ORIGINAL ARTICLE

DEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF PATIENTS WITH NEUROMUSCULAR DISEASES IN A REHABILITATION CLINIC OF A TERTIARY HEALTH CENTER: 5-YEAR RESULTS

Üçüncü Basamak Bir Sağlık Merkezinin Rehabilitasyon Kliniğinde Nöromusküler Hastalıklar Nedeniyle Takip Edilen Hastaların Demografik ve Klinik Özellikleri: 5 Yıllık Sonuçları

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ABSTRACT

Objective: We aimed to investigate the demographic and clinical characteristics of patients who received inpatient physical therapy and rehabilitation programs for neuromuscular diseases (NMDs) in a tertiary health center.

Material and Methods: This retrospective study examined patients who received a inpatient physical therapy program in the NMDs clinic between March 2019 and March 2024. Sociodemographic data, body mass index, muscle strength, sensory examination, presence of atrophy, presence of involuntary movements, spasticity examination, presence of dysphagia and dysarthria, history of osteoporosis, respiratory system examination findings and functional status were recorded.

Results: The highest number of patients was in the neuropathy group, followed by motor neuron disease (MND) and myopathy groups (n=146, 37, 21, respectively). The mean age was significantly lower in the myopathy group compared to the MND and neuropathy groups ($p<0.001$). History of fracture ($p<0.001$) and frequency of osteoporosis ($p=0.016$) were significantly higher in the MND group than in the neuropathy and myopathy groups . Upper extremity proximal muscle weakness was significantly higher in the myopathy group than in other groups ($p=0.041$). Sensory deficits were significantly higher in the neuropathy group compared to the MND and myopathy groups ($p<0.001$). Independent ambulation ratio was statistically significantly lower in the MND group than in the other two groups ($p<0.01$).

Conclusion: MNDs are noted for fracture risk and difficulty in ambulation, while myopathies are marked by muscle weakness and neuropathies by sensory deficits.

Keywords: *Motor Neuron Diseases; Neuropathies; Myopathies; Rehabilitation; Clinical Features*

ÖZET

Amaç: Üçüncü basamak bir sağlık merkezinde nöromusküler hastalıklar (NMH) nedeniyle yatarak fizik tedavi ve rehabilitasyon programı alan hastaların demografik ve klinik özelliklerini incelemeyi amaçladık.

Gereç ve Yöntemler: Çalışmamız NMH Kliniğinde 2019 Mart ve 2025 Mart ayları arasında yatarak fizik tedavi programı almış hastaların incelendiği retrospektif bir çalışmadır. Hastaların sosyodemografik verileri, vücut kitle indeksi, kas gücü, duyu muayenesi, atrofi varlığı, alt ekstremite eşitsizliği, spastisite muayenesi, disfaji ve dizartri varlığı, osteoporoz öyküsü, solunum sistemi muayenesi ve fonksiyonel durumları kaydedildi.

Bulgular: Çalışmamıza dahil edilen 204 hastaların dağılımına bakıldığında en fazla hasta sayısı nöropati grubundaydı, motor nöron hastalığı (MNH) ve miyopati grubu sırasıyla takip etmekteydi (sırasıyla n= 146, 37, 21). Miyopati grubunda yaş ortalaması MNH ve nöropati grubuna göre istatistiksel anlamlı düşüktü($p<0,001$). MNH grubunda geçmişte gelişen kırık öyküsü ($p<0,001$) ve osteoporoz sıklığı ($p=0,016$) , nöropati ve miyopati grubuna göre istatistiksel anlamlı yüksekti. Üst ekstremite proksimal kas güçsüzlüğü miyopati grubunda diğer gruplara göre istatistiksel anlamlı yüksekti ($p=0,041$). Nöropati grubunda MNH ve miyopati grubuna göre duyusal kayıplar istatistiksel anlamlı yüksekti ($p<0,001$). Bağımsız ambulasyon MNH grubunda diğer iki gruba göre istatistiksel anlamlı düşüktü ($p<0,01$).

Sonuç: NMH alt gruplarını karşılaştırdığımız bu çalışmada MNH grubu kırık riski ve ambulasyon zorluğu ile öne çıkarken miyopatiler kas güçsüzlüğü ve nöropatiler de duyusal kayıplarla öne çıkmaktadır.

