International Journal of Medicine Research
ISSN: 2455-7404; Impact Factor: RJIF 5.42
Received: 02-03-2019; Accepted: 05-04-2019
www.medicinesjournal.com
Volume 4; Issue 2; April 2019; Page No. 118-122

Clinical profile of peripheral neuropathy in geriatric population

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Abstract
Background: Aetiology of neuropathy in elderly is varied, and the leading causes include vasculitis, diabetes, alcohol and nutritional deficiencies. The diagnostic work up needs to be tailored to each individual patient based on the bedside history and examination.
Aims and Objectives: To describe clinical profile of peripheral neuropathy in geriatric population and correlate symptoms and pattern of involvement with nerve conduction study and aetiology of peripheral neuropathy respectively.
Materials and Methods: Two hundred patients were studied in the department of Medicine and Gandhi Medical College and associated Hamidia Hospital Bhopal from 2017-2018. Complete Blood Count with ESR, urine R & M, fasting Blood Sugar, post Prandial Blood Sugar, Renal Function Test, Liver Function Test, serum protein, lipid profile, serum creatinine, serum urea, T3, T4, TSH, CRP, PS for comment, serum NA+ and K+, USG abdomen and chest X-Ray(PA view) was performed in all the patients. Nerve conduction study was done in all subjects to observe the pattern and type of various peripheral neuropathies.
Results: Most common age group was 65-70 years (73.5%) with male preponderance (68.5%)]. Neuropathy was most common among the patients who were overweight. In present study 134 (64.5%) patients were having normal BMI. Abnormal vitamin B 12 level was present in 8 out of 10 patients. Out of 200 patients, 7 (3.5%) patients were RA factor positive. Most common nerve conduction results was mixed sensorimotor neuropathy in 38 (19%) patients followed by motor axonal neuropathy [7 (3.5%)]. Most common diagnosis in present study was diabetic neuropathy [96 (48%)] followed by hypothyroidism [26 (13%)], alcohol Related Neuropathy [11 (5.5%)] and anemia [11 (5.5%)].
Conclusion: Peripheral neuropathy was more prevalent in elderly patients with diabetes mellitus and hypothyroidism. Majority elderly patients had moderate sign (calculated as per NDS) and symptoms (calculated as per NSS) at presentation. NCS revealed that mixed type of sensorimotor neuropathy to be followed by motor axonal neuropathy among elderly patients.

Keywords: nerve conduction study, elders, neuropathy

Introduction
Peripheral neuropathy is one of the challenging diagnoses encountered by a neurologist with an estimated prevalence of 2–8% in the general population [1]. The incidence of peripheral neuropathy increases with age, commensurate with 'ageing' of the peripheral nervous system and the high prevalence of systemic disorders like diabetes mellitus [2]. Increased morbidity and impaired quality of life in elderly with peripheral neuropathy is recognized [3].
The aetiology of neuropathy in elderly is varied, and the leading causes include vasculitis, diabetes, alcohol and nutritional deficiencies. The diagnostic work up needs to be tailored to each individual patient based on the bedside history and examination, topographic pattern and evolution of clinical symptoms and signs [3].
Diabetes mellitus is the commonest cause of peripheral neuropathy (PN). Since the prevalence of diabetes mellitus increases with age, the prevalence of diabetic peripheral neuropathy is also expected to rise. Other common causes of peripheral neuropathy in elderly include a range of metabolic disorders, infectious agents, vasculities toxins, drugs and inherited polyneuropathies. To study the pattern and etiology of various types of peripheral neuropathies, forms the basis of the present study [4].
Investigations may include various blood tests, X-rays, scans, or other tests. Common tests are include Nerve conduction testing. The nerve conduction test looks at the speed that electrical signals pass through the nerves. Nerve conduction studies (NCS) are the most sensitive and reproducible measure of peripheral nerve functions. They are done to diagnose the disorders of the peripheral nervous system Neuropathy Symptom Score is a screening system developed to screen for neuropathy in patients [4].
Hence present study was performed to describe clinical profile of peripheral neuropathy in geriatric population so that adequate management can be planned.

