

THE PREVALENCE OF PERIPHERAL NEUROPATHY IN HEMODIALYSIS PATIENTS AT AL-AZHAR UNIVERSITY HOSPITAL IN NEW DAMIETTA CITY

By

Sherief M. Al-Shazly*, Mohammad Ali Saeed Hassan, El-Sayed Fathi Ali Hamed*, Mohammad Mahmoud Abd El-Aziz Mohammad*

Neurology Department, Faculty of Medicine, Al-Azhar University (Cairo and Damiatta*),
Egypt

***Corresponding author:** Mohammad Mahmoud Abdelaziz Mohammad,

E-mail: drzezo531@gmail.com

ABSTRACT

Background: Chronic kidney disease (CKD) is a worldwide public health problem. There are several etiologies for CKD. It can occur due to either primary kidney disease or as a complication of a multi-systemic disorder. Much emphasis has been placed on the increased cardiovascular risk and electrolyte abnormalities that accompany chronic kidney disease. The dreaded neurological complications are usually the uremic encephalopathy or a vascular event that accompanies hypertension.

Objectives: To study the prevalence of peripheral neuropathy in uremic patients on hemodialysis and its clinical and neurophysiological characters at Al-Azhar University Hospital in New Damietta.

Patients and Methods: This study was a cross-sectional study. This study was carried out at Hemodialysis Center at Al-Azhar University Hospital in New Damietta.

Fifty hemodialysis patients were investigated in the Hemodialysis Center at Al-Azhar University Hospital in New Damietta. All patients were submitted to clinical evaluation by the Michigan Neuropathy Screening Instrument (MNSI), and Electroneuromyography (ENMG), and laboratory investigations.

Results: The results of the study revealed that there was no significant relation between dialysis mode and severity of neuropathy, and there was significant relation between duration of dialysis and neuropathy of the studied cases.

Conclusion: The present study emphasized the high prevalence of peripheral neuropathy in a group of patients with end-stage kidney disease under hemodialysis maintenance treatment. The gold standard exam for diagnosis confirmation was nerve conduction studies. Thus, before undergoing dialysis, it would be recommended to submit all patients with CKD to nerve conduction studies.

Keywords: Dialysis, neuropathy, severity, CKD, case-control, motor, sensory.

INTRODUCTION

Chronic Kidney Disease (CKD) is a major public health problem in developed and developing countries, leading to decreased quality of life across the globe. It is a well-known fact that patients of

CKD are at increased risk of mortality as well as morbidity due to the myriad complications associated with this disease entity (*AbdElHafeez et al., 2018*).

Neurological complications, secondary to the uremic state, contribute largely to

the morbidity and mortality in patients with renal failure. Despite continuous therapeutic advances, many neurological complications of uremia, like uremic encephalopathy, atherosclerosis, neuropathy, and myopathy fail to respond completely to these treatment modalities (Rizzo *et al.*, 2012).

Studies of neuropathy in the end-stage renal disease have demonstrated that 70–100% of patients on dialysis experience neuropathic symptoms despite attaining current targets of dialysis adequacy (Aggarwalet *et al.*, 2013).

Although the prevalence of severe neuropathy may appear to have decreased to a certain extent, a significant cohort of end-stage renal disease patients still report symptoms which are considered functionally disabling, and even patients who meet accepted guidelines for dialysis adequacy may complain of neuropathic symptoms. Renal transplantation remains the only known cure for uremic neuropathy, with clinical improvement in sensory and, to a lesser extent, motor function occurring within a few days of transplantation (Arun *et al.*, 2009).

The present work aimed to study the prevalence of peripheral neuropathy in uremic patients on hemodialysis

SUBJECTS AND METHODS

Permission from The Faculty of Medicine Ethical Committee was obtained, and approval from the institutional review board was taken.

The researcher introduced himself to all participants included in this study and asked them to participate after illustrating the goal of the study.

All selected participants received comprehensive information regarding the objective and the expected benefit of the study. All ethical considerations were taken throughout the whole work. Informed verbal consents from all participants were taken and confidentiality of information was assured.