Anahtar Kelimeler: *Motor Nöron Hastalıkları; Nöropatiler; Miyopatiler; Rehabilitasyon; Klinik Özellikler*

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INTRODUCTION

Neuromuscular diseases (NMDs) are a group of diseases, which are genetically inherited or acquired, caused by an abnormality in the anterior horn motor cells, peripheral nerves, neuromuscular junction, or muscles (1). The damage in NMDs can be in the cell body, axons, Schwann cells, neuromuscular junction, or muscles. If the damage is in the neuron, the condition is called neuronopathy; if the damage is in the anterior horn motor neuron, it is called motor neuron disease (MND); if the damage is in the posterior root ganglion cell, it is called sensory ganglionopathy (1, 2). In our country, the NMD diagnosis and treatment guidelines established by the Ministry of Health in collaboration with neurologists were updated in 2006. (3).

The prevalence of NMDs is approximately 160 in 100,000 (4). It is known that there are over 70,000 patients with a NMDs diagnosis in Western Europe, 40,000 in the USA, and 35,000 in the UK (5). There are about 100,000 patients diagnosed with a NMDs in our country (6). NMDs can present at any age, from childhood to adulthood. Although advances in modern medicine have prolonged life expectancy in individuals with NMDs, there is still no curative treatment. These diseases generally have a progressive course and cause disability and impairment in daily living activities (5).

The most common symptom of NMDs is weakness. Patients may also present with functional deficits due to weakness, including reduced grip strength, difficulty getting up from a sitting position, squatting, walking, and climbing stairs (7). Physical examination findings include sensory loss, signs of autonomic dysfunction, muscle atrophy, cramps, fasciculations, and contractures. Dysarthria and dysphagia may also occur in these patients due to dysfunction of the neuromuscular junction or muscles, upper motor neurons, lower motor neurons, or both upper and lower motor neurons (8). NMDs can cause respiratory system disorders ranging from impaired airway patency to respiratory failure. They can cause decreased exercise capacity, cardiac conduction disorders, and structural changes. In addition to muscle weakness, NMDs can cause a wide range of involvement, including sensory loss, impaired swallowing and speech, and impaired respiratory and cardiac functions (9).

There is currently no treatment that provides complete recovery for NMDs. A literature review has shown that a well-structured physiotherapy program slows the loss of muscle strength in slowly progressing NMDs and improves the patient's secondary problems (10-12). A detailed evaluation of the patient's clinical characteristics is necessary to establish an effective physical therapy program. Studies have shown that comorbidities are seen at an earlier age and more frequently in NMDs than in the normal population. In this respect, clinical follow-up of these patients should be more careful, and all organ systems should be examined (13).

In this study, we aimed to examine the sociodemographic and clinical characteristics of patients who received inpatient physical therapy and rehabilitation programs due to NMDs, to make suggestions about the issues we should evaluate during follow-up, and to share our 5-year experience with the literature.

MATERIALS AND METHODS

Approval for the study was obtained from the, Bilkent City Hospital Ethical Review Board (Date: 12.06.2024, Number: 2-24-265). The study was conducted following the Declaration of Helsinki Principles. This retrospective study reviewed the files of patients who received inpatient physical therapy and rehabilitation programs at the NMDs Clinic between March 2019 and March 2024. Age, gender, occupation, marital status, height, weight, body mass index, disease duration (months), medications, comorbidities, smoking and alcohol use, history of fractures and falls, history of osteoporosis (OP), physical examination findings, including muscle strength, sensory examination, presence of atrophy, shortness and diameter difference in the lower extremities, presence of involuntary movements, spasticity, swallowing and speech evaluation, respiratory system examination, ambulation and functional status, were recorded.

