

A Population-Based Survey to Determine the Prevalence of Movement Disorders in Orhangazi District of Bursa, Turkey

Hareket Bozukluklarının Bursa İli Orhangazi İlçesinde Görülme Prevalansı (Türkiye Toplum Tabanlı Prevalans Çalışması)

Sevda Erer Özbek¹, Mehmet Zarifoğlu¹, Necdet Karlı¹, Alis Özçakır², Demet Yıldız¹, Doğa Aslan²

Uludağ Üniversitesi Tıp Fakültesi,
¹Nöroloji Anabilim Dalı, ²Aile Hekimliği Anabilim Dalı, Bursa, Türkiye

Türk Norol Derg 2009;15:109-118

ÖZET

Amaç: Bu çalışmada, Bursa ili Orhangazi ilçesinde yaşayan, 40 yaş ve üzeri popülasyondaki hareket bozukluklarının prevalans oranlarının bildirilmesi amaçlandı.

Hastalar ve Yöntem: Çalışmamız üç fazlı olarak planlandı. Faz I'de; 1256 olgu halk sağlığı ve nöroloji asistanları tarafından kapı-kapı, ev ziyaretleri şeklinde kısa anket formu doldurularak tarandı ve 404 şüpheli hareket bozukluğu olgusu tanımlandı. Şüpheli olguların 131'i faz II'de değerlendirilebildi ve bu olgular hareket bozuklukları uzmanları tarafından görülerek tremor, huzursuz bacak sendromu, hemifasiyal spazm ve distoni tanıları için kullandığımız skalalar doldurularak video kayıtları alındı. Faz III'te tüm video görüntüleri hareket bozuklukları uzmanları tarafından izlendi ve son tanı konusunda fikirbirliğine varıldı.

Bulgular: Prevalans oranları, huzursuz bacak sendromu için; n= 60, %9.71, esansiyel tremor için; n= 21, %3.34, ilerlemiş fizyolojik tremor için; n= 26, %4.14, Parkinson hastalığı için; n= 14, %2.23, hemifasiyal spazm için; n= 4, %0.82 ve distoni için; n= 2, %0.41 olarak bulundu.

Yorum: Esansiyel tremor, hareket bozuklukları arasında en sık görülmesine rağmen bizim çalışmamızda huzursuz bacak sendromu prevalansının esansiyel tremor prevalansından daha fazla olduğu gözlemlendi.

Anahtar Kelimeler: Esansiyel tremor, huzursuz bacak sendromu, Parkinson hastalığı, hareket bozuklukları.

ABSTRACT**A Population-Based Survey to Determine the Prevalence of Movement Disorders in Orhangazi District of Bursa, Turkey****Sevda Erer Özbek¹, Mehmet Zarifoğlu¹, Necdet Karlı¹, Alis Özçakır², Demet Yıldız¹, Doğa Aslan²**

Faculty of Medicine, University of Uludag,

¹Department of Neurology, ²Department of Family Medicine, Bursa, Turkey**Objective:** In this study we aimed to determine the prevalence of movement disorders among 40 years and older population in Orhangazi district of Bursa, Turkey.**Patients and Methods:** This population-based study was planned in three phases. In phase I, door-to-door home interviews were performed on 1256 subjects by residents of departments of neurology and family medicine by using a short questionnaire and 404 subjects with suspected symptoms of movement disorders and Parkinsonism were detected. These subjects were examined and videotaped in phase II. Of the suspected subjects in phase I, 131 did not attend to phase II for various reasons. In phase II, subjects were evaluated by movement disorders specialists by using scales specific to tremor, restless leg syndrome, Parkinson disease, and hemi-facial spasm. In phase III, video recording of all identified patients were reviewed and final diagnoses were made with a consensus of all three specialists.**Results:** In this phase, subjects were diagnosed to have restless leg syndrome n= 60, 9.71%, essential tremor n= 21, 3.34%, enhanced physiological tremor n= 26, 4.14%, Parkinson's disease n= 14, 2.23%, hemifacial spasm n= 4, 0.82%, and dystonia n= 2, 0.41%.**Conclusion:** Although essential tremor has been reported as the most common movement disorder, in our study restless leg syndrome had higher prevalence than essential tremor.**Key Words:** Essential tremor, restless leg syndrome, Parkinsonian disorders, movement disorders.**INTRODUCTION**

Movement disorders negatively affect physical abilities and quality of life in patients (1,2). These negative effects can be prevented with early diagnosis and treatment. Prevalence studies can provide data on the spread and etiology of movement diseases with a society, which is essential information to have during diagnosis and treatment. Epidemiological studies on movement disorders have recently increased in prominence, but few studies have focused on the prevalence of Parkinson's disease and movement disorders in Turkey (3-5).

