**ABSTRACT**

**Introduction:** Peyronie’s disease (PD) prevalence varies between 0.39% and 20% and studies on PD prevalence are limited. **Aim:** This study aims to determine the prevalence of PD in males aged \( \geq 30 \) years in Turkey and to evaluate etiological factors associated with it. **Methods:** The study was conducted in 12 regions of Turkey according to the Eurostat Nomenclature of Territorial Units for Statistics 1 classification and included 1,208 patients. Survey questionnaires including questions about demographic features and basic health status as well as about diagnosis and etiology of PD were put forth to the volunteers who agreed to participate in the study. Diagnosis of probable PD was established by evaluating the questionnaires. Patients with a diagnosis of congenital penile curvature were excluded from the group with PD. Chi-square test, Fisher’s exact test, and Mann-Whitney U test were used. **Main Outcome Measure:** The primary outcome analyzed in this article was the prevalence rate of PD in Turkey and the associated comorbidities. **Results:** The prevalence of PD was determined as 5.3%. The rates of participants with PD were found to be the highest in the 50–59 years group (27%) and in the North-East Region (20%). Compared with participants without PD, participants with PD were older (median: 52 interquartile range [41–64] vs 45 [37–55]; \( P < .001 \)) and the rates of smokers (73% vs 60.9%; \( P = .036 \)) and those having diabetes mellitus (17.5% vs 9.2%; \( P = .045 \)), hypertension (14.3% vs 6.9%; \( P = .041 \)), and heart failure were higher (7.9% vs 2.5%; \( P = .027 \)). Male with PD symptoms preferred their partners on top during sexual intercourse (15.2% vs 34.1%; \( P < .001 \)). This is the first study to evaluate premature ejaculation prevalence and related comorbidities with face-to-face interviews. **Conclusion:** The prevalence of PD was 5.3% in Turkey. Besides advanced age, smoking, position of sexual intercourse, and presence of comorbidities especially diabetes mellitus, hypertension, and heart failure were the factors associated with PD prevalence. Kadioglu A, Dincer M, Salabas E, et al. A Population-Based Study of Peyronie’s Disease in Turkey: Prevalence and Related Comorbidities. Sex Med 2020;8:679–685.

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**Key Words:** Peyronie’s Disease; Prevalence; Adult Males; Etiological Factors
Studies regarding PD epidemiology are limited in number and PD prevalence rates demonstrate a broad variance. A limitation of epidemiological studies is the discrepancy of patients’ perception and diagnosis of the physician.11,12 In cross-sectional prevalence studies, PD prevalence rates were reported to be between 0.39% and 20.3%.3,6,8,13–22 This broad spectrum of results may be a result of methodological distinctions and the variety of manifestations. To our knowledge, this is the first study which meticulously investigates both the prevalence of PD in a general male population and its association with possible comorbidities and sexual behaviors of participants via face-to-face interviews.

The purpose of this population-based study is to determine the prevalence of PD in Turkey, investigate patients’ comorbidities and sexual behaviors as PD etiological factors, and compare sociodemographic data and sexual dysfunction between PD patients and healthy males.

MATERIALS AND METHODS

A field survey was conducted involving male volunteers between the ages of 30 and 80 years under European Union Statistics Foundation Classification Level 1 (Nomenclature of Territorial Units for Statistics 1) to determine PD prevalence in Turkey.23 The study was carried out in 12 provinces: Adana, Ankara, Balikesir, Bursa, Erzurum, Istanbul, Izmir, Kayseri, Malatya, Mardin, Trabzon, and Zonguldak. Male participants who accepted to participate in the study and answered all the questions were included in the study. Volunteers who refused to participate, did not answer all of the questions, and did not speak Turkish were excluded from the study.

The study protocol was reviewed and approved by our local ethics committee (Institutional Review Board Number: 2017-545). This study was conducted in accordance with the Declaration of Helsinki.

A total of 1,186 volunteers were included in the study to find the prevalence of PD in the adult male population in Turkey within a CI of 95% with a precision degree of 2%. The design effect was considered to be 2 to amend any possible error as a result of stratification. The distribution of the participants was determined according to the population density in the regions. The study was carried out in settlements determined via the method of cluster sampling under age groups of the field survey and experienced pollsters were assigned to fieldwork.

A questionnaire designed by PD researchers was given to volunteers who agreed to participate in the study. This questionnaire was made up of 4 parts. In the first part, there were queries on the demographic statistics of the participants; in the second, there were questions about diagnosis of PD (pain, palpable plaque, curvature); in the third, there were questions regarding additional diseases—questions on etiology; and in the 4th part, there were questions about sexual intercourse habits of the volunteers. Patients with a diagnosis of congenital penile curvature were excluded from the group with PD. The remaining characteristics of the patients with and without PD (demographics, additional diseases, ED) were compared.

