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Frequency of Falls and Relationship Between Falls, Socio-demographic and Clinical Factors in Idiopathic Parkinson's Disease

İdiopatik Parkinson Hastalarında Düşme Sıklığının, Sosyo-demografik ve Klinik Faktörlerle İlişkisi

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Abstract

Objective: Falls are major problems for people with Parkinson's disease. This study aimed to determine fall frequency, and the relation of socio-demographic and clinical factors in idiopathic Parkinson's disease (IPH).

Materials and Methods: Eighty-seven patients with IPH who were under follow-up in Erciyes University Faculty of Medicine, Neurology Department [37 females (42.5%), and 50 males (57.5%)] were included in the study. The participants were evaluated with neurologic examination, mini-mental state examination, the Unified Parkinson's Disease Rating Scale (UPDRS), 6-meter walking test, turning time, freezing phenomenon, Hoehn and Yahr (H&Y) Scale, and ranking of fear of falls. Fall was recorded as history of fall in the 6 months before testing.

Results: A total of 22 (25.3%) patients reported a fall in the 6-month period before testing. Twenty-five patients (28.7%) were stage 1.5, and 22 (25.3%) were stage 2 according to the H&Y Scale. Freezing phenomenon was observed in 34 39.1%) patients. There was no significant difference between patients with and without a history of falls according to age, sex, education, occupation, and marital status ($p>0.05$). According to disease period, H&Y Scale and the UPDRS, motor, turning time 360 degrees from right, turning time 360 degrees from left, balance defect at 360 degrees right turning, balance defect at 360 degrees left turning, and freezing phenomenon there were no significant difference between those with and without a history of fall ($p>0.05$). There was a significant difference between those who had fallen and had not fallen according to UPDRS-mental, UPDRS-ADL, degree of fear of falling, 6-m walking time, 6-m walking test, and number of steps ($p<0.05$).

Conclusion: Our study showed that frequency of falls and walking speed, fear of falling, activities of daily living, and mental function are important factors for falls in IPH. Fall assessment in IPH is needed for a multifactorial approach and determining these factors will be helpful for taking measures against falls.

Keywords: Idiopathic Parkinson's disease, falls, walking speed, turning

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Öz

Amaç: Düşmeler, Parkinson hastaları için yaygın ve önemli bir problemdir. Çalışma, idiopatik Parkinson hastalarında (İPH) düşme sıklığını, sosyo-demografik ve klinik faktörlerin düşme ile ilişkisini belirlemek amacıyla planlanmıştır.

Gereç ve Yöntem: Erciyes Üniversitesi Tıp Fakültesi, Nöroloji Anabilim Dalı Poliklinikleri'nde izlenen 87 İPH [37 kadın (%42,5), 50 erkek (%57,5)] çalışmaya alınmıştır. Olgular, nörolojik muayene, mini mental durum değerlendirme testi, Hoehn ve Yahr (H&Y) Evrelemesi, Birleşik Parkinson Hastalığı Değerleme Ölçeği (BPHDÖ), 6 metre yürüme testi, dönme zamanı, donma fenomeni, düşmekten ne kadar korktuğu yönünden değerlendirilmişlerdir. Düşme, testlerden önceki 6 aylık dönemde düşme hikayesi olarak kaydedilmiştir.

