manifestations	Studied patients (n=270)	
	No.	%
Present	8	3
Absent	262	97

Table (2), showed that the frequency of neurological manifestations in renal disease patients was (3%).

Table (3): Clinical neurological manifestations in renal disease patients

Neurological manifestations	No.	%
Febrile seizures	5	62.5
Cerebral thromboembolism	2	25
Uremic encephalopathy	1	12.5
Total	8	100

Table (3), showed that the 270 patients, 8 (3%) had neurological presentations, of whom, 5 had febrile seizures, 2 had cerebral thromboembolism and one uremic encephalopathy.

Table (4): Outcomes of renal diseases with neurological complication

Renal diseases with neurological complications	OUTCOMES
5 cases of UTI with Febrile seizures	Complete resolution
2 cases of Nephrotic syndrome with cerebral thromboembolism	Both admitted to ICU due to Hemiparesis with MRI abnormalities
1 case of ESRD with Uremic encephalopathy	Admitted to ICU then died

Table (4), showed the outcomes of renal diseases with neurological complications was 5 cases of UTI with Febrile seizures (Complete resolution), 2 cases of Nephrotic syndrome with cerebral thromboembolism (Both admitted to ICU due to Hemiparesis with MRI abnormalities), and 1 case of End-stage renal disease (ESRD) with Uremic encephalopathy (Admitted to ICU then died).

Table (5): Clinical characters of febrile seizure

	NO
Urinary tract infection:	5
E. coli	3
Other organisms	
Age (years):	2
Range	
Sex:	1- 5.4 years
Male	
Female	2
Type>	3
Simple	5

Table (5), showed that all patients with clinical presentations of febrile seizure had urinary tract infections. The febrile seizure was the first sign of urinary tract infection in these patients and the cause of admission.

DISCUSSION

The incidence of chronic renal disease in children may be as high as 32.4 per million in developed countries. Sixty-four percent of these children are 9-15 years of age ⁽¹⁾. Neurologic manifestations that may be observed in chronic renal failure (CRF) are febrile seizures, cerebral thromboembolism, and encephalopathy ⁽¹²⁾.

The prevalence of febrile seizures ranges from 2% to 5%. A febrile seizure is divided into simple and complex types. Regarding the simple type, seizures are usually of tonic-clonic type. The seizures do occur once a day and take less than 15 min. Concerning the complex type of seizure, it is usually focal and occurs more than once a day and each seizure takes more than 15 min. A febrile seizure usually has a good prognostic outcome, but it may be lead to epilepsy in 2%-7% of the cases ⁽¹³⁾.

The current study showed that 34.3% were males, and 65.7% were females in the studied patients and the mean age of studied patients was 115 ± 35.2months. This coped with the study of **Dalirani et al.** ⁽¹⁾ who studied Neurological Manifestations of Renal Diseases in Children in which out of 634 children with renal diseases, 523 (82.4%) were female and 111 (17.6%) were male, the youngest was 1 month old, and the oldest 144 months old, with median ± IQR= 30±50 months.

The present study showed that the frequency of neurological manifestations in renal disease patients was (3%), in agreement with the study of **Brouns and Paul** ⁽¹⁴⁾ who reported that 2.8% of children with renal diseases had neurological presentations and febrile seizure was the most common neurological presentation. Studies in this regard are infrequent.

Our results showed that out of the 270 patients, 8 (3%) had neurological presentations, of whom, 5 had febrile seizures, 2 had cerebral thromboembolism, and 1 encephalopathy. This concise with the study of **Dalirani et al.** ⁽¹⁾ who reported that of 634 patients, 18 (2.8%) had neurological presentations, of whom, 15 had febrile seizures, 2 had cerebral thromboembolism and 1 encephalopathy.

In our study, the frequency of cerebral thromboembolism was lower than the mentioned studies, in the present study one case was found. The difference in the prevalence of neurological presentations in our study and mentioned studies may be due to differences in study type and method, sample size, and hospital type (referrals or non-referrals), which in agreement with the study of **Brice et al.** ⁽¹⁵⁾ on 326 patients younger than 21 yr with nephrotic syndrome showed that the incidence of cerebral thromboembolism was 9.2%.

In the present study, a patient with ESRD had presented with impaired consciousness and cortical symptoms, and cerebral symptoms had been caused by increased blood pressure and hypertensive-encephalopathy. The results of our study showed that neurological manifestations of pediatric renal diseases still are common.

CONCLUSION

Neurological manifestations of pediatric renal diseases still are common and the neurological presentations in 3 % of children with renal diseases, and febrile seizures as the most common presentation.

REFERENCES

1. **Dalirani R, Mahyar A, Ayazi P et al. (2016):** Neurological Manifestations of Renal Diseases in Children in Qazvin/Iran. *Iran J Child Neurol.*, 10 (3): 24-27.
2. **Bhoobun S, Jalloh A, Jacobsen K (2012):** Cerebral venous thrombosis in a child with nephrotic syndrome: case report. *Pan Afr Med J.*, 13: 57-62.
3. **Mehta A, Williams V, Parajuli B (2017):** Child with Dysuria and/or Hematuria. *Indian J Pediatr.*, 84 (10): 792-798.
4. **Anochie I, Eke F, Okpere A (2006):** Childhood nephritic syndrome: change in pattern and response to steroids. *J Natl Med Assoc.*, 98 (12):1977-81.
5. **Lee P, Verrier Jones K (1991):** Urinary tract infection in febrile convulsions. *Arch Dis Child*, 66 (11):1287-90.
6. **Lammers R, Gibson S, Kovacs D et al. (2001):** Comparison of test characteristics of urine dipstick and urinalysis at various test cutoff points. *Ann Emerg Med.*, 38 (5): 505-512.
7. **Pan G, Avner E (2011):** Glomerulonephritis Associated with Infections. In: Kliegman RM, Stanton RE, Schor NF, Geme III JW St, Behrman RE. *Nelson Textbook of Pediatrics*. 19th ed. Phila, Saunders, Pp. 1783-6.
8. **Salvadori M, Bertoni E (2013):** Update on hemolytic uremic syndrome: Diagnostic and therapeutic recommendations. *World J Nephrol.*, 2(3): 56-57.
9. **Carr L (2007):** Pediatric neurology: principles and practice. *J Neurol Neurosurg Psychiatry*, 78(12): 1416.
10. **Kerlin B, Ayoob R, Smoyer W (2012):** Epidemiology and Pathophysiology of Nephrotic Syndrome-Associated Thromboembolic Disease. *Clin J Am Soc Nephrol.*, 7(3): 513-520.
11. **Faigle R, Sutter R, Kaplan P (2013):** The electroencephalography of encephalopathy in patients with endocrine and metabolic disorders. *J Clin Neurophysiol.*, 30(5): 505-516.
12. **Seikaly M, Ho P, Emmett L et al. (2003):** Chronic renal insufficiency in children. *Pediatr Nephrol.*, 18 (8):796-804.
13. **Patterson J, Carapetian S, Hageman J et al. (2013):** Febrile seizures. *Pediatr Ann.*, 42 (12): 249-54.
14. **Brouns R, Paul D (2004):** Neurological complications in renal failure: A review. *Neurological complications in renal failure: a review. Clin Neurol Neurosurg.*, 107(1): 1-16.
15. **Bryce A, Rose A, William E (2012):** Epidemiology and Pathophysiology of Nephrotic Syndrome-Associated Thromboembolic Disease. *Clin J Am Soc Nephrol.*, 7 (3): 513-520.