Materials and Methods
Present prospective observational study was performed on 200 patients in the department of Medicine and Gandhi Medical College and associated Hamidia Hospital Bhopal from 2017-2018.
Patient > 65 years found to have peripheral neuropathy by Neuropathy Symptom Score >3 were included in the study after taking informed consent. All of the study subjects undergone history and Clinical examination and necessary investigation.
Patients with history of nerve injuries, with acute or chronic

musculoskeletal disorder, cases unable to stand unassisted more than 1 minute and non ambulatory patient were excluded from the patients. This study is approved by the Institutional ethics committee.

Complete Blood Count with ESR, urine R & M, fasting Blood Sugar, post Prandial Blood Sugar, Renal Function Test, Liver Function Test, serum protein, lipid profile, serum creatinine, serum urea, T3, T4, TSH, CRP, PS for comment, serum NA+ and K+, USG abdomen and chest X-Ray(PA view) was performed in all the patients.

Nerve conduction studywere done in all subjects to observe the pattern and type of various peripheral neuropathies. Special investigation like Serum Vitamin B-12, toxin screening of lead and arsenic, viral serology using ELISA method, serum and urine electrophoresis, rheumatoid factor, antinuclear antibodies (ANA) and antinuclear cycoplasmic antibodies (c-ANCA and p-ANCA), CSF examination were done as and when needed.

Demographic details of all the study subjects wetre collected on individual basis by filling of the Proforma (encl attached) following written consent (attached encl). All subjects were enrolled for the study were undergone the lab tests as listed above. Nerve conduction study were done in all cases by RMS EMG SALUS 2C (PC BASED NCV Machine.

All the data analysis was done using IBM SPSS ver. 20 software. Frequency distribution and cross tabulation was used to prepare tables. Microsoft word 2010 was used to prepare graphs. The parametric students 't' test were used to compare mean +SD. According to the characteristics of the subjects were compared using the Chi-square test value of less than 0.05 will be considered statistically significant.

Results

Maximum patients belong to age group of 65-70 years [147 (73.5%)] and were male [137 (68.5%)].

Most common past history was diabetes mellitus [79 (39.5%)] followed by hypothyroidism [25 (12.5%)] and hypertension [19 (9.5%)]. Most common clinical feature was TINGLING [120 (60%)] followed by tingling and numbness [36 (18%)].

As per the NSS references, total score was divided in to mild, moderate and severe symptoms. Out of 200 patients maximum patients had score for moderate symptoms [166 (83%)] followed by severe symptoms [28 (14%)].

As per the NDS references, total score was divided in to mild, moderate and severe signs. Out of 200 patients maximum patients had score for moderate sign [133 (66.5%)] followed by mild signs [58 (29%)].

In most of the subjects deep tendon reflex were normal [132 (66%)] whereas in 42 (21%) subjects deep tendon reflex were impaired and in 26 (13%) subjects deep tendon reflex were absent.

Mean refill time, pedal pulse and balance and coordination was 0.92±0.27, 1.53±0.53 and 4.07±1.1 respectively. romberg test revealed that maximum patients were AB [164 (82%)] followed by P [36 (18%)]. In present study, 51 (25.5%) patients were overweight followed by 10 (5%) patients who were obese. That means neuropathy was most common among the patients who were overweight. In present study 134 (64.5%) patients were having normal BMI. Mean SBP, DBP and pulse was 130.66±16.86, 84.98±10.05 and 73.34±8.10 respectively. Out of 200 patients 62 (31%) were hypertensive and 138 (69%) were non hypertensive.

Mean Hb in elder patients was 9.90±1.27 respectively. Majority of the patients [151 (75.5%)] had hemoglobin <11. In present study out of 200 patients, 88 (44%) were IFG whereas 51 (25.5%) were IGT patients. As per FBS and PPBS 112 (56%) and 149 (74.5%) were diabetes patients. Mean FBS and PPBS was 138.36±29.31 and 231.75±38.80 mg/dl respectively.