Our study included patients aged ≥ 18 years of age who received inpatient physical therapy and rehabilitation programs in the NMD clinic between March 2019 and March 2024 for the diagnoses of MND, neuropathies, and myopathy. Patients with neuromuscular junction diseases, patients under 18, and patients with incomplete file data were excluded. Patients were divided into 3 groups: motor neuron

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diseases , neuropathies, and myopathies . Poliomyelitis sequelae, spinal muscular atrophies (SMA), and amyotrophic lateral sclerosis (ALS) were evaluated in motor neuron disease group. Guillain-Barré syndrome and polyneuropathies (diabetic polyneuropathy, drug-induced neuropathies, critical illness neuropathies, inflammatory polyneuropathies) were included in neuropathies group. Myopathies and muscular dystrophies were evaluated in myopathies group.

Statistical Analysis

Recorded data were analyzed using the Statistical Package for Social Sciences, version 27.0 (SPSS Inc., Armonk, NY). The normality of numerical data distribution was examined using the Shapiro-Wilk normality test. Normally distributed continuous variables were presented as mean and standard deviation, while non-normally distributed ones were presented with median and interquartile range (IQR; 25th-75th percentiles). Qualitative data were expressed as frequencies and percentages. Categorical variables were compared using the Chi-square test, and p-values from Pearson's Chi-square test and Likelihood ratio were used, depending on the sample and expected counts. Numeric variables were analyzed using the Kruskal-Wallis test with post hoc Bonferroni correction for multiple comparisons. The numeric variables between the two groups were analyzed using the Mann-Whitney U test. The confidence interval was set at 95%, and the accepted margin of error was 5%. Therefore, the p-value was considered significant when $p < 0.05$.

RESULTS

Two hundred and four patients were included in our study. The largest number of patients was in the neuropathy group (n=146), followed by MND (n=37) and myopathies (n=21). The sociodemographic features of the patients are presented in Table 1. The age is lower in the myopathies group than in other groups ($p < 0.001$).

Systemic diseases, medications, frequency of fractures, osteoporosis, time since diagnosis, and prophylactic or treatment for deep venous thrombosis (DVT) and pulmonary thromboembolism (PTE) are listed in Table 2. The history of falling or fracture ratio is significantly higher in the MND group than in the other groups ($p < 0.001$). OP frequency is greater in the MND group

Table 1. Sociodemographic data of the patients according to diagnostic groups

	MND (n=37)	NP (n=146)	MYP (n=21)	P
Age (median: IQR)	58.0 (17.0)	59.5 (29.0)	38.0 (17.0)	<0.001
Gender (n/%)				0.277
Female	23 (62.2)	72 (49.3)	9 (42.3)	
Male	14 (37.8)	74 (49.7)	12 (57.1)	
Marital status (n/%)				0.012
Married	18 (48.6)	79 (54.1)	6 (28.6)	
Single	11 (29.7)	35 (24.0)	13 (61.9)	
Widow	8 (21.6)	32 (21.9)	2 (9.5)	
Education (n/%)				
Retired	22 (59.5)	98 (67.1)	7 (33.3)	
Nonworking	5 (13.5)	6 (4.1)	4 (19.0)	
House-wife	1 (2.7)	4 (2.7)	1 (4.8)	
Officer	7 (18.9)	6 (4.1)	4 (19.0)	
Worker	2 (5.4)	30 (20.5)	4 (19.0)	
Self-	-	2 (1.4)	1 (4.8)	
employment				
BMI (median: IQR)	25.3 (6.1)	26.3 (8.4)	23.2 (6.3)	0.180
Smoking (n/%)	7 (28.0)	17 (13.1)	1 (4.8)	0.062
Alcohol (n/%)	3 (13.0)	2 (1.6)	-	

IQR: interquartile range, MND: motor neuron disease, NP: neuropathies, MYP: myopathy, BMI: body mass index

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Table 2. The medical history, clinical specialties and performed tests or imaging methods of the patients

