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Prevalence and Clinical Features of Idiopathic Parkinson's Disease in Western Turkey

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ABSTRACT

Introduction: We aimed to determine the prevalence and risk factors of idiopathic Parkinson's disease (IPD) in Western Turkey, which encompasses Edirne and its surrounding districts.

Methods: In this study, 9887 individuals, able to communicate and agreed to participate in the study, were evaluated. The data was obtained by answering a face-to-face questionnaire consisting of 53 questions from volunteers living at 30 randomly selected family health centers in Edirne and its counties. The questionnaire included demographic information, questions to evaluate potential concomitant conditions, and questions regarding the symptomatology used in IPD diagnosis. Following the questionnaire, it was planned to determine the degree of IPD with the Unified Parkinson's Disease Rating Scale (UPDRS) and the Hoehn and Yahr scale (HY) clinical rating scale in patients diagnosed with IPD to assess disease severity in patients diagnosed with IPD

Results: Of the 9887 individuals, 118 were diagnosed with IPD according to the questionnaire results from Edirne and its districts, and the prevalence of IPD was 1.2%. Approximately, 58.4% of the patients with IPD were male and 41.6% were female, which was not significantly different (p=0.214). Non-motor symptoms such as difficulty urinating, anxiety, depression, fatigue, REM sleep behavior disorder, and difficulty falling asleep or staying asleep were also examined in patients diagnosed with IPD. Depression was identified in 45.7% of the cases, while the control group was 4.3% (p=0.001). Fatigue was identified in 46.8% of the cases and control group was 3.5% (p=0.002).

Conclusions: IPD prevalence studies will increase the awareness in the community and provide early diagnosis and treatment as well as serve as a basis to increased life expectancy, reduce morbidity, and improve life quality.

Keywords: Idiopathic Parkinson's disease, prevalence, Edirne, non-motor symptoms, concomitant diseases

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INTRODUCTION

Idiopathic Parkinson's disease (IPD) is a movement disorder characterized by resting tremor, rigidity, bradykinesia/akinesia, and postural instability, but the clinical picture includes other motor and non-motor symptoms. Pathologically, IPD is characterized by the loss of dopaminergic neurons in the pars compacta of the substantia nigra and also the accumulation of misfolded α-synuclein, which is found in intra-cytoplasmic inclusions called Lewy bodies (1).

Non-motor symptoms may include depression, anxiety, emotional changes, cognitive impairments, urinary problems, constipation, fatigue, sleep problems, and difficulty chewing, swallowing, and speaking (1). IPD is predominantly associated with advanced age and an increase in the prevalence of IPD is expected as lifespan increases (2). In the epidemiological studies conducted worldwide for IPD, a broad range of prevalence rates have been reported at 0.2% (95%CI of the household population). Most community-based studies that screened all ages and clinically examined participants found the age-adjusted prevalence rates of IPD to be between 102-218/100,000 person (3, 4). The incidence of IPD has been reported to be 14.2 per 100,000 person/year. In addition, IPD occurs more in men than in women (5). The available system of investigation on IPD epidemiology suggests that disease frequency occurs in the age-group of 80-89 years old (6, 7) and then decreases. Other studies have established the highest age specific prevalence rates among the oldest groups studied (2, 8). According to a 2014 meta-analysis, the

Highlights

- **9887 individuals, able to communicate and agreed to participate in the study, were evaluated.**
- **The data obtained 30 randomly selected family health centers in Edirne and its counties.**
- **118 were diagnosed with IPD and the prevalence of IPD was 1.2%.**
- **Non-motor symptoms such as depression was identified in 45.7% of the cases while the control group was 4.3%**
- **Non-motor symptoms such as fatigue was identified in 46.8% of the cases while the control group was 3.5%.**