Bulgular: Olguların, 22'sinin (%25,3), değerlendirmeden önceki 6 ayda düştükleri belirlenmiştir. H&Y Evrelemesi'ne göre olguların 25'i (%28,7) 1,5, 22'si (%25,3) 2 evresinde oldukları tespit edilmiştir. Donma fenomeni 34 (%39,1) olguda tespit edilmiştir. Yaş, cinsiyet, eğitim, meslek ve medeni durum yönünden, düşen ve düşmeyen gruplar arasında istatistiksel olarak fark bulunmamıştır (p>0,05). Hastalık süresi, H&Y Evrelemesi, BPHDÖ motor, sağdan 360 derece dönüş zamanı, soldan 360 derece dönüş zamanı, sağdan 360 derece dönüşteki denge bozukluğu, soldan 360 derece dönüşteki denge bozukluğu, donma fenomeni yönünden, düşen ve düşmeyen gruplar arasında istatistiksel olarak fark bulunmamıştır (p>0,05). BPHDÖ mental, BPHDÖ-Günlük yaşam aktiviteleri (GYA), düşmekten ne kadar korktuğu, 6 metre yürüme zamanı, 6 metre yürüme testi adım sayısı yönünden, düşen ve düşmeyen gruplar arasında istatistiksel olarak anlamlı bir fark bulunmuştur (p<0,05). GYA ölçeğinin düşme durumuna göre yapılan risk karşılaştırma sonucunda, GYA ölçüm sonuçlarına göre düşme var diyenler yok diyenlere göre 1,373 kat daha riskli durumdadır. BPHDÖ mental durum ölçüm sonuçlarına göre düşme var diyenler yok diyenlere göre 1,029 kat daha riskli durumdadır.

Sonuç: Çalışmamız İPH için, düşmelerin sıklığını ve yürüme hızının, düşme korkusunun, mental durumun, günlük yaşam aktivitesinin düşmede etkili faktörler olduğunu göstermiştir. Düşmeleri değerlendirmede multi-faktöriyel yaklaşımların gerekli olduğu ve bu faktörlerin belirlenmesi ile düşmeleri önlemede gerekli önlemlerin alınabileceği sonucuna varılmıştır.

Anahtar Kelimeler: İdiopatik Parkinson hastaları, düşme, yürüme hızı, dönme

Introduction

Idiopathic Parkinson's disease (IPD), the most frequent cause of parkinsonism is characterized by damage of the cells that produce dopamine in the substantia nigra, which is in the depths of the brain. The major findings in IPD are bradykinesia, resting tremor, rigidity, and postural instability. Posture and walking disturbances are very important in IPD because they cause severe disability. Falls due to these disturbances are the most severe complications of IPD, which reflect the progression of disease. Difficulties in balance control due to disturbances in postural reflexes cause falls, and falls make patients dependent upon other people and more disabled. Falls can cause severe injuries (1,2).

The pattern of walking in patients with Parkinson's disease changes from patient to patient, and in different stages of the disease. Typical findings are shortened stride length and a decrease in the number of steps per minute. Patients walk with small shuffling steps. Difficulties in starting to walk, freezing while walking, and postural inbalance are frequent symptoms of late-stage disease. Patients swing slowly like a block and swinging could be performed with multiple steps. These conditions constitute risk factors for falls (3,4).

Falling frequency of IPD is 38-68% (5,6). Socio-demographic and clinical risk factors for falls in patients with IPD have been shown in the literature (7,8,9). However, these studies are limited. In this study, we planned to evaluate:

1) The frequency of falling in IPD,

2) The effects of socio-demographic variables on falling, and

3) The effects of walking speed, swinging, and fear of falling on falling.

Materials and Methods

Patients

Eighty-seven patients (50 males and 37 females) who were diagnosed as having IPD with clinical findings and being followed up in the clinic of movement disorders in the neurology department of Erciyes University between 2015 and 2015 were included in the study.

Patients who were diagnosed as having IPD according to the criteria of the United Kingdom Parkinson's Disease Society Brain Bank, who had normal cognitive functions or had mild cognitive impairment (Mini-Mental State Test score ≥24), who could walk at least 6 m independently, who had no unresolved visual, hearing and speech problems, who had no orthopedic, systemic or neurologic diseases that could encumber walking, and who agreed to be involved were included in the study. All patients were evaluated during "on" periods (when drugs were effective).

The study was approved by the Clinical and Laboratory Researches Ethics Committee of Medicine Faculty of Erciyes University at 17.09.2015 (2015/414).

Method

All patients were informed about the tests that would be performed and written informed consent was obtained from all participants.