This study was a cross-sectional study. This study was carried out at the hemodialysis center at Al-Azhar University Hospital in New Damietta (Fifty hemodialysis patients).

Inclusion criteria:

All patients irrespective of age and sex, and patients with end-stage chronic kidney disease on hemodialysis 4 hours' duration and 3cycles per week.

Exclusion criteria:

Patients denying Consent, patients on peritoneal dialysis, patients who had a renal transplant, patient with other known cause of peripheral neuropathy such as hypothyroidism, alcohol, diabetes mellitus, patients on drugs having peripheral neuropathy as established toxicity, malignancy, and vitamin B6 deficiencies.

History: This included Socio-demographic factors, with special emphasis on the cause, onset, duration of kidney disease, duration of hemodialysis, detailed neurological history with particular reference to the presence of risk factors for polyneuropathy and the occurrence of symptoms indicating peripheral neurological damage.

Diagnosis of UN (Uremic Neuropathy): This was investigated by the Michigan Neuropathy Screening Instrument

questionnaire (MNSI_Q), and physical assessment (Duraishamy and Parthasarathy, 2018).

Neurological examination was done with special emphasis on peripheral nerve examination.

Laboratory investigations were performed for every patient before the electrophysiological examination. The Parameters included CBC, S. creatinine, and fasting blood glucose.

Electrophysiological studies were performed by using Mihnokohden Machine for motor nerve conductions, sensory nerve conduction, late responses, and EMG Protocol.

Statistical analysis:

Analysis of data was done using the Statistical Package for Social Science version 20 (SPSS Inc., Chicago, IL, USA). Quantitative variables were described in the form of mean and standard deviation, and range. Qualitative variables were described as number and percentage. To compare parametric quantitative variables between two groups, the Student t-test was performed. Qualitative variables were compared using the chi-square (X²) test or Fisher's exact test when frequencies were below five. P-value < 0.05 was considered significant.

RESULTS

The cause of chronic kidney disease was chronic glomerulonephritis in 38%, chronic interstitial nephritis in 26%,

hypertension in 6%, obstructive chronic kidney disease in 10%, congenital in 10% and others in 10% (**Table 1**).

Table (1) Causes of chronic kidney disease in studied cases

Causes of chronic kidney disease	N	%
Chronic glomerulonephritis	19	38
Chronic interstitial nephritis	13	26
Obstructive chronic kidney disease	5	10
Congenital	5	10
Hypertention	3	6
Others	5	10

The mean Session length per week was 11.7 ± 1.1 with range of 8-13 hours, Low-flux was present in 56.0% and High-flux was in 44%, hemodialysis in 88 % and

Hemodiafiltration in 12%, and demyelination was present in 21% of cases, axonal in 39.5% and combined in 39.5% (**Table 2**).

Table (2) Types of neuropathy and dialysis characteristics of the studied cases

Types of Neuropathy	N	%
Demyelination	8	21.0
Axonal	15	39.5
Combined	15	39.5
Session length per week (Hours)		
Mean \pm SD	11.7 \pm 1.1	
Range	8-13	
Dialyzer type	N	%
Low-flux	28	56.0
High-flux	22	44.0
Dialysis mode	N	%
Hemodialysis	44	88.0
Hemodiafiltration	6	12.0

76% of cases have ENMG evidence of polyneuropathy, and 36% have scored MNSI scores between 5-10 out of 10 and 58% have scored MNSI scores between 3-

5.5 out of 10 and 2% have scored MNSI scores between 1-2.5 and 4% not have any point of MNSI scores (**Table 3**).

Table (3): ENMG evidence of polyneuropathy and MNSI score among studied cases

Variables	Present		Absent	
ENMG evidence of polyneuropathy	N	%	N	%
	38	76	12	24
Cases:	N		%	
MNSI score:				
5-10	18		36.0	
3-5.5	29		58.0	
1-2.5	1		2.0	
No point	2		4.0	

There was a significant relation between the duration of dialysis and neuropathy of the studied cases (Table 4).