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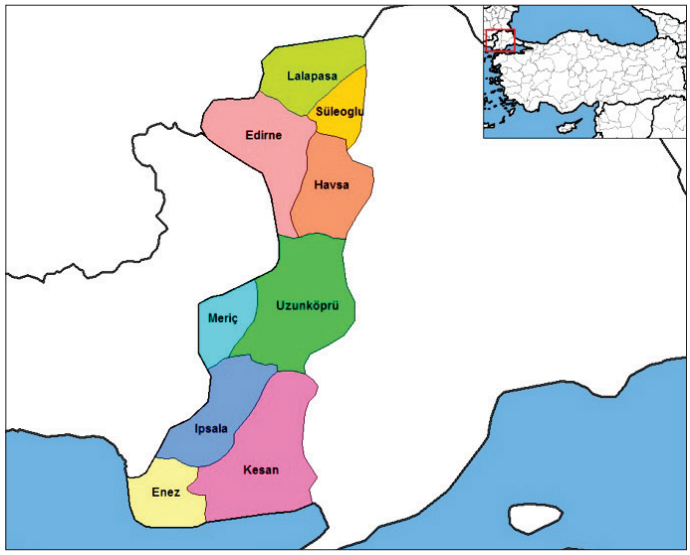

Figure 1. Map showing the localization of Edirne.

prevalence of IPD increases with older age from 41 per 100,000 (0.04%) in persons aged 40-49 years to 1.903 per 100,000 (1.9%) in persons aged 80 and older. In the epidemiological studies conducted worldwide for IPD, a broad range of prevalence rates have been reported from 15-250/100,000 (2, 8). These findings were affected by the methodological approach and differences in the administration of questionnaires.

IPD has a negative impact on the quality of life. This condition is the subject of an increasing number of epidemiological studies. Therefore, knowing the true prevalence of IPD is extremely important in terms of the quality of life improvement and evaluation of other accompanying chronic disease processes. The main aim of this population-based study is to determine the epidemiological features and prevalence of patients diagnosed with IPD who received treatment or who remained undiagnosed and did not receive treatment. In addition, we aimed to make IPD easier to recognize and initiate treatment among primary care family physicians. Population-based prevalence studies regarding the prevalence of IPD in Turkey are extremely limited (9-11). It is extremely important to perform studies to compare different regions and different socio-economic areas. Therefore, in this study, which was conducted in Edirne and its districts of Western Turkey, we aimed to determine the potential IPD prevalence. Individuals in this region are primarily Caucasian (Figure 1).

IPD is a debilitating disease that affects an individual's daily life, mood, and functionality. It commonly goes unrecognized by physicians and the society. We aimed to determine the prevalence of IPD with large-scale study among people aged 18 or older who live in Edirne and its districts.

METHODS

Study populations

To assess the prevalence of IPD in Edirne and its districts, 9,887 volunteers (5.033 men (51.0%) and 4,770 women (49.0%)) were included in the study. The study was approved by the Trakya University Medical Faculty Ethics Committee on January 16, 2013 (approval number 2013/11). The study was conducted between 2013-2017 on individuals aged 18 or older who lived in Edirne and its districts. In 2012, the adult population in this region was 314,975, which included 128,667 from Edirne and 186,308 in the surrounding districts. A total of 9,887 individuals were considered necessary for inclusion in the study based on a 5% error rate and 80% overall power. To account for the possibility of missing cases of IPD in our study population, we added an additional 10% to the estimated number of individual's needed for a total of 10,487. However, the study only included 9,887 individuals because some of the surveys lacked some of the data required for the study.

The sample selection was based on the World Health Organization's (WHO) 30 cluster sampling method (12). Family Health Centers (FHCs) were designated as the cluster unit. To select clusters for study primarily from the Edirne Health Directorate province, the populations of all FHCs in all rural areas of the province and at the region's geographical boundaries (neighborhoods, streets, and in the countryside) were sampled.

Thirty FHCs were identified by simple random sampling to represent the entire population. To collect study information, the total populations of 50 FHCs in Edirne and its districts were chosen and 30 clustered with a simple random sampling method (12 FHCs in Edirne; 18 FHCs in its districts). The sample size was established by weighting the populations served by family physicians by both age and gender. On average, 98 -200 individuals belonged to each cluster.