Essential tremor (ET) and restless legs syndrome (RLS) are more common movement disorders than Parkinson's disease, hemifacial spasm, and dystonia (1,2,6-8). Large variation in the prevalence of movement disorders has been reported by studies from different countries (9-16). The reason for this variability could be differences between studies, in terms of methodology and diagnostic criteria, as well as demographic, geographic, and ethnic characteristics of study populations.

The present study aimed to determine the prevalence rates of all movement disorders in the Orhangazi district of Bursa, Turkey, based on face-to-face interviews performed by movement disorder experts.

PATIENTS and METHODS

Bursa, with a population of 2.125.140 according to the latest census, is the fourth largest, industrially and so-

cio-economically developed city in Turkey. Orhangazi district, where the study was conducted, has a population of 44.426. Our study population was drawn from both rural and urban regions of Orhangazi district.

The study was conducted between June 2004 and September 2005 with adults aged ≥ 40 years that were living in Orhangazi district. Based on 2000 national census data, we predicted that in 2004, people aged ≥ 40 years would comprise 35.3% of the total population of Bursa (36.2% female, 34.4% male) and 27.2% of the total population of Orhangazi (26.6% female, 27.7% male).

The study sample size was calculated according to the following formula: $n = N Z^2 p(1-p)/d^2(N-1) + Z^2 p(1-p)$, where N is the population, Z is the Z statistic for a 95% confidence level, n is the sample size, p is the probability of occurrence, and d is the precision (17). Based on this calculation, field screening 1256 individuals aged ≥ 40 years was considered sufficient for identifying patients with movement disorders with a sensitivity of 2.0%.

A multistep stratified cluster sampling method was used for subject selection. In the first step, the number of subjects aged ≥ 40 years living in each of the subsections of Orhangazi district was calculated. The study population's gender ratio was also adjusted according to the gender ratio in Orhangazi. Random sampling was made among these sections according to the proportional size of the age groups. The first street in each section to be

included in the study was chosen by blindly drawing a tag with the name of the street written on it. Odd-numbered houses on the first street were visited first, followed by even-numbered houses. New streets were determined by drawing tags until the required number of subjects was obtained. When the required number of subjects for a section was reached, our researchers moved on to the next section and used the same method.

In the pre-study period all screening researchers attended a one day clinical education course on movement disorders. The study was conducted in three phases. In phase I, all subjects were interviewed in their homes by three public health and three neurology residents. During this screening phase participants answered a short questionnaire regarding movement disorders and Parkinsonism (Table 1). Subjects that answered at least one question on this questionnaire positively were selected for phase II screening.

In phase II subjects with suspected movement disorder symptom or Parkinsonism were assessed by movement disorder specialists and videotaped. Subjects with findings of Parkinsonism or tremor were asked to answer a 22-item movement disorder screening form (Table 2). Five of these 22 questions were designed to probe for signs of Parkinsonism (bradykinesia, rigidity, postural instability, cerebellar dysfunction, and ocular dysfunction), while other questions were designed to identify ET, enhanced physiological tremor, and subtypes. The Hoehn-Yahr scale was used to stage Parkinson's disease (18). We diagnosed Parkinson's disease according to the Uni-

ted Kingdom Parkinson's Disease Society Brain Bank diagnostic criteria (19).

In phase II diagnosis of RLS was established using the IRLSSG (International Restless Legs Syndrome Study Group) diagnostic criteria, which includes (1) the urge to move the legs, usually accompanied or caused by uncomfortable leg sensations, (2) temporary relief with movement, partial or total relief from discomfort by walking or stretching, (3) onset or worsening of symptoms during rest or inactivity, such as when lying down or sitting, and (4) exacerbation of or onset of symptoms in the evening or at night. Subjects with a definitive RLS diagnosis completed the RLS scale (20).

We used the inclusion and exclusion criteria set forth in the Guidelines of the Ad Hoc Scientific Committee to establish the diagnosis of ET (21).

Psychogenic tremor was diagnosed on the basis of historical and clinical diagnostic criteria, and the clinical tremor descriptions of Bhidayasiri were used to diagnose physiological and enhanced physiological tremors (22).

In phase III, three movement disorder specialists (M.Z., N.K., S.E.) reviewed the video records of the subjects that were diagnosed with a movement disorder in phase II. For definitive diagnosis, the consensus of all 3 movement specialists was required.

The study protocol was approved by the Uludağ University Ethics Committee and was performed in accordance with the latest version of the Declaration of Helsinki. All subjects provided informed consent prior to their inclusion in the study.

Table 1. Short screening questionnaire

Short Questionnaire for Movement Disorders

1. Do you have tremor in any part of your body? (e.g. in hands, legs, head, voice, body)
2. Do you feel slowing down in your movements?
3. Do you feel contraction in any part of your body?
4. Do you feel unilateral or bilateral contractions in your face?
5. Do you feel unwanted symptoms in your legs such as uneasiness, pain or numbness particularly during night?
6. Do you have any disease?