	MND (n=37)	NP (n=146)	MYP (n=21)	P
Systemic diseases (n/%)				
HT	12 (32.4)	65 (44.5)	4 (19.0)	
DM	3 (8.1)	47 (32.2)	1 (4.8)	
CAD	1 (2.7)	28 (19.2)	1 (4.8)	
Malignancy	2 (5.4)	11 (29.7)	2 (9.6)	
History of fracture (n/%)	12 (32.4)	8 (5.5)	1 (4.8)	<0.001
Osteoporosis (n/%)	8 (21.6)	16 (11.0)	-	0.016
Duration of disease (months) (median: IQR)				
Dyspnea	2 (8.7)	18 (12.3)	3 (14.3)	0.443
Cough	1(2.7)	18 (12.3)	1 (4.8)	0.152
Lower respiratory tract infection	-	15 (10.3)	1 (4.8)	0.024
Bilateral lower extremities Doppler USG imaging (n/%)	12 (32.4)	89 (54.8)	11 (52.4)	0.051
DVT diagnosis (n/%)	--	9 (6.2)	-	0.154
Prophylactic treatment for DVT (n/%)	3 (8.1)	35 (24.0)	1 (4.8)	0.019
Pulmonary embolism diagnosis	-	2 (1.4)	1 (4.8)	0.350
Echocardiography imaging (n/%)	8 (21.6)	46 (31.5)	12 (57.1)	0.019
Ejection fraction (%) (median; IQR)	60.8±3.5	57.2±7.3	58.8±5.5	0.325

IQR: interquartile range, HT: Hypertension, DM: Diabetes mellitus, CAD: Coronary arterial disease, USG: Ultrasonography, DVT: Deep venous thrombosis, MND: Motor neuron disease, NP: Neuropathies, MYP: Myopathies, BMI: Body mass index

than in neuropathies (p=0.016). The history of lower respiratory tract infections is more common in the neuropathies group compared to the MND group (p = 0.024). Prophylactic treatment for DVT was applied more commonly in the neuropathy group than in other groups (p=0.019). Echocardiography imaging was performed more frequently in the myopathies group than in the other groups (p = 0.019).

The patient's physical examination findings and ambulation status are presented in Table 3. The frequency of proximal weakness in the right and left upper extremities is higher in the myopathies group than in the other groups (p = 0.041). Proximal weakness in the right lower extremity is more frequent in the MND and myopathies group than in the neuropathies group (p < 0.001). Left lower extremity proximal weakness is more common in the MND group than in the neuropathies group (p = 0.011). The ratio of patients with loss of sensation is higher in the neuropathy group compared to the other groups (p < 0.001). Muscle atrophy is more frequent in the MND group and the myopathies group than in the neuropathies group (p<0.001). Shortness in lower extremities is more common in MND than in the neuropathies group (p<0.01). The frequency of absence of urinary sensation is higher in the neuropathy group than in the MND group (p = 0.035). The proportion of dependent/independent ambulated patients is significantly lower in the MND group than in other groups. (p<0.01). Therefore, the frequency of patients dependent on a wheelchair is not significantly different between the groups. (p=0.075). Using a forearm crutch is more common in the MND group than in the other groups (p<0.01).

DISCUSSION

There was no significant difference in terms of gender between the three groups in our study. A study conducted in the Netherlands showed that 56% of 20,000 patients diagnosed with NMDs were male and 44% were female, and no difference was found in gender, similar to our study (14). In our study, the mean age is lower in the myopathy group compared to the neuropathy and MND groups. In a study from our country, the median age was lower in the myopathy group than in the neuropathy group, similar to our study. Neuropathies are a common neurological disorder with a prevalence of 1-3% in the normal

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Table 3. Physical examination findings and ambulation status of the patients