A survey including 53 questions was prepared by neurology and epidemiology specialists (13). Randomly selected participants were asked to complete it in person. Each individual who agreed to participate in the study was evaluated in the FHCs. FHCs physicians and participants were informed in detail about the importance of the diagnosis and treatment of IPD and accompanying non-motor symptoms. The definitive diagnosis of patients suspected of having IPD as a result of the questionnaire was made by a neurologist specialized in this field. Once participants understood the value of this study for the health of the individual and community, they voluntarily agreed to participate. The questionnaire solicited demographic information, including age, gender, profession, alcohol use and smoking status of the participants. Family history of IPD, earlier diagnosis of IPD, presence of constipation, difficulty urinating, sexual dysfunction, sleep problems, hyposmia, hyperhidrosis, memory disorders, live dreams, fatigue, psychiatric illness (depression, anxiety, bipolar disorder, schizophrenia, cognitive impairment, dementia and apathy) were also examined. In addition to the standard IPD diagnostic criteria (i.e, resting tremor, bradykinesia, rigidity, loss of postural reflexes, flexion posture and freezing), time of symptom onset was also investigated. Downsizing in handwriting (micrographia), arm shaking level, foot riding on the affected side of the body, freezing, dulling of facial expression (hypomimia), loss of vitality in speech, hoarse speech (hypophonia), the tendency to fall backwards were examined.

To evaluate the utility of the questionnaire, a pilot study on 50 individuals was conducted. Incomprehensible questions or problems encountered in its implementation were addressed, and the intelligibility of the questionnaire was determined. In 1992, the IPD diagnostic criteria were determined by UK Parkinson's Disease Society Brain Bank Clinical Diagnostic Criteria (13), international IPD study group. In 2016, these criteria were revised as "MDS Clinical Diagnostic Criteria for Parkinson's Disease" (14). A definitive diagnosis of the disease was only possible if four symptoms were present in the same individual. In addition to these diagnostic criteria, the questionnaire included demographic data and questions regarding non-motor symptoms.

For the definitive diagnosis of REM sleep behavior disorders, polysomnography was planned on patients with clinical symptoms according to the International Classification of Sleep Disorders (ICSD-III) criteria (15).

The inclusion criteria of the volunteers were as follows: capable of communication, motivated to participate, and cooperative in answering questions. Individuals who had psychiatric diseases or who had a diagnosis of atypical or secondary forms of parkinsonism; cognitive impairment as (starting before motor signs of idiopathic Parkinson's

Dear Participant,

We would like to invite you to participate in "The prevalence of Parkinson's disease in the province of Edirne" study, prepared by Department of Neurology and Department of Family Medicine at Medical Faculty of Trakya University. You are not obliged to participate in the study and you will not receive any reward or punishment. We will invite people having restless leg syndrome,identifiedbythis questionnaire, to TrakyaUniversity Medical Research and Practice Center for etiological research.Information you provide will not be associated with your credentials and will be kept completely confidential. Information will be used only for scientific research.