<input type="checkbox"/> Atherosclerotic heart disease	<input type="checkbox"/> Hypertension	<input type="checkbox"/> Trauma	<input type="checkbox"/> Diabetes mellitus
<input type="checkbox"/> Rheumatologic diseases	<input type="checkbox"/> Asthma	<input type="checkbox"/> Stroke	<input type="checkbox"/> Others.....
7. Do you regularly use any drug(s)?

<input type="checkbox"/> Beta-blocker	<input type="checkbox"/> ACE inhibitor	<input type="checkbox"/> Insulin	<input type="checkbox"/> Oral antidiabetic
<input type="checkbox"/> ASA	<input type="checkbox"/> Oral anticoagulant		
8. Findings in neurological examination

<input type="checkbox"/> Bradykinesia	<input type="checkbox"/> Hypomimia	<input type="checkbox"/> Tremor	<input type="checkbox"/> Chorea/athetosis
<input type="checkbox"/> Hemifacial spasm	<input type="checkbox"/> Dystonia	<input type="checkbox"/> Rigidity	<input type="checkbox"/> Others.....

Table 2. Movement disorders screening form

Movement Disorders Screening Form

1. Patient's name:
2. Age (years):
3. Handedness:
4. Sex:
5. Family history of movement disorders:
6. Duration of tremor:
7. Co-existence of movement disorders:
8. Disability related to movement disorders:
9. Drug induced exacerbating factors for movement disorders:
10. Initial symptoms: Tremor Rigidity Bradykinesia Pain Vertigo
11. Side of initial findings: Right Left Bilateral
12. Neurological examination: Paresis Pathological reflexes
13. Tremor: 0: None 1: Mild 2: Moderate 3: Marked 4: Severe
14. Rigidity: 0: None 1: Mild 2: Moderate 3: Marked 4: Severe
15. Anteflexion posture: + -
16. Dystonia: 0 1: Orolingual 2: Head-neck 3: Hand 4: Arm 5: Leg 6: Trunk
17. Hemifacial spasm: + -
18. Hoehn-Yahr score:
19. Tremor severity rating:

Location	Rest	Postural	Kinetic	Total
Face/tongue-chin				
Voice				
Head-neck				
Trunk				
Right arm				
Right hand				
Left arm				
Left hand				
Right leg				
Right foot				
Left leg				
Left foot				
Task-specific				

20. Drawings: 0: Normal 1: Slightly abnormal 2: Moderately abnormal
 3: Markedly abnormal 4: Severely abnormal
- a. Spiral Right hand Left hand
- b. Draw straight line Right hand Left hand
21. Handwriting: 0: Normal 1: Slightly abnormal 2: Moderately abnormal
 3: Markedly abnormal 4: Severely abnormal
- Handwriting sample:
22. Speaking and voice rating: 0: Normal 1: Slightly abnormal 2: Moderately abnormal
 3: Markedly abnormal 4: Severely abnormal

Statistical Analysis

Statistical analyses were carried out using SPSS v11.0 for Windows (SPSS Inc., Chicago, IL, USA). All continuous variables are expressed as mean \pm standard error (SE) or standard deviation (SD), and categorical variables are expressed in terms of frequency and percentage (n, %). The crude prevalence rate, and age- and sex-adjusted prevalence rates were calculated using weighting and imputation procedures. Pearson's chi-square and Student's t tests were used to make comparisons. Univariate and multivariate logistic regression analyses were used. A p value < 0.05 was considered statistically significant.

RESULTS

Of the 1256 persons screened in phase I, 1124 (89.6%) were included in the study. Mean age (\pm SE) of the 1124 persons screened in phase I that participated in the study was 57.8 ± 0.3 years (range: 40-95 years); of those, 574 were female (51.1%) and 550 were male (48.9%), with mean (\pm SE) ages of 56.6 ± 0.4 years and 59.8 ± 0.5 years, respectively.

There weren't any statistically significant differences between the subjects included in the study and those that did not participated in the study in terms of age and the presence of chronic diseases ($p > 0.05$). The number males that did not participate in the study was significantly higher than that of those included in the study ($p < 0.001$) (Table 3); therefore, we projected our crude prevalence rate, and age- and sex-adjusted prevalence rates using weighting and imputation procedures for the 1124 subjects included in the study, rather than for the 1256 subjects screened.

In all, 404 subjects in phase were suspected to have a movement disorder (35.9%). In phase II, 273 of these

subjects with a suspected movement disorder were contacted and 131 of them declined to participate in the study for various reasons. In all, 134 (49.1%) of the 273 subjects with a suspected movement disorder were diagnosed with a movement disorder in phase II. A flowchart of the study is shown in Figure 1.