The demographic features of the participants including age, sex, and level of education were recorded.

The Standardized Mini-Mental Test (SMMT): This was used to evaluate the cognitive states of the patients. This test was developed by Folstein et al. (10). Five cognitive areas are

tested in the SMMT: orientation (10 points), recording memory (3 points), attention and calculation (5 points), recall (3 points), and language (9 points). This 30-point questionnaire consists 11 questions. Scores between 27-30 indicate normal cognition, 24-26 indicate mild cognitive impairment, and below 24 indicate severe cognitive impairment (11).

Hoehn and Yahr (H&Y) staging: Staging of Parkinson's disease was performed using the H&Y Scale. This scale describes the disease in 5 stages (12).

The United Parkinson's Disease Rating Scale (UPDRS): This scale is commonly used to clinically rate the severity of Parkinson's disease (13).

1) Mental status, behavior, psychiatric status (16 points),

2) Daily life activities (DLA) (52 points),

3) Motor sub-scores (92 points), and UPDRS total scores were used in the statistical analyses.

The Tinetti Falls Efficacy Scale: This scale was used to evaluate the fear of falling. It comprises 10 questions and it evaluates the effects of the fear of falling on the sense of safety during daily activities. Patients rate each of the questions between 0 (not safe) and 10 (very safe) points and a total score between 0 (low efficacy related with falling) and 100 (high efficacy related with falling), points are calculated at the end (14).

Turning: Durations of swinging 360 degrees from left to right or right to left were measured usiing a chronometer. Between turning, the patients had a break to rest. Balance and posture during turning were numbered categorically.

Stride time: Time to walk 6 meters was measured using a chronometer and recorded for each patient (15). Also, the number of steps that the patient used to walk 6 meters was recorded (walking cadence). The average values of the results of the tests, which were repeated 3 times, were taken.

Statistical Analysis

The distribution of data was evaluated using the Shapiro-Wilk test.

For variables that were not normally distributed, the Mann-Whitney U test was used for the comparison of two independent sample groups. The exact method of the Pearson's chi-squared test was used for the comparison of categorical variables.

A p-value of <0.05 was considered significant. IBM SPSS version 22 was used for statistical analyses.

Results

It was determined that twenty-two (25.3%) of the patients had fallen in the 6 months before the study began. There were no differences between the groups who had and had not fallen in terms of age, sex, education, occupation, and marital status (p>0.05) (Table 1).

Twenty-five (28.7%) patients were in stage 1.5, and 22 (25.3%) patients were in stage 2 according to the H&Y Scale.

Duration of disease, H&Y staging, UPDRS-motor, time for swinging 360 degrees from right, time for swinging 360 degrees from left, balance disturbance during swinging 360 degrees from right and balance disturbance during swinging 360 degrees from left were not different between the groups who had and had not fallen (p>0.05).

There were statistically significant differences between groups in terms of UPDRS-mental, UPDRS-DLA, fear of falling, stride time for 6 m, and stride number for 6 m (<0.05) (Table 2).

The logistic regression analyses showed that patients with worse DLA had 1.37 times greater risk for falling compared with patients with better DLA, and patients with worse UPDRS-mental status scores had 1.029 times greater risk of falling compared with patients with better UPDRS-mental status scores (Table 3).

Discussion

We found no differences between groups had and had not fallen in terms of duration of the disease, the H&Y staging, UPDRS-motor scores, time for swinging 360 degrees, and balance disturbance in swinging 360 degrees, wheraas we found statistically significant differences in terms of UPDRS-mental, UPDRS-DLA, fear of falling, stride time for 6 m, and stride number for 6 m.