Mean creatinine and urea was 1.21±0.58 and 56.37±14.53 respectively. Mean blood sodium and potassium was 139.07±3.92 and 3.71±0.68 respectively. In present study, 2 patients had abnormal LFT and 17 patients had abnormal lipid profile Mean TSH was 3.38±2.26. Out of 200 patients 22 (11%) patients had uncontrolled TSH.

In present study, 1 (0.5%) patients each was having cardiomegaly and hyperinflated chest respectively. USG abdomen revealed that out of 200 patients, chronic kidney disease was present in 9 (4.5%) and chronic liver disease was present in 7 (3.5%).

Abnormal vitamin B 12 level was present in 8 out of 10 patients. Out of 200 patients, 7 (3.5%) patients were RA factor positive. In our study vitamin b12 level <150pg/dl are considered significant deficiency and vitamin b12 level measured in those patient whose RBC indices and PS comment are suggestive.

Table 1: Distribution of finding of nerve conduction studies

NCS	No of patient	Percentage
Mixed sensorimotor neuropathy	38	19.0
Motor axonal neuropathy	7	3.5
Motor mono neuropathy of median nerve	4	2.0
Motor mono neuropathy of peroneal nerve	2	1.0
Sensorimotor axonal neuropathy	7	3.5
Sensorimotor demyelinating neuropathy	7	3.5
Sensory axonal neuropathy	4	2.0
Normal	131	65.5
Total	200	100.0

Table 2: Distribution of patients as per the diagnosis

Diagnosis	Frequency	Percent
Alcohol Related Neuropathy	11	5.5
Anemia	11	5.5
CIDP	5	2.5
Diabetic Neuropathy	96	48.0
HIV Neuropathy	1	.5
Hypothyroidism	26	13.0
Leprosy Neuropathy	1	.5
RA associated neuropathy	7	3.5
Uraemic Neuropathy	9	4.5
Idiopathic (bottom)	33	16.5
Total	200	100.0

Discussion

Elderly are at an increased risk for polyneuropathy. Several studies have addressed the epidemiology, aetiology, quality-of-life and clinico-pathological correlation of neuropathy in elderly [5, 6]. These studies are varied in the operational definition of neuropathy, investigatory tools and study settings. Community-based epidemiological studies have primarily focused on distal symmetrical sensory or sensorimotor neuropathy in order to avoid mimickers like stroke, injuries, etc., and improve inter-rater reliability.

In present study, maximum patients belong to age group of 65-70 years (73.5%). Maximum patients were male and male : female ratio is (68.5%). In a similar study, Ozkaraman *et al*. reported that average age of participants was 68.46 ± 5.8 and most of them were males (63.3%) [7]. Adgaonkar *et al*. comprised study of profile peripheral neuropathy in 50 patients of diabetes mellitus clinically as well as by nerve conduction study and reported that maximum patients were male (n=30) [8]. Mold *et al*. studied 795 who were 65 years of age and older and reported that participants had a mean age of 73.4 years (5.9), with a range of 64 to 94 [9]. Mold *et al*. in a similar study found that 56% were female which is contrary to present study findings which comprised of more male patient [9]. Prevalence reported by several studies were 8% in people over 55 years old in Italy [10], 2.4% in adults of all ages in Bombay [11], and 7% of all adults in Sicily based on symptoms alone [12].

In present study, maximum patients who presented with neuropathy had past history of diabetes mellitus (39.5%) and hypothyroidism (12.5%). In a similar study by Mold *et al*. [9] found that 219 out of 795 subjects (27.5%) gave a history of at least one disease known to cause peripheral neuropathy which strengthen the present study findings.

In present study most common clinical feature in present study was tingling (60%) followed by tingling & numbness (18%). Adgaonkar *et al*. reported that common mode of peripheral neuropathy was tingling and numbness which was found in 15 cases (30%) followed by impaired vibration 13(26%), impaired ankle jerk (24%), impaired touching (18%) and pain in 8 (16%). 8 Mold *et al*. reported that out of 795 patients the proportions of patients with one or more deficits who reported symptoms were as follows: numbness of extremities, 28%; pain or discomfort, 48%; restless legs, 31%; trouble walking, 44%; and trouble with balance, 35%. [9] In a study done by Udayashankar *et al*. it was noted that all 50 patients (100%) had foot pain, numbness and tingling. Upper limb symptoms were observed in 41 (82%) patients. On sensory testing, pin prick was diminished in 48 (96%) whereas vibration sense was who had diabetes for more than 5 years had either moderate or severe diabetic neuropathy as compared to those with lesser duration of diabetes [13].