The most common movement disorder identified was RLS. There were 161 subjects suspected of having RLS in phase 1, and 60 of them (48 females, mean age: 54.2 ± 10.3 years) were diagnosed with RLS in phase 2. The difference in age between the RLS and non-RLS groups was not statistically significant ($p > 0.05$).

In total, 199 suspected tremor cases were evaluated by the movement disorder specialists in phase II and 56 (28.1%) were diagnosed with tremor (Figure 1). Among these, 26 cases had physiological tremor, 21 had ET, six had psychogenic tremor, two had enhanced physiological tremor secondary to hyperthyroidism, and one had post-stroke tremor. Mean age of the subjects with tremor was 59.8 ± 10.3 years. When the subjects were reassessed in order to make definitive final diagnoses based on the video records from phase III, there were no discrepancies with the diagnoses made in phase II, only a few differences in tremor subtypes were noted. None of the subjects diagnosed with ET had previously consulted a physician or received treatment.

In all, 32 patients were suspected of bradykinesia, 17 of hypomimia, and 28 of rigidity during phase I of the study. After assessment by specialists in phases II and III, 31% (n= 10) of the subjects suspected of having bradykinesia, 30% (n= 5) of those suspected of having hypomimia, and 32% (n= 13) of the suspected rigidity cases were confirmed. Mean Hoehn-Yahr score of the cases was stage II.

Table 3. Sociodemographic characteristics of the study subjects. Data were presented as n (%)

		Subjects not participated (n= 132)	Subjects included (n= 1124)	Subjects screened (n= 1256)
Sex*	Female	10 (7.6%)	632 (56.2%)	642 (51.1%)
	Male	121 (92.4%)	493 (43.8%)	614 (48.9%)
Age**	40-49 years	58 (44.3%)	507 (45.1%)	
	50-59 years	35 (26.7%)	296 (26.3%)	
	60-69 years	25 (19.1%)	201 (17.9%)	
	≥ 70 years	13 (9.9%)	121 (10.8%)	
Chronic diseases**	No	36 (27.5%)	328 (29.2%)	
	Yes	95 (72.5%)	797 (70.8%)	

* $p < 0.001$, Pearson chi-square test.
** Not significant.