Table (4): Relation between duration of dialysis and neuropathy of the studied cases

Variables Duration of dialysis	With neuropathy N=38	Without neuropathy N=12	P-value
Mean \pm SD	5.11 \pm 1.75	3.01 \pm 0.95	< 0.001 (S)

There was no significant relation between Dialysis mode and severity of neuropathy (**Table 5**).

Table (5) Relation between Dialysis mode and severity of neuropathy

Parameters Dialysis mode	Severe neuropathy N=18		Moderate N=10		Mild N=10		P-value
	NO.	%	NO.	%	NO.	%	
Hemodialysis	16	88.9	8	80.0	9	90.0	0.453
Hemodiafiltration	2	11.1	2	20.0	1	10.0	

In patients with neuropathy there was a predominant decrease in CMAP amplitudes with relatively decreased

conduction velocity, and prolonged distal latency (**Table 6**).

Table (6): Motor nerve conduction studies in the study

Parameters Variables	Decrease in CMAP amplitude		Decrease Conduction velocity		Prolonged distal latency	
	No	%	No	%	No	%
Peroneal						
	34	68.0	33	66.0	21	42.0
Tibial						
	33	66.0	30	60.0	19	38.0
Ulnar						
	15	30.0	15	30.0	2	10.0
Median						
	14	28.0	14	28.0	2	10.0

Patients with neuropathy were showed decreased SNAP amplitudes with

relatively decreased conduction velocity (**Table 7**).

Table (7): Sensory nerve conduction studies in the study.

Parameters Variables	Decrease amplitude SNAP		Decreased conduction velocity	
	No	%	No	%
Sural				
	38	76.0	35	70.0
Median				
	20	40.0	22	44.0
Ulnar				
	17	34.0	20	40.0

2.6% of patients have motor weakness, and 50% have sensory symptoms, and 44.7% have autonomic symptoms, No patient have wasting of limbs, and 78.9%

have absent ankle jerk, and 31.6% have impaired pain and temperature, 44.7 % have impaired vibration and joint position sense (**Table 8**).

Table (8): Symptoms and signs in Cases in the study

Variables	Cases	
	No	%
Motor weakness :		
	1	2.6
Sensory symptoms :		
	19	50.0
Autonomic symptoms:		
	17	44.7
Wasting of limbs:		
	0	0.0
Absent ankle jerk:		
	30	78.9
Impaired pain and temperature :		
	12	31.6
Impaired vibration and joint position sense :		
	17	44.7

DISCUSSION

The present study showed that the cause of CKD was CGN in 38%, CIN in 26%, hypertension in 6%, obstructive CKD in 10%, congenital in 10%, and others in 10%. Our results were supported by the study of *Macário et al. (2011)* as they reported that in Portugal the main etiologies for CKD in the patients under hemodialysis treatment are DM (33.6%), undetermined (20.7%), and arterial hypertension (15.5%).

The current study showed that demyelination was present in 21% of cases, axonal in 39.5% and combined in 39.5%. A patient has motor weakness 2.6%, and 50% have sensory symptoms, and 44.7% have autonomic symptoms, and 0% have wasting of limbs, and 78.9% have absent ankle jerk, and 31.6% have impaired pain and temperature, and 44.7% have impaired vibration and joint position sense. Our results were supported by the study of *Kolli et al. (2018)* who reported that positive sensory symptoms were seen in 48.5%, while negative

sensory symptoms were seen in 38.5%. Autonomic symptoms were seen in 8.5%. 80.5% had absent ankle jerk. Impaired pain and temperature sensation were noted in 30.5%, while impaired vibration and joint position sense was noted in 43%. Motor weakness was noted in 3% of patients. According to *Anbarasu and Prathiba (2018)* 71.6% of patients were diagnosed as having clinical peripheral neuropathy, and 28.33% had not satisfied the diagnosis of clinical peripheral neuropathy.

Furthermore, *Santos (2012)* observed that all the patients with motor symptoms also had sensory symptoms, but not all the patients with sensory symptoms had motor symptoms.