Physical examination findings (n/%)	MND (n=37)	NP (n=146)	MYP (n=21)	P
Muscle weakness	36 (97.3)	131 (89.7)	20 (95.2)	0.272
Right upper extremity proximal weakness	18 (48.6)	68 (47.6)	16 (76.2)	0.041
Right upper extremity distal weakness	21 (56.8)	79 (55.2)	13 (61.9)	0.846
Left upper extremity proximal weakness	18 (48.6)	71 (49.7)	16 (76.2)	0.041
Left upper extremity distal weakness	18(48.6)	74(50.6)	16 (76.2)	0.709
Right lower extremity proximal weakness	34 (91.9)	97 (67.8)	20 (95.2)	<0.001
Right lower extremity distal weakness	30 (81.1)	102 (71.3)	14 (66.7)	0.401
Left lower extremity proximal weakness	33 (89.2)	97 (67.4)	18 (85.7)	0.011
Left lower extremity distal weakness	28 (75.7)	103 (72.0)	14 (66.7)	0.762
Loss of sensation	5 (13.5)	92 (63.0)	3 (14.3)	<0.001
Muscle atrophy	8 (21.6)	3 (2.1)	2 (9.5)	<0.001
Shortness in the lower extremities	5 (13.5)	2 (1.4)	-	<0.01
Involuntary movements	1 (2.7)	4 (2.7)	1 (4.8)	0.712
Spasticity	6 (16.2)	10 (6.8)	1 (4.8)	0.151
Dysphagia	6 (16.2)	20 (13.7)	1 (4.8)	0.372
Speech disorder	4 (10.8)	10 (6.8)	1 (4.8)	0.650
Absence of urinary sensation	-	14 (9.6)	2 (9.5)	0.035
Loss of urinary control	4 (10.8)	29 (19.9)	2 (9.5)	0.264
Fecal incontinence	1 (2.7)	13 (8.9)	1 (4.8)	0.326
Ambulation (n/%)				
Independent ambulation	3 (8.1)	40 (27.4)	9 (42.9)	<0.01
Dependent on a wheelchair, non-functional ambulation	13 (35.1)	27 (18.5)	6 (28.6)	0.075
Ambulation with a walker	8 (21.6)	31 (21.2)	1 (4.8)	0.118
Ambulator, dependent on the physical assistance of a single person	3 (8.1)	16 (11.0)	3 (14.3)	0.760
Ambulator, dependent on the physical assistance of two persons	1 (2.7)	16 (11.0)	1 (4.8)	0.166
Using a forearm crutch	8 (21.6)	10 (6.8)	-	<0.01
Using a cane	1 (2.7)	6 (4.1)	1 (4.8)	0.899

MND: motor neuron disease, NP: neuropathies, MYP: myopathy

population, increasing to 7% in people over 65 years of age (15). Although myopathies are genetically inherited or acquired diseases, they are mainly genetically inherited and present at a younger age (16). We think that the difference in age between the groups is attributable to these clinical features of the diseases. In this study, 24.3% of patients in the MND group, 25% in the neuropathy group, and 42.8% in the myopathy group were employed. In a study conducted in Turkey on the difficulties experienced by the families of patients with neuromuscular diseases, 126 volunteer family members of patients with NMD were interviewed, and it was concluded that 31.7% of the patients were able to work, and 50% of them had difficulty in meeting the care needs of their disease. We believe that the sociodemographic characteristics of patients diagnosed with NMDs should be determined, and social support should be a part of the rehabilitation process in addition to the medical support.

In our study, the frequency of fracture history and OP was higher in the MND group than in the neuropathy and myopathy groups. Previous studies have shown that bone mineral density decreases and fracture risk increases in SMA, amyotrophic lateral sclerosis (ALS), and Duchenne muscular dystrophy (17, 18). In a retrospective study conducted in our country,

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45 patients were included, composed of only postmenopausal women and men over 50. The patients were divided into 3 groups, and a comparison was made similarly to our study. No difference was observed between the groups regarding OP and fracture risk in that study (19). We think that this difference is due to the different age range of the patient populations. A study conducted in 33 ALS patients and a control group concluded that bone density was lower than in healthy individuals, particularly females. The risk of falling is increased in patients with NMDs (20). Assessment of OP and fracture risk is an essential point to keep in mind in all patients with NMDs, especially in those with MND, as the risk of falling is increased.

Progressive loss of muscle strength seen in NMDs causes a decrease in upper airway tone, impairing the cough reflex, making it difficult to clear secretions, and may lead to recurrent respiratory tract infections and severe respiratory system symptoms that may progress to respiratory failure (21). In this study, the prevalence of dyspnea was 8.7% in the MND group, 12.3% in the neuropathy group, and 14.3% in the myopathy group, with no difference between the groups. Lower respiratory tract infection frequency was significantly higher in the neuropathy group than in other groups. The onset of respiratory problems varies according to the patient's age and the type of NMDs. Patients with SMA type 1 suffer from severe respiratory failure in childhood, and patients die before the age of 3 if adequate respiratory support is not provided (22). The evaluation of the adult patients who were followed up in the inpatient clinic and the lack of comparison with the normal population may be the reason for our study's lower frequency of dyspnea and lower respiratory tract infections.