The relationship between peripheral neuropathy and hypertension is particularly interesting. In present study out of 200 patients 62 (31%) were hypertensive and 138 (69%) were non hypertensive. Similar reports were depicted in the study done by Impallomeni *et al*. and Prakash *et al*. [13].

Patients with higher body mass index were more likely to have neuropathy as compared to normal weight patient which suggests several possibilities. It is likely that some of these patients had undiagnosed diabetes, because people who are overweight are more likely to have diabetes, and there is some evidence that undetected diabetes is associated with at least some cases of neuropathy [14]. In present study, 51 (25.5%) patients were overweight and 10 (5%) patients were obese. Mean body mass index of participants reported by Mold *et al*. [9] was 28.6 kg/m2 which is in agreement to present study findings where mean BMI was 23.92±3.51 kg/m2. In present study neuropathy was most common among the patients who were overweight

Diabetes is the commonest cause for peripheral neuropathy and was a common co-morbidity in the current study. In present study out of 200 patients, 88 (44%) were IFG whereas 51 (25.5%) were IGT patients. As per FBS and PPBS 112 (56%) and 149 (74.5%) were diabetes patients. Mean FBS and PPBS was 138.36±29.31 and 231.75±38.80 mg/dl respectively. In the present study it was observed that severity of peripheral neuropathy was related with blood sugar. Higher the blood sugar level, severe is the neuropathy. In present study 18% elders were left undetected due to several reason most common was the euglycemic state. Adgaonkar *et al*. reported that maximum incidence of peripheral neuropathy was noted in blood sugar >300 mg%. Below 200 mg% no patient was symptomatic. Clinical symptoms of peripheral neuropathy are directly proportional to blood sugar levels [8]. Partanen *et al*. [15] demonstrated rising incidence of peripheral neuropathy with crease of blood sugar levels. Dutta *et al*. [16] found incidence of peripheral neuropathy with blood sugar level in lower range.

Mean TSH was 3.38±2.26 respectively. Out of 200 patients 22 (11%) patients had uncontrolled TSH, T3 and T4 respectively. In present study 11% patients had hypothyroidism. Similar reports were depicted in the study done by Impallomeni *et al*. [17].

In present study majority of the patients (75.5%)] were anemic. A lack of vitamin B12 can cause serious anemia, nerve damage and degeneration of the spinal cord. It is common for anemia to develop first, but this is not always the case, especially if a person is taking a folate supplement. A lack of B12 damages the myelin sheath that surrounds and protects nerves. In present study 90 of the patients had abnormal vitamin B12 level. Similar reports were generated by the study done by Kararizou *et al*. [18].

In present study, in most of the subjects deep tendon reflex were normal [132 (66%)] whereas in 42 (21%) subjects deep tendon reflex were impaired and in 26 (13%) subjects deep tendon reflex were absent. Impallomeni *et al*. [17]. carefully assessed the ankle reflexes of 200 consecutive older patients admitted to the geriatric inpatient service of a hospital in England (mean age, 80; range, 65 to 99). They reported that only 9 patients (4.5%) had bilaterally absent reflexes. Other researchers have found much higher percentages of older people to have this abnormality.

It is worth mentioning that B12 deficiency was associated with peripheral neurologic deficits. It has been shown in a number of studies done in a variety of populations that B12 deficiency is extremely common in the elderly (prevalence 10% to 20% in unscreened patients) and grossly underdiagnosed [19]. Similar reports were depicted in present study where abnormal vitamin B 12 level was present in 8 (80%) out of 10 patients. Gabriel *et al*. concluded that sural nerve biopsy altered the diagnosis in 14%, confirmed the suspected diagnosis in 70% and was non-contributory in 16% [20].