As regard MNSI scores, 36% have scored MNSI scores between 5-10 out of 10, and 58% have scored MNSI scores between 3-5.5 out of 10, and 2% have scored MNSI scores between 1-2.5, and 4% did not have any point of MNSI scores. *Mambelli, et al. (2012)* concluded the study by saying that MNSI could

represent a valid and simple clinical-instrumental screening test for the early diagnosis of UN because of an early therapeutic approach. The course of neuropathy is variable in patients undergoing hemodialysis. Routine hemodialysis has found not to improve neuropathy in patients with CKD despite the decrease in urea and creatinine levels, this was emphasized by *Borire et al.* (2017).

As regard hemodialysis characteristics, the mean session length per week was 11.7 ± 1.1 with a range of 8-13 hours. Low-flux was present in 56.0% and high-flux was in 44%. Hemodialysis was in 88 % and hemodiafiltration was at 12%. Our results showed that 76% of cases have ENMG evidence of polyneuropathy. 58% of them had 3-5.5 of MNSI score. Our results are supported by the study of *Anbarasu and Prathiba (2018)* as they reported that the smallest MNSI score obtained in the study population was 2 and the largest score was 7 with a mean score of 2.580 with a standard deviation of 2.069.

The current study showed that there was no significant relation between demographic data and neuropathy. *Anbarasu and Prathiba (2018)* reported that males were significantly more affected by peripheral neuropathy when compared to females. Concerning age, in their study, it was found that patients aged ≥ 60 years were predominantly affected by uremic neuropathy which was statistically very significant.

Our results showed that there was a significant relation between neuropathy and urea level, while there was no significant relation between other renal

functions and neuropathy. There was no significant relation between neuropathy and the etiology of CKD in the study of the studied cases. There was a significant relation between the duration of hemodialysis and neuropathy of the studied cases.

In the present study, there was no significant relation between hemodialysis mode and severity of neuropathy. There was a significant relation between renal function and neuropathy severity of the studied cases. In patients with neuropathy, there were a predominant decrease in compound motor action potential (CMAP) amplitudes with relatively decreased conduction velocity, and prolonged distal latency. Abnormalities were found in the peak latency, sensory nerve action potential (SNAP) amplitude and conduction velocity (CV) of the sural, median, ulnar nerves. In patients with neuropathy, SNAP amplitudes decreased with relatively decreased conduction velocity. *Aggarwal et al. (2013)* showed that mean nerve conduction velocities (m/sec), which were almost similar to this study. *Tilki et al. (2009)* reported that the prevalence of uremic neuropathy is 60%-100% of patients on hemodialysis. Neuropathy generally only develops at glomerular filtration rates of less than 12 mL/min/1.73 m². In stage V CKD (on HD), the prevalence of clinical uremic peripheral neuropathy was 71.6% which was clinically and statistically significant.

CONCLUSION

The present study emphasized the high prevalence of peripheral neuropathy in a group of patients with end-stage kidney disease under hemodialysis maintenance treatment. Despite the short period, the

study was conducted and, consequently, small sample size, the obtained results allowed us to highlights the huge importance of having neurologists and nephrologists as well as other specialists working all together to better diagnose and manage neurological complications of end-stage kidney disease in those patients. The standard exam for diagnosis confirmation is nerve conduction studies. Thus, before undergoing hemodialysis, it would be recommended to submit all patients with CKD to nerve conduction studies.