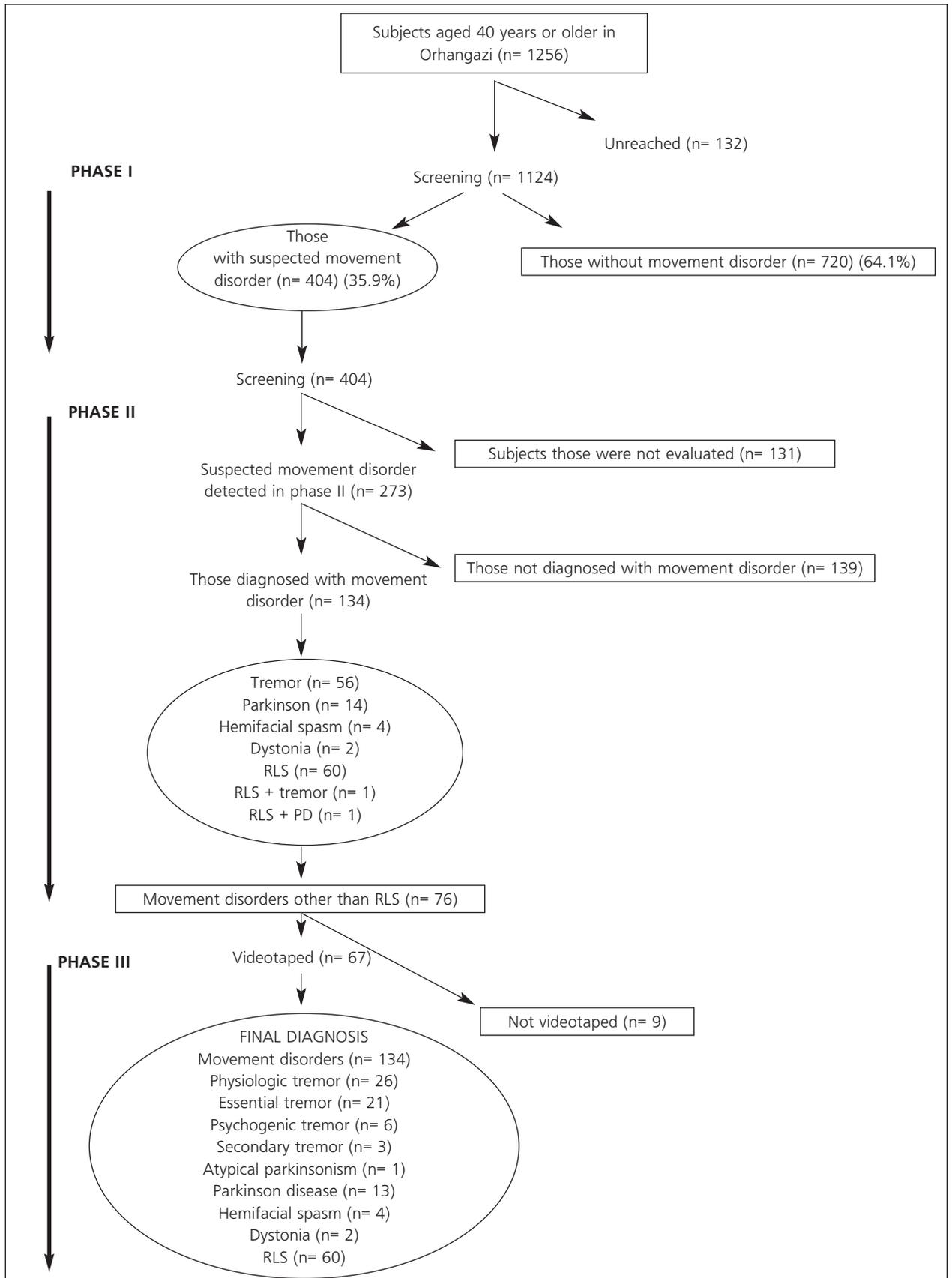


Figure 1. Flowchart of the study. RLS: Restless leg syndrome, PD: Parkinson’s disease.

Table 4. Estimated prevalence rates of movement disorders with respect to age groups

	40-49 years	50-59 years	60-69 years	≥ 70 years	Total
Tremor	3.97%	11.71%	12.63%	18.26%	9.0%
Essential tremor	0.0%	6.16%	4.51%	9.13%	3.34%
Psychogenic tremor	2.89%	4.93%	5.41%	6.09%	4.14%
Restless leg syndrome	8.66%	11.71%	9.02%	10.65%	9.71%
Parkinson disease	0.36%	0.62%	3.61%	12.18%	2.23%

Restless Leg Syndrome

The crude prevalence of RLS was 9.71% (Table 4). Compared with the other age groups, 50-59-years-olds had the highest prevalence of RLS (11.71%), although the differences between groups were not statistically significant ($p > 0.05$). RLS was 2.6 times more common in women than in men (95% CI: 1.2-5.6). None of the patients diagnosed with RLS sought medical care for their complaints. The incidences of comorbid atherosclerotic heart disease and bronchial asthma were statistically significant, whereas comorbidity with other diseases was not ($p > 0.05$).

Tremor

The crude prevalence of ET, enhanced physiological tremor, and all types of tremor among people aged ≥ 40 years was 3.34%, 4.14%, and 9.0%, respectively (Table 4). ET was more common among 50-59-years old patients (6.16%) and among patients ≥ 70 years old (9.13%), as compared to the other age groups. The prevalence of enhanced physiological tremor was higher among patients ≥ 70 years (6.09%), as compared with the other age groups; however, ET, enhanced physiological tremor, and all tremor prevalence rates were not significantly different between age groups or gender ($p > 0.05$).

The incidences of comorbid high blood pressure, rheumatological diseases, diabetes, and bronchial asthma with ET and enhanced physiological tremor were significant ($p < 0.05$). When the co-existence of ET and enhanced physiological tremor with other movement disorders was explored, only one case with enhanced physiological tremor and RLS was identified.

Parkinson's Disease

The third most common movement disorder observed in the present study was Parkinson's disease. In all, 13 subjects received a diagnosis of Parkinson's disease and one had atypical Parkinson's disease (11 male, 3 female). Mean age of all 14 subjects was 72.3 ± 13.0 years, while that of the male subjects was 73.7 ± 0.4 years. Of these 14 cases, eight were diagnosed previously and the remaining six were diagnosed while participating in the present study. The most common comorbid chronic diseases

were atherosclerotic heart disease, high blood pressure, and bronchial asthma ($p < 0.05$).

The age-adjusted prevalence rates of Parkinson's disease according to age groups are presented in Table 4. Parkinson's disease was more prevalent among subjects aged > 70 years; among them, the prevalence of Parkinson's disease was 1.22 times greater (95% CI: 1.07-1.35) than in the other age groups.

The coexistence of ET and RLS with Parkinson's disease, ($p > 0.05$) was not statistically significant; only one Parkinson's disease patient also had RLS.

Among the other rare movement disorders suspected during phase I, four subjects were suspected of having dystonia and six were suspected of having hemifacial spasm. Based on the assessments during phases II and III, dystonia was identified in two subjects (one post-stroke hemi-dystonia and one focal extremity dystonia) and hemifacial spasm was identified in four subjects. The crude prevalences of hemifacial spasm and dystonia were 0.82%, and 0.41%, respectively. None of the subjects with hemifacial spasm had a history of Bell's palsy.