Parkinson's Aisease Questionnaire

1) **How old are you ?.....**years old
2) **Your Gender** (1) Male.....(2) Female
3) **Your employment status?** (0) Unemployed.....(1) Employed
4) **If you are employed, what is your occupation?**
(1) Health worker (2) Civil servant (3) Worker
(4) Self-employed (5) Employed in private sector
(6) Other
5) Do you smoke?
(0) I don't smoke, I have never smoked
(1) I don't smoke, I quit smoking
I started smoking at the age of .....I quit smoking at the age of.....
(2) I am a smoker
I started smoking at the age of .....Average number of cigarettes per day .....
6) **Do you drink alcohol?**
(0) I did not drink alcohol
(1) I don't drink, Iquit drinking
I started drinking at the age of ..... I quit drinking at the age of .....
(2) I drink
I started drinking at the age of ..... Average amount of alcohol consumedper day .....
7) Is there anyone in your family who was diagnosed with Parkinson's disease?
(0) No (1)Yes
8) Have you been diagnosed with Parkinson's disease before?
(0) No (1)Yes
9) Do you have tremors? (Arms, legs, chin, lips)
(0) No (1)Yes
10) Do your tremors increase with stress?
(0) No (1)Yes
11) Do you have tremors at rest?
(0) No (1) Yes
12) Do your tremors decrease when you make a move?
(0) No (1) Yes
13) Has anyone told you if yourtremors continue during sleep?
(0) My tremors do not continueduring sleep.
(1) I continue to tremble during sleep.
(2) I do not know
14) Do you feel stiffness in your muscles?
(0) No (1) Yes
15) Hasanyone toldyou that you have stiff muscles when you want to passively move?
(0) No (1) Yes
16) Has anyone told you that there is constant resistance in your muscles when you want to passively move?
(0) No (1) Yes
17) Do you have any difficulty making movements such as getting up from a chair, turning in bed and starting walking?
(0) No (1) Yes
18) Do you feel any hesitation or slowness while doing a new move?
(0) No (1) Yes
19) Do you get tired quickly when doing a new move?
(0) No (1) Yes
20) Do you have any difficulty buttoning up?
(0) No (1) Yes
21) Do you have any difficulty opening the jar lid?
(0) No (1) Yes
22) Do you takesmall and slow steps and scuff while walking?
(0) No (1) Yes
23) Do you walk leaning forward while walking?
(0) No (1) Yes
24) Is there any swing in your arms while walking?
(0) No (1) Yes
25) If I have a swing in your arms while walking, is it in both halves of your body or one-sided?
(1)One sided (2) Two sided
26) Is there any dullness in your facial expression?
(0) No (1) Yes
27) Is there a slowdown in facial expressions?
(0) No (1) Yes
28) Do you feel any change in your speech?
(0) No (1) Yes
29) Do you feel slow speech or a decrease in your voice?
(0) No (1) Yes
30) Is your speech soft and in the same tone?
(0) No (1) Yes
31) Has yourhandwriting changed?
(0) No (1) Yes
32) Is this change in the form of shrinking or illegible handwriting?
(0) No (1) Yes
33) Do you feel the balance of your body?
(0) No (1) Yes
34) Do you often have falls without a cause?
(0) No (1) Yes
35) When you go backwards or forwards, do you feel afraid that your speed is increasing or you can't stop?
(0) No (1) Yes
36) Do you have muscle pain?
(0) No (1) Yes
37) Do you have any difficulty swallowing?
(0) No (1) Yes
38) Is there a lot of saliva coming from yourmouth?
(0) No (1) Yes
39) Do you have constipation?
(0) No (1) Yes
40) Do you have any difficulty urinating?
(0) No (1) Yes
41) Do you have sexual dysfunction?
(0) No (1) Yes
42) Do you have excessive sweating?
(0) No (1) Yes
43) Do you have loss of sense of smell?
(0) No (1) Yes
44) Do you have any difficulty falling asleep or maintaining sleep at night?
(0) No (1) Yes
45) Do you have anyproblems with remembering recent events or do you forget things to do?
(0) No (1) Yes
46) Do you have intense, vivid dreams or scary dreams?
(0) No (1) Yes
47) During activities such as working, driving or eating, are you having trouble staying awake?
(0) No (1) Yes
48) Do you feel tired?
(0) No (1) Yes
49) Do you have any mental illness?
(0) No (1) Yes
50) If you do, what is it?
(1) Depression (2) Anxiety (3) Bipolar disorder (4) Schizophrenia
(5) Other (please write the name of your illness) .....
51) Do you take anymedication?
(0) No (1) Yes
52) If you do, please write their names.
.....
53) Can you write yourphone number?

Thank you for completingour questionnaire.

disease) determined by the Mini-Mental State Examination (MMSE) score of ≤26; untreated hallucinations or psychosis (drug-induced or spontaneous); use of hypnotic, sedative or stimulant medications; and those who underwent upper/lower extremity surgery were not included in the study. Questionnaires were administered by a neurologist (each and every individual by only one neurologist) who was also the principal investigator of the study. All questionnaires and all patients suspected of having IPD were evaluated individually by the same principal investigator.

Assessment of IPD

IPD is diagnosed by the presence of specific symptoms, and the diagnostic criteria were established by using Movement Disorder Society (MDS) IPD Criteria (14). Retained motor parkinsonism was the core feature of the disease. Therefore, diagnosis was based on the Queen Square Brain Bank Diagnostic Criteria. Clinical diagnosis of IPD was confirmed by the presence of bradykinesia and at least one of the following symptoms: resting tremor, rigidity, or impaired postural reflexes (16, 17). According to MDS IPD Criteria, motor abnormalities remain central and increased recognition has been given to non-motor manifestations. These are incorporated into both the current criteria and particularly into separate criteria for prodromal PD. However, in our study, non-motor symptoms were evaluated in patients diagnosed with IPD by meeting motor criteria. Therefore, non-motor symptoms could not be evaluated as a prodromal symptom alone.