The incidence of deep venous thrombosis (DVT) is considered to be increased in individuals with NMDs due to their older age and decreased mobility. DVT and subsequent pulmonary thromboembolism (PTE) are significant causes of death in patients with NMDs (23). PTE leads to mortality in 2% of ALS patients (24). It is thought that decreased muscle pump activity resulting from weakness and atrophy of the legs in these patients facilitates blood congestion (25). Furthermore, venous stasis associated with wheelchair use also increases the risk of DVT and consequently PTE development. In a study conducted in stroke patients, the risk of DVT development was found to be greater in wheelchair users compared to bed-level patients (26). DVT prophylaxis is recommended for all NMDs patients who ambulate by wheelchair (27). There are very few studies regarding DVT in NMDs patients. A study in which 50 outpatients with ALS were followed up for one year found that one patient had symptomatic DVT, one patient had PTE, and two patients had asymptomatic DVT during follow-up (28).

In our study, 32.4% of the MND group, 54.8% of the neuropathy group, and 52.4% of the myopathy group were screened for DVT by Doppler ultrasonography (USG). DVT was diagnosed in nine patients in the neuropathy group, and PTE in two patients, while PTE was diagnosed in one patient in the myopathy group. The rate of receiving treatment for DVT prophylaxis was significantly higher in the neuropathy group than in the other groups. The neuropathy group had the highest number of DVT and PTE cases. In terms of mobilization, 27 patients in the neuropathy group were ambulatory with a wheelchair. The higher number of DVTs and PTEs in the neuropathy group may be because ambulation limitations were more severe in the neuropathy group compared to the other groups. One hundred twelve patients were evaluated for DVT by bilateral lower extremity venous Doppler USG, and 39 patients were receiving DVT prophylaxis. The annual incidence of DVT in the general population is 0.1%. In our study, the frequency of DVT was found to be higher, at 6.2%. We think that this is because we screened approximately 55% of the patients for DVT and detected asymptomatic cases in addition to the patient's mobilization limitations. Physicians should be cautious against DVT and PTE, which may cause mortality in patients with NMDs, and patients should be evaluated in detail for prophylactic treatment.

Cardiac pathologies, including cardiomyopathies and/or conduction disorders, may be seen in NMDs, which develop as a result of simultaneous or progressive involvement of the heart muscle as well as skeletal muscle (29). Most forms of cardiac involvement are detected from childhood to the second decade of life (DMD, myotonic dystrophy, etc.). It may also remain asymptomatic until advanced age (Becker muscular dystrophy, some forms of congenital myopathy,

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etc.). Cardiac involvement is more severe when neuromuscular symptoms appear in childhood or rapidly progress during infancy (30). Patients were divided into two groups in a study investigating echocardiographic features in NMDs. MND and polyneuropathies were included in one group, and myopathies in the other group, and echocardiographic findings were compared. The results revealed lower left ventricular ejection fraction and impaired diastolic function in the myopathy group (31). Unlike this study, there was no difference in left ventricular ejection fraction between the groups in our study. We found that cardiac involvement was more frequent in the myopathy group than in the other groups. This is an expected result in the myopathy and muscular dystrophy group, where cardiac involvement is more frequent and causes severe morbidity and mortality compared to MND and neuropathies (32).

Muscle weakness is one of the most important clinical findings that affects the daily life activities and prognosis of patients with NMDs. The distribution of weakness is also critical in the diagnosis of neuropathic and myopathic diseases (33). In this study, right and left upper extremity proximal muscle weakness was significantly higher in the myopathy group than in the other groups. Muscle weakness in the proximal right lower extremity was significantly higher in the neuropathy group compared to the other groups, and in the proximal left lower extremity in the MND group compared to the neuropathy group. Muscle atrophies were also more frequent in the myopathy and MND groups than in the neuropathy group. The hallmark of MND is painless weakness and atrophy, often accompanied by cramps and fasciculations (7).