DISCUSSION

The results of our study show that the most common movement disorder in the Orhangazi district of Bursa was RLS, followed by Parkinson's tremor, ET, enhanced physiological tremor, hemifacial spasm, and dystonia. The crude prevalences of ET, RLS, Parkinson's disease, hemifacial spasm, and dystonia were 3.34%, 9.71%, 2.23%, 0.82%, and 0.41%, respectively.

The literature contains a limited number of studies concerning the prevalence of all movement disorders (1,2,23,24); therefore, we think that the present study contributes much needed additional data on the prevalence of movement disorders.

It has been reported that the high prevalence rate of RLS is primarily associated with increasing age (25-28). Sevim et al. reported that the prevalence of RLS in Turkey was 3.9% (5). Although similar methods were used in their study and ours, our results showed a higher RLS preva-

lence rate. Sevim et al. conducted a study that included a population group younger than ours, a difference that might explain the variation in prevalence rates (5).

The prevalence of RLS in Europe ranges between 5% and 15%, while in Asia the range is considerably smaller (0.1%-2.3%) (28-30). The prevalence of RLS in the present study is higher than the prevalence in Asian countries and is similar to the prevalence in Europe, which could be attributed to ethnic, genetic, and environmental differences.

The second most common movement disorder in our study population was tremor. The prevalence of ET was 3.34% while that of enhanced physiological tremor was 4.14%. As the literature contains insufficient data on the prevalence of tremor subtypes, our results could not be compared with those of previous studies.

The reported prevalence rates of ET vary between 0.005% and 22.0%, and a correlation between increased age and high prevalence has been reported (4,7,9,10,16,31). In the present study there wasn't a correlation between increased age and the prevalence of ET, and ET was observed less frequently than Parkinson's tremor. These findings could be related to our methodology and/or small sample.

Our finding that chronic diseases, such as atherosclerotic heart disease and asthma were statistically more prevalent in subjects with tremor and RLS may be related to the advanced age of our sample.

It is noteworthy that all the cases with ET and RLS were diagnosed by the investigators. This shows that awareness of movement disorders, especially ET and RLS, among the general population and healthcare professionals is low. This might either be the result of a lack of knowledge about movement disorders or the fact that symptoms do not affect every day activities in some patients and, therefore, they do not consult physicians. As such, we think that both physicians and the general population need to be educated about movement disorders.

The prevalence of Parkinson's disease in the general population has been reported to be between 50-260/100.000, increasing markedly to 1.6% among the > 60-years-old population (32-35). There has been only one Parkinson's prevalence study carried out in Turkey; Torun S et al. reported that the prevalence rate of Parkinson's disease was 111/100.000 (3). The prevalence of Parkinsonism in our study population was 2.2%. A significant increase in the prevalence of Parkinson's disease over the age of 70 has been reported in the literature (36-38). Although we screened individuals over the age of 40, mean age of the patients with Parkinsonism was 72.3 years, which might explain the high prevalence of Parkinson's disease in our study group.

It has been suggested that ET and RLS share a similar pathogenesis with Parkinson's disease and, therefore, the coexistence of these diseases is frequent (20,39-41). In the present study the coexistence of Parkinson's disease with other movement disorders was not significant. Previous studies on the coexistence of Parkinson's disease were performed with patients that presented to hospitals and reflect the results of tertiary centers. In contrast, the present study was a population-based survey and, therefore, it is difficult to compare our results with those of previous studies. Nonetheless, when considering the present study's results, the small study sample is a limiting factor.

Variation in the prevalence of movement disorders is generally attributed to the differences in methodologies used by researchers (9,32). In the present study subjects identified with at least one suspected symptom in phase I were included in phase II for re-assessment and 35.8% of all patients suspected of having symptoms were diagnosed with a movement disorder by the specialists.

In the clinical literature RLS prevalence rates have been determined based questionnaires or mails. It was reported that based on questionnaires answered on the telephone or by mail the RLS prevalence rate was 5.5%-25%, whereas based on face-to-face assessment it was 2.3%-10.6% and with 2-phase face-to-face assessment it was 0.1%-1.06%; this decrease in RLS prevalence rates was significant (5,25,26,29).

During the present study we observed that patients newly diagnosed with a movement disorder were not aware of their symptoms. Because of this we think that face-to-face interviewing is a more sensitive method than phone-based or mail-based questionnaire screening. We also suggest that if screening is performed by a movement disorder expert the results are more reliable.

Major limitations of the present study were a small study population, screening a limited geographical area of Turkey, and not successfully contacting the entire proposed study population. Nonetheless, to the best of our knowledge this is the first epidemiological movement disorder study to use video recordings. The use of both face-to-face interviews and video recordings are the strengths of our study. Our prevalence rates are in somewhere in the wide range that has been reported before. We assume that future studies using similar methods will narrow this range and define the prevalence rates more precisely.