Patients with other parkinsonian syndromes including secondary or Parkinson plus syndrome (multiple system atrophy or progressive supranuclear palsy) were excluded from the IPD sample. We implemented standardized questions in both cohorts that address the four cardinal diagnostic criteria of the MDS IPD. The participants who answered yes to for all specific questions were given detailed evaluation in terms of diagnosed with IPD. During the examination, torticollis, spasmodic dysphonia, blepharospasm, and other dystonic postures or tremors were specifically assessed and considered signs of parkinsonism (18). Participants or their caregivers were informed about the study before signing an Informed Consent Form. Data were collected during patient interviews and from medical documentation and recorded on the Patient Case Report Forms. The Movement Disorders Association's Parkinson's Disease Unified Rating Scale (MDS-UPDRS) (19) was used for disease severity and the Hoehn and Yahr Rating Scale (HY) (20) was used for clinical grade. However, UPDRS values could not be included in the study results due to missing data in some patients. In addition, the Mini-Mental State Examination (MMSE) (21) was performed as a screening test of cognitive status, and the Beck Depression and Anxiety Inventory (BDI) (22, 23) for depression and anxiety.

Statistical Analysis

Statistical evaluation was performed using SPSS 21 statistics software. One-sample Kolmogorov-Smirnov test was used to assess the eligibility for normal distribution of the measured data because the data did not exhibit a normal distribution. A Mann-Whitney U test was used for comparison between the groups. A Pearson's χ^2 test, Fisher's exact χ^2 analysis, and Kolmogorov-Smirnov two-sample test were used for qualitative data. The mean values ± standard deviations were determined as descriptive statistics. Stepwise Logistic regression analyses were applied. A significance limit was set as $p<0.05$ for all statistics.

RESULTS

The study population consisted of 9,887 participants including 50.9% men (n=5,022) and 49.2% women (n=4,865). The IPD prevalence was 1.2%, and 118 participants were evaluated as IPD positive. Moreover, during our study, 55.8% of IPD-positive participants had a previous IPD diagnosis, whereas 44.2% of IPD-positive participants were newly diagnosed. Sixty-nine (58.4%) of the IPD patients were men and 49 (41.6%) were women (p=0.012). The mean age of the patients diagnosed with IPD was 78.6±14.7, and the other individuals had a mean age of 68.2±17.04. There was a non-significant difference in the prevalence of IPD between women and men (p=0.214).

There was a significant difference in working status between the IPD positive and negative participants. The proportion of IPD-negative participants with jobs was higher (p=0.011). There was also a not significant difference in the occupational groups between the IPD positive and negative participants (p=0.345). Thirty-eight (32%) of the IPD-positive participants were non-smokers, whereas 62 (52.5%) had quit smoking and 8 (6.77%) were still smoking (p=0.004). Seventy two (61.0%) of the IPD-positive participants did not drink alcohol, whereas thirty four (28.8%) had quit drinking and twelve (10.1%) drank alcohol (p=0.003). Family history was negative in 86.7% of the cases and positive in 13.3%, which was significantly different (p=0.001) (Table 1).

Table 1. The characteristic features of IPD positive and negative participants

Variables	IPD (negative) (n=9769, 98.8%)	IPD (positive) (n=118, 1.2%)	p
Age (Mean ± SD)	78.6±14.7	68.2±17.04	0.120
Gender (female/male), (%)	49.1/50.9	41.6/58.4	0.012
Occupation (negative/positive)	69.2/30.8	87.8/12.2	0.011
Types of occupation, (%)			
Health worker	11.8	0.0	<0.05
Officer	7.2	1.4	
Worker	20.5	11.2	
Self-employment	22.4	19.1	
Private sector	25.3	3.8	
Others	11.2	11.8	
Family history (negative/positive), (%)	98.8/1.2	86.7/13.3	0.000
Previous diagnosis of ET (negative/positive), (%)	100/0.0	44.2/55.8	0.008
Alcohol use (did not drink alcohol,/drank alcohol/had quit drinking), (%)		61.0/10.1/28.8	0.003
Smoking (non-smokers/were still smoking/had quit smoking), (%)		32.0/8.0/52.5	0.004
Dominant hand (right/left), (%)	95.7/4.3	88.7/11.3	0.000
Fatigue (negative/positive), (%)	96.5/3.5	53.2/46.8	0.002
Depression (negative/positive), (%)	95.7/4.3	54.3/45.7	0.001

IPD, idiopathic Parkinson's disease.