Falls cause disability in patients with Parkinson's disease. The frequency of falls are 38-68% in the literature (16,17,18). We found a frequency of 25.3% in our study. The lower frequency in our study may be caused by these factors: most of the patients were in stage 1 and 2 in terms of H&Y staging, and all patients had

Table 1. The disturbation of falls due to socio-demographic factors in patients with Parkinson's disease

		Patients who had fallen		Patients who had not fallen		p
		n	%	n	%	
Sex	Female	11	50%	26	40%	0.412
	Male	11	50%	39	60%	
Education	Uneducated	5	22.7%	14	21.5%	0.461
	Elementary school	14	63.6%	30	46.2%	
	Middle school	1	4.5%	8	12.3%	
	High school	2	9.1%	9	13.8%	
	University	0	0%	4	6.2%	
Profession	Housewife	10	45.5%	24	36.9%	0.150
	Retired	11	50%	23	35.4%	
	Self-employed	0	0%	4	6.2%	
	Employee	1	4.5%	14	22.5%	
Marital status	Married	21	95.5%	61	93.8%	0.116
	Single	0	0%	4	6.2%	
	Widow	1	4.5%	0	0%	
	Falling status	**Mean±SD**		**Median (min.-max.)**		
Age	Yes (n=22)	62.09±12.459		61.50 (37-86)		0.845
	No (n=65)	60.77±12.100		62.00 (29-88)		

Min.: Minimum, Max: Maximum, SD: Standard deviation

Table 2. The disturbation of falls due to clinical factors in patients with Parkinson's disease					
	Falling status	**n**	**Mean±SD**	**Median (min.-max.)**	**p**
Disease duration (years)	Yes	22	5.45±5.068	4.00 (1-20)	0.630
	No	65	6.29±5.902	4.00 (1-25)	
UPDRS mental status	Yes	22	1.82±2.152	1.50 (0-8)	0.01
	No	65	0.75±1.511	0.00 (0-7)	
UPDRS DLA	Yes	22	11.27±7.459	9.00 (3-25)	0.03
	No	65	7.85±6.911	6.00 (0-32)	
UPDRS Motor	Yes	22	8.18±6.449	7.50 (0-20)	0.301
	No	65	6.88±7.103	4.00 (0-29)	
UPDRS Total	Yes	22	21.27±13.688	21.00 (5-52)	0.05
	No	65	15.54±13.686	11.00 (1-56)	
The Tinetti Falls Efficacy Scale	Yes	22	32.41±25.838	22.00 (10-100)	<0.01
	No	65	67.06±32.967	76.00 (0-100)	
The fear of falling	Yes	22	5.00±3.78	6.00 (0-10)	<0.01
	No	65	1.72±3.19	0.00 (0-10)	
6-m stride time (s)	Yes	22	20.43±11.28	16.0 (8-55)	0.01
	No	65	16.23±12.22	12.5 (6.5-90)	
6-m stride number	Yes	22	26.0±9.16	22.75 (14.5-43.5)	<0.01
	No	65	18.5±10.51	18.5 (11–16)	
Swinging from right (s)	Yes	22	10.70±9.25	9.00 (2-42)	0.09
	No	65	6.93±4.27	5.00 (2-20)	
Swinging from left (s)	Yes	22	11.02±9.97	9.50 (2-45)	0.105
	No	65	7.23±4.62	5.00 (3-22)	
Balance during swinging from left	Yes	22	0.77±0.75	1.00 (0-2)	0.134
	No	65	0.55±0.83	0.00 (0-3)	
Balance during swinging from right	Yes	22	0.77±0.75	1.00 (0-2)	0.134
	No	65	0.55±0.83	0.00 (0-3)	

	The H&Y Staging	**n**	**%**	**p**
Falls	1.0	2	9.1	0.657
	1.5	6	27.3	
	2.0	7	31.8	
	2.5	1	4.5	
	3.0	5	22.7	
	4.0	1	4.5	
No falls	1.0	12	18.5	
	1.5	19	29.2	
	2.0	15	23.1	
	2.5	8	12.3	
	3.0	9	13.8	
	4.0	2	3.1	

Min.: Minimum, Max.: Maximum, SD: Standard deviation, H&Y: Hoehn and Yahr Scale, UPDRS: Unified Parkinson's Disease Rating Scale, DLA: Daily life activities

IPD. Also, we recorded falls that had happened in the 6 months before the study began. However, some studies in the literature included falls that happened 12 months before the tests (19,20).