However, in our study we could not do nerve biopsy due to constraints. In the same study, nerve biopsy affected the therapeutic management in 60% of patients. [20] Thus, the indication for performing nerve biopsy needs to be balanced against the expected diagnostic yield vis-à-vis procedural complications [18]. Fewer studies have focused on the utility of nerve biopsy in the elderly population with variable findings [18]. Chia *et al*. showed a very high yield of nerve biopsy and concluded that a definite diagnosis could be arrived at in 94% of the subjects by combining clinical and histological data. Kararizou *et al*. in a study of 74 elderly subjects reported that nerve biopsy changed the previously preferred diagnosis in 7.4%, and established the suspected diagnosis in 15.4%, while 12.2% showed only unexplained

axonal neuropathy [18].

Most common nerve conduction results was mixed sensorimotor neuropathy in 38 (19%) patients followed by motor axonal neuropathy [7 (3.5%)]. Anish *et al*. studied 100 elderly subjects aged 65 and above with peripheral neuropathy who underwent nerve biopsy and reported that the most common pattern of was distal symmetric sensorimotor polyneuropathy (35%), followed by multiple mononeuropathy (29%) and asymmetric sensorimotor neuropathy (15%) [1]. In our study NCV was normal in 65.5%.

In present study, as per the NSS and NDS references, total score was divided in to mild, moderate and severe symptoms and sign respectively. Out of 200 patients maximum patients had score for moderate symptoms [166 (83%)] followed by severe symptoms [28 (14%)]. Out of 200 patients maximum patients had score for moderate sign [133 (66.5%)] followed by mild signs [58 (29%)]. Udayashankar *et al*. performed a similar study out of the total of 50 patients, 49 (98%) were found to have a Toronto Clinical Neuropathy Scoring (TCNS) score of 6 or more, clinically indicating the presence of neuropathy [13]. Similar study done by Bril V *et al*. [21] with 65 patients, 12.3%, 21.5%, 27.7% and 38.5% had no neuropathy, mild neuropathy, moderate neuropathy and severe diabetic neuropathy respectively. Kiani *et al*. performed standard Neuropathy Symptom Score (NSS) and Neuropathy Disability Score (NDS) criteria for the diagnosis of diabetic neuropathy on 600 patients and reported that showed a relatively high prevalence (45.7%) of DPN that was associated with a history of foot ulcer, age, duration of diabetes, weight, diastolic blood pressure, education level and sex [22]. A study in Isfahan on 810 diabetic patients reported a DPN prevalence of 75.1%, as diagnosed by symptoms, signs and nerve conduction velocity studies [23]. Another study in Yazd Province, Iran reported a prevalence of 51.7% for diabetic sensory neuropathy in 2350 patients by considering physical signs for diagnosis [24]. According to a study by Dyck, Nerve Conduction Velocity (NCV) determination is not most sensitive test for the diagnosis of diabetic neuropathy as the main disadvantage of this test is that it does not provide direct information on signs and symptoms of neuropathy [25]. Udayashankar *et al*. and Bril *et al*. studied NSS and found that NSS provide better outcome as compared to NCV test [13, 21].

Conclusion

We found that peripheral neuropathy (PN) was more prevalent in elderly patients with diabetes mellitus and hypothyroidism. PN was also more prevalent in overweight and elderly patients having diabetes. Maximum elderly patients had moderate sign (calculated as per NDS) and symptoms (calculated as per NSS) at presentation. Deep tendon reflex in elderly patients with PN were normal, impaired or absent. NCS revealed that mixed type of sensorimotor neuropathy to be followed by motor axonal neuropathy among elderly patients. Among all categories, diabetic neuropathy was most common followed by hypothyroidism, alcohol related neuropathy and anemia. Peripheral neuropathy is a common morbidity in elderly which has important implication of health and should be searched for by NSS score and NDS score routinely and manage accordingly. On the basis of these finding we can conclude that neuropathy is a common finding among the elderly patients, early clinical diagnosis using above said features will allow initiating early intervention.

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