Neuropathies are neurological disorders affecting motor, sensory, or autonomic fibers and have various subtypes. The most common form is distal symmetrical polyneuropathies that start with sensory symptoms (numbness, paresthesia) or small fiber neuropathy (pain, loss of temperature perception). Loss of muscle strength in neuropathies develops after sensory losses (15). In our study, sensory losses were statistically significantly higher in the neuropathy group than in the MND and myopathy groups.

Length discrepancy in the lower extremities was statistically significantly more common in MND group than in the other groups in our study. Leg length disparity caused by growth due to paralysis is the most common sequela in poliomyelitis patients. Many factors are involved in lower extremity discrepancies. Some of these factors are directly related to bone growth, and some are indirectly related to affecting bone development. This discrepancy in the lower extremities may cause many problems (34). Due to alterations in postural balance, musculoskeletal problems such as low back pain, scoliosis, degenerative arthritis of the hip or knee joint, and patellofemoral pain syndrome may occur (35). It is crucial to recognize limb inequalities early in clinical follow-up to prevent musculoskeletal problems that may occur secondary to the discrepancy.

Spasticity was most common in the MND group, with a rate of 16.2%, but there was no significant difference between the groups. Upper motor neuron involvement may cause spasticity, especially in ALS. In a study examining the prevalence of spasticity and spasticity-related pain in ALS, 150 patients were evaluated, and spasticity was found in 36% of patients (36). In this study, the spasticity ratio was lower because the motor neuron disease group did not consist only of ALS patients. Lower spasticity rates may be expected since post-polio or SMA-related weakness is typically flaccid rather than spastic

In a study investigating the frequency of dysarthria and dysphagia in NMDs, 220 patients were evaluated by speech and language therapists, and dysarthria was found in 56% and dysphagia in 47% of the patients. They explained that the higher rates of dysarthria and dysphagia in this study compared to other studies were because the evaluations were made by experienced speech therapists, not by a questionnaire or an interview (37). The prevalence of dysarthria and dysphagia was lower in our study than in other studies, and we thought that this was because not all patients were evaluated by a speech and language therapist. As Simone et al. stated in their research, a detailed evaluation of patients with NMDs by speech and swallowing therapists is important to identify these patients in the early period (37).

NMDs significantly affect patients' independence in their daily activities. Functional mobility should be assessed in all patients with NMDs. The symptoms that

often occur are the biomechanical consequences of the inappropriate mobility of the patient. In these patients, the onset of movement, weight transfer, balance, and the effort required to complete the movement should be observed, and appropriate assistive devices should be used when necessary (38). Patients should also be checked for assistive devices, considering disease progression (39). In our study, independent ambulation was statistically lower in the MND group than in the other two groups, while cane use was significantly higher. Most patients in all groups (91.9%, 72.6%, 57.1%, respectively) were dependent in their ambulation through a walker, single-person support, double-person support, cane, or cane use. In a study conducted in our country, the use of assistive devices in patients with NMDs was found to be higher in the myopathy group, 22.7%, compared to the MND and neuropathy groups (40). In our study, the evaluation of ambulation with person support, not only the use of the device, may have caused different results.

The studies on NMDs were generally conducted on a specific disease in the literature. The strengths of our research included 5-year data from a clinic in a tertiary health center where only NMDs were followed up, a high number of patients, multidimensional sociodemographic and clinical evaluation of patients, and comparison between subgroups. We think that it is a valuable study in these respects. The limitations of our study were its retrospective nature, lack of comparison with a healthy control group, and lack of treatment outcome data.

CONCLUSION

Our study demonstrates that each subgroup of neuromuscular disorders possesses distinct clinical features. The younger age profile observed in myopathies, the increased prevalence of osteoporosis and fractures in MNDs, and the higher rates of infections and thromboembolic events in neuropathies emphasize the need for a disorder-specific clinical approach. Differences in the distribution of muscle weakness, sensory impairment, and ambulation levels further support this heterogeneity.

Therefore, early evaluation, precise identification of risk factors, and individualized rehabilitation planning are essential in the management of neuromuscular disorders. We consider that larger and prospective studies will significantly enhance follow-up and treatment strategies for this patient population.

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