We found no differences in terms of age, sex, education, disease duration, and H&Y staging between the groups. Rudzińska et al. (21) found no differences in terms of age, sex, disease duration, UPDRS, and H&Y staging between groups, which is similiar to our findings. Gazibara et al. (22) found no differences in terms of demographic variables between groups only. Disease duration, motor control, mental control, balance, vestibular disturbances and depression were found to be worse in patients with Parkinson's disease who had fallen (23,24). However, in these studies, patients were not classified according to types of Parkinson's disease, unlike in our study.

The walking pattern changes from patient to patient and in different stages of Parkinson's disease. Typical findings are shortened stride length and a decrease in the number of steps per minute (cadence control). Patients walk with small shuffling steps. Difficulties in starting to walk, freezing while walking, and postural inbalance are frequent symptoms of late stage IPD (25,26,27). Restoration of the ability to walk is the main purpose in these patients. Many components of walking have caught the attention of physicians but walking speed is the most important of all (28) because independence in society correlates with walking speed; walking speed is considered as an important clinical marker. Walking speed is a reliable evaluation and can be used to determine the ability of walking in patients with Parkinson's disease (29). We used walking speed as a variable to compare the groups who had and had not fallen. The patients who had fallen took longer to walk 6 m and with more steps compared with patients who had not fallen.

Patients with IPD in our study walked 6 m with an average of 23 steps and in 18 seconds. We think that our data are noteworthy for physicians, physiotherapists, and researchers. The walking speed of patients with Parkinson's disease has been shown to be related with age, disease severity, and balance in the literature (28,29,30).

Difficulty in swinging is common in patients with Parkinson's disease and 50% of patients report difficulties in swinging (30,31). Difficulty in swinging is an important risk factor for falling. We found that it took more time to swing 360 degrees and swinging balance was more impaired in the patients who had fallen, but this did not reach statistical significance. It was shown in the literature that time for swinging 180 degrees took an average of 3 seconds in patients who did not fall, whereas it took an average of 5 seconds in patients who fell (30,31). It took an average of 10-11 seconds to swing 360 degrees in our patients who fell.

Our study is the first to show a relationship between falls and fear of falling. The fear of falling is described in the literature as feeling unsatisfactory about falling while doing basic DLA. The fear of falling decreases the sense of safety of older peatients during DLA and makes them live an inactive life. The fear of falling due to postural instability and balance disturbance is also common in patients with Parkinson's disease (32,33). When elders worry about falling, their physical activities are affected and their DLA are limited. That in itself causes a fear of falling or the fear causes physical and mental weakness, which results in falling; a vicious cycle is formed. This cycle increases the patient's dependence and causes the sense of incapacity (33,34).

Table 3. Logistic regression analysis

	p	Odds (95% CI)
UPDRS-DLA	0.02	1.373 (0.557-0.952)
UPDRS mental status	0.02	1.029 (1.004-1.055)

UPDRS: Unified Parkinson's Disease Rating Scale, DLA: Daily life activities, CI: Confidence interval

Our study showed that frequency of falls, walking speed, fear of falling, mental status, and DLA are related with falls in patients with IPD. A multifactorial approach for evaluating falls is required. After determining the factors, necessary precautions could be taken to prevent falls.

Ethics

Ethics Committee Approval: The study were approved by the Erciyes University of Local Ethics Committee (Protocol number: 17.09.2015-2015/414), Informed Consent: Consent form was filled out by all participants.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Meral Mirza, Murat Gültekin, Concept: Ferhan Soyuer, Feyzan Cankurtaran, Design: Ferhan Soyuer, Data Collection or Processing: Feyzan Cankurtaran, Analysis or Interpretation: Gözde Ertürk, Literature Search: Feyzan Cankurtaran, Writing: Ferhan Soyuer.

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