Bursa and the Orhangazi district are residential areas that receive migration. Therefore it is plausible that population from these regions may represent the demographic composition of Turkey.

In conclusion, the prevalence rates of movement disorders observed in the present study constitute new

and important data. The face-to-face interview method, which is accepted as the gold standard technique for epidemiological studies, was taken a step further by videotaping. This facilitated review of the subjects and consensus diagnoses by the movement disorder specialists. We think that this study design enhances the reliability of our results. Larger and different regions should be screened in future studies to contribute to these prevalence data.

REFERENCES

- Moghal S, Rajput AH, Meleth R, D'Arcy C, Rajput R. Prevalence of movement disorders in institutionalized elderly. *Neuroepidemiology* 1995;14:297-300.
- Wenning GK, Kiechl S, Seppi K, Muller J, Hög B, Saletu M, et al. Prevalence of movement disorders in men and women aged 50-89 years (Bruneck Study cohort): A population-based study. *Lancet Neurol* 2005;4:815-20.
- Torun Ş, Uysal M, Gücüyener D, Özdemir G. Parkinson's disease in Eskisehir, Turkey. *Eur J Neurol* 1995;2(Suppl 1):44-5.
- Dogru O, Louis ED, Sevim S, Kaleagasi H, Aral M. Clinical characteristics of essential tremor in Mersin, Turkey-a population-based door-to-door study. *J Neurol* 2005;252:570-4.
- Sevim S, Dogru O, Camdeviren H, Bugdayci R, Sasmaz T, Kaleagasi H, et al. Unexpectedly low prevalence and unusual characteristics of RLS in Mersin, Turkey. *Neurology* 2003;61:1562-9.
- Allen RP, Walters AS, Montplaisir J, Hening W, Myers A, Bell TJ, et al. Restless legs syndrome prevalence and impact: REST general population study. *Arch Intern Med* 2005;165:1286-92.
- Benito-Leon J, Bermejo-Pareja F, Morales JM, Vega S, Molina JA. Prevalence of essential tremor in three elderly populations of central Spain. *Mov Disord* 2003;18:389-94.
- Berger K, Luedemann J, Trenkwalder C, John U, Kessler C. Sex and the risk of restless legs syndrome in the general population. *Arch Intern Med* 2004;164:196-202.
- Bergareche A, De La Puente E, Lopez De Munain A, Sarasqueta C, De Arce A, Poza JJ, et al. Prevalence of essential tremor: A door-to-door survey in bidassoa, Spain. *Neuroepidemiology* 2001;20:125-8.
- Brin MF, Koller W. Epidemiology and genetics of essential tremor. *Mov Disord* 1998;13(Suppl 3):55-63.
- Findley LJ. Epidemiology and genetics of essential tremor. *Neurology* 2000;54:8-13.
- Louis ED, Ottman R, Hauser WA. How common is the most common adult movement disorder? Estimates of the prevalence of essential tremor throughout the world. *Mov Disord* 1998;13:5-10.
- O'Keefe ST, Noel J, Lavan JN. Restless legs syndrome in the elderly. *Postgrad Med J* 1993;69:701-3.
- Phillips B, Young T, Finn L, Asher K, Hening WA, Purvis C. Epidemiology of restless legs symptoms in adults. *Arch Intern Med* 2000;160:2137-41.
- Rothdach AJ, Trenkwalder C, Haberstock J, Keil U, Berger K. Prevalence and risk factors of RLS in an elderly population: The MEMO study. Memory and Morbidity in Augsburg Elderly. *Neurology* 2000;54:1064-8.
- Tan LC, Venketasubramanian N, Ramasamy V, Gao W, Saw SM. Prevalence of essential tremor in Singapore: A study on three races in an Asian country. *Parkinsonism Relat Disord* 2005;11:233-9.
- Kan I. *Biostatistics: 2006*. Nobel Press (in Turkish).
- Hoehn MM, Yahr MD. Parkinsonism: Onset, progression and mortality. *Neurology* 1967;17:427-42.
- Hughes AJ, Daniel SE, Kilford L, Lees AJ. Accuracy of clinical diagnosis of idiopathic Parkinson's disease: A clinico-pathological study of 100 cases. *J Neurol Neurosurg Psychiatry* 1992;55:181-4.
- Hening W, Walters A, Rosen R, LeBrocq C, Hirsch L, Dhar A; International RLS Study Group 2001. The International RLS Study Group rating scale: A reliable and valid instrument for assessing severity of the restless leg syndrome. *Neurology* 2001;56(Suppl 13):A4.
- Deuschl G, Bain P, Brin M. Consensus statement of the Movement Disorder Society on Tremor. *Ad Hoc Scientific Committee. Mov Disord* 1998;13(Suppl 3):2-23.
- Bhidayasiri R. Differential diagnosis of common tremor syndromes. *Postgrad Med J* 2005;81:756-62.
- De Rijk MC, Launer LJ, Berger K, Breteler MM, Dartigues JF, Baldereschi M, et al. Prevalence of Parkinson's disease in Europe: A collaborative study of population-based cohorts. Neurologic Diseases in the Elderly Research Group. *Neurology* 2000;54:21-3.
- Tse W, Libow LS, Neufeld R, Lesser G, Frank J, Dolan S, et al. Prevalence of movement disorders in an elderly nursing home population. *Arch Gerontol Geriatr* 2008;46:359-66.
- Nichols DA, Allen RP, Grauke JH, Brown JB, Rice ML, Hyde PR, et al. Restless legs syndrome symptoms in primary care: A prevalence study. *Arch Intern Med* 2003;163:2323-9.
- Tison F, Crochard A, Leger D, Bouee S, Lainey E, El Hasnaoui A. Epidemiology of restless legs syndrome in French adults: A nationwide survey: The INSTANT study. *Neurology* 2005;65:239-46.
- Ohayon MM, Roth T. Prevalence of restless legs syndrome and periodic limb movement disorder in the general population. *J Psychosom Res* 2002;53:547-54.
- Tan EK, Seah A, See SJ, Lim E, Wong MC, Koh KK. Restless legs syndrome in an Asian population: A study in Singapore. *Mov Disord* 2001;16:577-9.
- Bjorvatn B, Leissner L, Ulfberg J, Gyiring J, Karlsborg M, Regeur L, et al. Prevalence, severity and risk factors of restless legs syndrome in the general adult population in two Scandinavian countries. *Sleep Med* 2005;6:307-12.
- Zucconi M, Ferini-Strambi L. Epidemiology and clinical findings of restless legs syndrome. *Sleep Med* 2004;5:293-9.
- Louis ED, Ottman R, Hauser WA. How common is the most common adult movement disorder? Estimates of the prevalence of essential tremor throughout the world. *Mov Disord* 1998;13:5-10.
- Barbosa MT, Caramelli P, Maia DP, Cunningham MC, Guerra HL, Lima-Costa MF, et al. Parkinsonism and Parkinson's disease in the elderly: A community-based survey in Brazil (the Bambui study). *Mov Disord* 2006;21:800-8.
- De Rijk MC, Breteler MM, Graveland GA, Ott A, Grobbee DE, Van der Meche FG, et al. Prevalence of Parkinson's disease in the elderly: The Rotterdam study. *Neurology* 1995;45:2143-6.
- De Rijk MC, Tzourio C, Breteler MM, Dartigues JF, Amaducci L, Lopez-Pousa S, et al. Prevalence of Parkinsonism and Parkin-