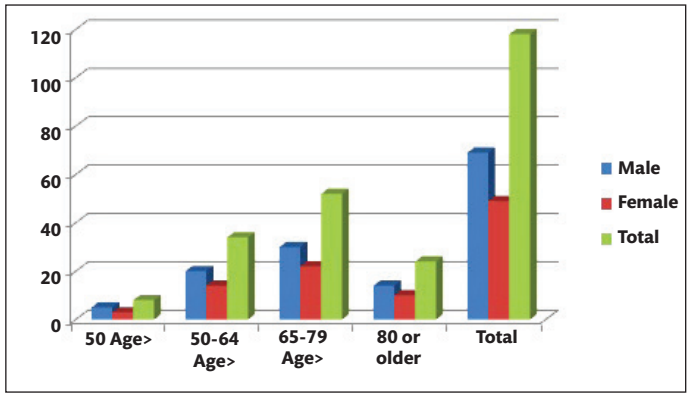

Figure 2. The prevalence of IPD in terms of age and gender.

The distribution of age and gender groups was determined by the patients who applied to FHC and had volunteered to participate in the study. There was no significant difference in IPD prevalence between the groups in terms of age and gender (p=0.794 and p=0.798, respectively (Figure 2). The prevalence of IPD over the administrative divisions of the province of Edirne is provided in Table 2. There was no significant difference between the prevalence of IPD between administrative divisions (p=0.482).

Those with psychiatric diseases accompanying IPD were classified in terms of the presence of anxiety, depression, bipolar disorder, and schizophrenia. Anxiety was identified in 20.5% of the IPD cases was significantly different between the IPD positive and negative patients (p=0.001). Depression, was identified in 45.7% of the IPD cases and was significantly different between the IPD positive and negative patients (p=0.001). The other non-motor symptoms of IPD are summarized in Table 3. In 68 (57.6%) of the IPD positive cases, sleep disorders were identified. Thus, IPD and excessive daytime sleepiness have negative effects on the quality of life and lead to a loss of workforce productivity (especially in young people with IPD) as demonstrated by the identification of secondary complications.

DISCUSSION

Parkinson's disease (PD) is the second most common neurodegenerative disease after Alzheimer's. The combined effect of genetic and environmental risk factors plays a role in etiology. It is thought that the disease has a multifactorial etiology. The first aim of this study was to determine the current frequency of PD in Edirne. Age-adjusted prevalence rates of PD in several other community-based studies as well as in our previous study have reported remarkably lower rates than the current study (ranging from 109-183/100,000) (1, 3, 10). However, the use of different case ascertainment methods and standard populations set limits to the comparability of prevalence estimates reported by different studies.

Our study is the first large-scale population-based IPD prevalence study conducted on a Turkish population with a large sample size (9,887)

Table 2. IPD distribution according to the administrative division of the province of Edirne

	IPD (negative) n, (%)*	IPD (positive) n, (%)**	Overall	Total population
City center	4.023 (41.1)	38 (38.7)	4.006 (41.1)	128.667
Suloglu	300 (3.07)	9 (3.5)	202 (2.0)	5.601
Lalapasa	300 (3.07)	6 (1.7)	202 (2.0)	5.527
Havsa	400 (4.09)	8 (2.9)	505 (5.0)	16.660
Uzunkopru	1.818 (18.60)	10 (4.14)	1608 (16.5)	52.763
Meric	200 (2.04)	8 (2.9)	414 (4.1)	13.133
Kesan	2.198 (22.4)	23 (20.8)	1929 (19.2)	13.133
Ipsala	300 (3.07)	7 (2.6)	708 (7.0)	11.555
Enez	200 (2.04)	9 (4.0)	313 (3.1)	8.181
Edirne (Overall)	9.769 (100.0)	118 (100.0)	9.887 (100.0)	314.975

IPD, idiopathic Parkinson's disease; *, the rate within IPD-negative patients; **, the rate within IPD-positive patients.