REFERENCES

1. **Aggarwal HK, Sood S, Jain D, Kaverappa v and Yadav S. (2013):** Evaluation of spectrum of peripheral neuropathy in predialysis patients with chronic kidney disease. *Renal failure*, 35:1-7.
2. **Anbarasu D., and Prathiba P. (2018):** Study on prevalence of peripheral neuropathy among patients on hemodialysis. *IAIM*, 5(10): 73-80.
3. **AbdElHafeez S, Bolignano D, 'Arrigo G, Dounousi E, Tripepi G ,and Zoccali C. (2018):** Prevalence and burden of chronic kidney disease among the general population and high-risk groups in Africa: a systematic review *BMJ Open*, 8:e015069.
4. **Kolli, S. (2018):** A Clinical and Electrophysiological Study of Peripheral Neuropathies in Predialysis and Dialysis Patients: Our Experience from South India. *Journal of The Association of Physicians of India*, 66(6):31-37.
5. **Macário F, Filipe R, Carvalho MJ, Galvão A, Lopes JA, Amoedo M. (2011):** Diálise Domiciliária. *SPNews - Sociedade Portuguesa de Neurologia*, VII (24):1–20.
6. **Mambelli E, Barrella M, Facchini MG, Mancini E, Sicuso C, Bainotti S, Formica M and Santoro A. (2012):** The prevalence of peripheral neuropathy in hemodialysis patients. *Clinical Nephrology*, 77(6): 468-75.
7. **Rizzo MA, Frediani F, Granata A, Ravasi B, Cusi D, and Gallieni M. (2012):** Neurological complications of hemodialysis: *J Neph.*, 25(02): 170-182.
8. **Santos, A. O. P. (2012):** Peripheral neuropathy in patients in haemodialysis treatment Doctoral dissertation, Universidade da Beira Interior.
9. **Tilki HE, Akpolat T, Coşkun M, and Stålberg E. (2009):** Clinical and electrophysiologic findings in dialysis patients. *Journal of Electromyography and Kinesiology*, 19(3): 500-8.

انتشار اعتلال الاعصاب الطرفية عند مرضى غسيل الكلى الدموى بمستشفى جامعة الأزهر بدمياط الجديدة

شريف محمود الشاذلى*، محمد على سعيد حسن، السيد فتحى على حامد*، محمد

محمود عبد العزيز محمد *

قسم طب المخ والاعصاب بكلية الطب جامعة الأزهر، (القاهرة و دمياط*)، مصر

خلفية البحث: مرض الكلى المزمن هو مشكلة صحية عامة في جميع أنحاء العالم. هناك العديد من مسببات مرض الكلى المزمن. يمكن أن يحدث بسبب مرض الكلى الأولي أو كمضاعفات لاضطراب الانظمه المتعدده. وقد تم التركيز كثيرا على زيادة مخاطر القلب والأوعية الدموية وتشوهات المعادن التي تصاحب أمراض الكلى المزمنة. المضاعفات العصبية عادة ما تكون اعتلال الدماغ البولى أو احداث الأوعية الدموية التي ترافق ارتفاع ضغط الدم.

الهدف من البحث: دراسة مدى انتشار الاعتلال العصبي الطرفى لدى مرضى غسيل الكلى الدموى وتشخيصاته السريرية والعصبية الفسيولوجية في مستشفى جامعة الأزهر بدمياط الجديدة.

المرضى وطرق البحث: كانت هذه الدراسة دراسة مقطعية. أجريت هذه الدراسة في مركز غسيل الكلى الدموى بمستشفى جامعة الأزهر بدمياط الجديدة.

تم ادراج ٥٠ مريضاً بغسيل الكلى بمركز غسيل الكلى الدموى بمستشفى جامعة الأزهر بدمياط الجديدة. وتم تقديم جميع المرضى للتقييم السريري باستخدام وسيلة ميشيغان فى فحص الاعتلال العصبي، ودراسة فسيولوجيا الاعصاب، والتحقيقات المختبرية.

النتائج: كشفت نتائج الدراسة أنه لم تكن هناك علاقة كبيرة بين أسلوب غسيل الكلى الدموى وشدة الاعتلال العصبي، وكانت هناك علاقة كبيرة بين مدة غسيل الكلى والاعتلال العصبي للحالات المدروسة.

الاستنتاج: أكدت هذه الدراسة على ارتفاع معدل انتشار الاعتلال العصبي الطرفى في مجموعة من المرضى الذين يعانون من مرض الكلى في المرحلة النهائية تحت علاج غسيل الكلى الدموى. كان اختبار المعيار الذهبي لتأكيد التشخيص هو دراسات التوصيل العصبي. وهكذا، قبل الخضوع لغسيل الكلى الدموى، يوصى بتقديم جميع المرضى المصابين بمرض الكلى المزمن إلى دراسات التوصيل العصبي.