- son's disease in Europe: The EUROPARKINSON collaborative study. European Community Concerted Action on the Epidemiology of Parkinson's disease. *J Neurol Neurosurg Psychiatry* 1997;62:10-5.
35. De Rijk MC, Launer LJ, Berger K, Breteler MM, Dartigues JF, Baldereschi M, et al. Prevalence of Parkinson's disease in Europe: A collaborative study of population-based cohorts. *Neurologic Diseases in the Elderly Research Group. Neurology* 2000;54:21-3.
36. Benito-Leon J, Bermejo-Pareja F, Rodriguez J, Molina JA, Gabriel R, Morales JM. Prevalence of PD and other types of parkinsonism in three elderly populations of central Spain. *Mov Disord* 2003;18:267-74.
37. Taba P, Asser T. Prevalence of Parkinson's disease in Estonia. *Acta Neurol Scand* 2002;106:276-81.
38. Twelves D, Perkins KS, Counsell C. Systematic review of incidence studies of Parkinson's disease. *Mov Disord* 2003;18:19-31.
39. Garcia-Borreguero D, Odin P, Serrano C. Restless legs syndrome and PD: A review of the evidence for a possible association. *Neurology* 2003;61:49-55.
40. Ondo WG, Vuong KD, Jankovic J. Exploring the relationship between Parkinson disease and restless legs syndrome. *Arch Neurol* 2002;59:421-4.
41. Shahed J, Jankovic J. Exploring the relationship between essential tremor and Parkinson's disease. *Parkinsonism Relat Disord* 2007;13:67-76.

Yazışma Adresi/Address for Correspondence

Uzm. Dr. Sevda Erer Özbek
Uludağ Üniversitesi Tıp Fakültesi
Nöroloji Anabilim Dalı
16059 Bursa/Türkiye

E-posta: sevdaerer@gmail.com

geliş tarihi/received 08/04/2009

kabul edilmiş tarihi/accepted for publication 21/04/2009