Table 3. Non-motor symptoms and rates in IPD cases

Non motor symptoms	NMS (negative) n, (%)*	NMS (positive) n, (%)*	p
Constipation	28 (23.8)	90 (76.2)	0.001
Difficulty urinating	51 (43.3)	67 (56.7)	0.004
Sexual dysfunction	62 (52.6)	56 (47.4)	>0.05
Excessive sweating	36 (30.6)	82 (69.4)	0.001
Loss of sense of smell	32 (27.2)	86 (72.8)	0.001
Difficulty falling asleep or maintaining sleep at night	44 (37.3)	74 (62.7)	0.002
Forgetfulness	47 (39.8)	71 (60.1)	0.002
Intense, vivid dreams or scary dreams	80 (77.0)	38 (33.0)	0.001
Fatigue	63 (53.2.4)	55 (46.8)	0.821
Swallowing	80 (67.7)	38 (32.2)	0.234
Increased salivation	31 (26.3)	87 (73.7)	0.001
Excessive Daytime Sleepiness	78 (66.2)	40 (33.8)	0.624

IPD, idiopathic Parkinson's disease; NMS, non motor symptoms; *, Pearson χ^2 analysis.

collected from the city center and all districts. Other IPD prevalence studies conducted in Turkey are limited to only a province or district. Other Turkish studies detected a prevalence of IPD between 0.015-2.23% (9, 10, 24). In accordance with the changing boundaries of Edirne province and district, the prevalence of IPD in rural areas was determined as 1.2%. When other studies conducted in Turkey regarding the prevalence of IPD were examined, the reported values were variable. In the eastern part of Turkey, in a small study conducted in rural areas Başkale, age-standardized estimated prevalence of IPD was reported to be 202/100,000 in Turkey (9). Turkey's Central Anatolia Region to the east in a study conducted in Sivas found the prevalence of IPD in 1,338 people to be 0.015% (24). In another study conducted in Orhangazi, Bursa, which is located in the south of the Marmara Region, 1,256 individuals were screened and the prevalence of IPD was 2.23% (10). Studies conducted in Turkey have generally included door-to-door interviews using a short questionnaire to identify possible cases of IPD after which physicians diagnosed the suspected cases. However, Guler et al. applied multistep, stratified, cluster, and systematic samplings (25). Compared with the other prevalence studies conducted in different regions of Turkey, our study utilized sample selection methods based on the WHO 30 cluster sampling method. Surveys were filled out in person by individuals who were invited to FHCs in order to prevent missing data. In addition, our study also assessed psychiatric disorders and comorbid conditions not performed in other IPD prevalence studies in Turkey.

Most people with IPD have depression, anxiety, bipolar disorder, and schizophrenia (26, 27). A study by Akhmadeeva et al. (28) reported that the prevalence of depression and anxiety in the current PD patients was 40-50% and 17-43% respectively.

On the other hand, non-motor symptoms were evaluated in our study. It has been reported that the cause of excessive sleep in IPD may be linked to circadian dysfunction (29). The nature of this association needs to be further explored in longitudinal studies. Prevalence of sleep problems in PD can vary anywhere from 50 to 81 percent (29, 30). This may negatively affect daily performance and increase accidents caused by fatigue or excessive daytime sleepiness (EDS). EDS can affect up to 60% of PD patients, and it has a multifactorial etiology (29, 30). In our study, the frequency of EDS developed secondary to IPD was 66 (55.9%) IPD patients.

In our study, fatigue was identified in 46.0% of patients with IPD, which is also consistent with the literature (31). Therefore, IPD might indirectly cause a decrease in life quality and might create problems with social communication. Additionally, 6.5% of the IPD negative participants had fatigue mainly due to psychological factors. IPD might affect sleep quality, quality of life, and cognitive activities at a relatively high prevalence, but quality of life can improve substantially after treatment.

In our study, newly diagnosed IPD patients were found to constitute 44.2% of all IPD patients. However, 55.8% previously had symptoms of IPD. This suggest that the awareness of the disease in the community is low or misdiagnosed due to lack of neurological assessment. In addition, it is observed that newly diagnosed IPD patients may present with non-motor symptoms. These findings should be taken into consideration for early diagnosis and treatment of IPD.

In the literature, the incidence and prevalence of IPD gradually increases typically develops between the ages of 55 and 65 years and occurs in 1–2% of people over the age of 60 years rising to 3.5% at age 85–89 years. About 0.3% of the general population is affected, and the prevalence is higher among men than women with a ratio of 1.5 to 1.0. (32, 33). It is widely recognized that the peak of the disease occurs between the ages of 85 years and older. Our findings were similar to previous studies; however, there was no statistically significant difference. Eight IPD patients were 50 years and younger, 34 IPD patients were between 50-64 years old, 52 IPD patients were between 64-79 years old, and 24 IPD patients were 80 years and older. IPD was higher in males in all age groups. However, there was not significant difference between the age groups among men and women. We determined the highest number of patients in the 64-79 age group.

Non-motor symptoms such as hyposmia, constipation, REM Sleep behavior disorder (RBD), and depression may occur precede motor symptoms clinically. In the literature, anosmia is a common non-motor feature of PD. The olfactory tract is involved early in PD as indicated by frequent occurrence of hyposmia or anosmia years/decades before motor symptoms (34). It has been reported in the literature that 10.0% of idiopathic hyposmia cases may lead to IPD (35). In our study, it was determined that the rate of hyposmia was high in IPD cases.

Non-motor symptoms such as olfactory disorder and RBD have been announced as new Clinical Criteria for the diagnosis of IPD by the MDS. One of the most frequent and important prodromal symptoms of PD are RBD. Several studies have investigated the idea that the occurrence of other premotor signs such as hyposmia may potentiate the predictive value of RBD in the conversion to PD. RBD patients have been shown to have significantly higher olfactory thresholds and therefore, 97% of their patients have an abnormal olfactory test (35). In our study, polysomnography was planned for the definitive diagnosis of RBD for 60 of the 118 patients who were diagnosed with IPD and those who were clinically considered to have RBD.

Gastrointestinal disturbances are common in IPD and may precede the occurrence of motor symptoms. IPD patients suffer from constipation about twice as often as controls. It has been reported that 64.5% of patients with IPD have constipation at all stages of disease. In addition, 87% of patients develop constipation before motor symptoms such as bradykinesia, tremor, and rigidity occur (36). In our study, 90 (76.2%) patients with PD were found to have constipation, especially in advanced stage (H and Y: 2-3) patients.

One of the limitations of our study is the lack of data to demonstrate proper evaluation of IPD severity in each patient. Therefore, UPDRS values were not included in the study results. The aim of the study was to determine the prevalence of IPD and its non-motor symptoms such as excessive daytime sleepiness, and our questionnaire consisted of 53 questions. The clinical diagnostic criteria for IPD were determined by the UK Parkinson's Disease Association Brain Bank in 1992. However, due to the impatience of the participants, sufficient data could not be collected in our pilot study. This issue represents one of the study's weaknesses. Another limitation of our study is that, although a pilot study was performed to test the feasibility of the study, a validation of the IPD diagnosis was not performed. The study has several strengths. One of the strengths of our study is the extent of the epidemiology, which included the Edirne provincial center and all of its districts. Edirne is located in a region that has not experienced a massive population displacement or migration. We believe that the best way to determine the contribution of racial and genetic characteristics to developing IPD is to conduct comprehensive studies in such regions. Another strength of our study was the detailed assessment of non-motor symptoms of IPD, which are commonly present but less studied. Early recognition of IPD and proper treatment management are very important in quality of life of these patients. In addition, the questionnaires that were administered in our FHCs by family physicians were informed regarding IPD, which is strength. Thus, we believe that in Edirne and its districts as well as physician and public awareness of IPD has greatly increased. This is important in terms of better recognition of both the disease and the lesser known non-motor symptoms.

Moreover, PD imposes a significant burden on families and caregivers that is not easily quantified. This will continue to grow as the size of the elderly population in the Turkey continues to increase. We hypothesize that the increase in life-expectancy of the Edirne and Turkey population and the improved diagnosis of PD will contribute most to the increase in disease frequency. Additional detailed and comprehensive studies are needed.

Ethics Committee Approval: The study was approved by the Trakya University Medical Faculty Ethics Committee on January 16, 2013 (approval number 2013/11).

Informed Consent: Participants or their caregivers were informed about the study before signing an Informed Consent Form.

Peer-review: Externally peer-reviewed.

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