Statistical Methods

Data were analyzed using the PASW Statistics 18.0 for Windows program. Descriptive statistics were expressed as numbers and percentages for categorical variables, and as mean, SD, median, and minimum–maximum for numerical variables. The numerical variables were investigated using Kolmogorov-Smirnov test to determine whether they were normally distributed. For categorical variables, Chi-square test was used in 2 groups and multiple comparisons when Chi-square condition was met and continuity correction, Fisher’s exact test was used for multiple comparisons when Chi-square condition was not met. For comparison of 2 independent groups, Mann-Whitney U test was used for non-normally distributed numerical variables. A type I error level of less than 5% was used to infer statistical significance.

RESULTS

This study included 1,208 men who were older than 30 years and spread through 12 regions in Turkey. PD symptoms were identified in 63 men and so the prevalence of PD was determined to be 5.3% (63/1,208). Out of 1,208 participants, 4.8% were suffering from penile pain, 5.3% from penile curvature, 4.8% from penile plaque, and 4.6% from not being able to perform sexual intercourse. In 26.9% (17/63) of the men with PD, all 3 symptoms were present simultaneously.

The northeastern region had the highest rate of PD prevalence (20.0%); results of the remaining regions are shown in Tables 1 and 2. Demographic data of the subjects are summarized in Table 1. The average age of those participating in the study was 47 ± 12 years. Mean body mass index of men and their partners were 26.44 ± 3.94 and 24.44 ± 4.17 kg/m², respectively; 37.2% of the partners of volunteers were obese.

The highest PD prevalence percentage was observed between the ages of 50 and 59 years (27%; \( P < .001 \)). In terms of associated comorbidities, patients with PD were observed to be older (52 vs 45 years; \( P < .001 \)) with higher rates of smoking (73% vs 60.9%; \( P = .036 \)), diabetes mellitus (DM) (17.5% vs 9.2%; \( P = .045 \)), HT (14.3% vs 6.9%; \( P = .041 \)), and heart failure (7.9% vs 2.5%; \( P = .027 \)) (Table 1).

Analysis of etiological factors revealed that a higher percentage of PD patients was exposed to trauma during sexual intercourse (1.1% vs 12%; \( P < .001 \)), had more sexual partners (\( P = .012 \)), and the body mass index of their partners was higher (24.32 ± 4.05 vs 27.05 ± 5.97; \( P = .028 \)) compared to the control groups. Besides, males with PD symptoms preferred female on top sexual positions at higher rates than their control counterparts (34.1% vs 15.2%; \( P < .001 \)). Also, higher dissatisfaction rates of sexual intercourse were described by patients with PD (53.7% vs 77.4%; \( P < .001 \)) and a high rate of ED of
57.4% was demonstrated in patients with PD. Intravaginal ejaculation latency time (IELT) was found to be significantly lower in the group with PD (IELT < 1 min: 5.3% vs 25.5%; \( P < .001 \)). Interestingly, the rate of coincidence of DC and PD in the patient group was 28.8% (Table 3).

**DISCUSSION**

Epidemiological and etiological data of any disease are essential requirements for physicians to inform their patients about the disease. Since disease cause and potential prevention measures are the 2 most frequent inquiries from patients, recognizing the relation of the disease with comorbidities and sexual habits of the patients would greatly aid us in briefing and advising our patients.

The exact prevalence of PD may be challenging to estimate because males may either exaggerate or hide complaints about their sexuality. In studies of prevalence, disparities in age, geographical regions, socioeconomic situations, and assessment...
of co-existing diseases may cause a variance in PD prevalence. Also, because populations are assessed in various milieus (groups, hospitals, etc), different results might emerge.

The prevalence of PD in Turkey was determined to be 5.3% which was calculated from the combined data from 12 different regions. The participants were interviewed face-to-face by questioners. This rate is within the spectrum of previously published rates of prevalence (range: 0.39—26%, Table 4). As expected, PD most frequently occurred between the ages of 50 and 59 years and an association of PD with DM, HT, and heart disease was demonstrated.

The first study on the prevalence of PD was carried out in 1991 by Lindsay et al and 388 (0.39%) PD cases in a population of 100,000 were reported in this study. In the Koln prevalence study performed in 8,000 males, PD prevalence, proven with the presence of palpable plaque, was reported to be 3.2%. In another population-based prevalence study carried out online in Australia, 1,782 male participants answered questions and PD prevalence was found to be 19.9%.

The risk of PD increases with advancing age and in this study, the median age of PD patients was 52 years. In the prevalence study carried out by Sommer et al, PD most frequently occurred in the age group between 50 and 59 years. The average age of PD patients ranged between 48.3 and 59.6 years in other previously reported studies and our median age is in conformity with the literature.

PD prevalence has been observed most frequently in the northeastern region of Turkey (20%). This is probably due to the higher prevalence of DM in the Eastern Anatolia Region (18.2%) when compared to other regions since DM has an association with PD. The frequency of PD was determined to be lower in some regions (eg, Central Anatolian Region) and this might be related to the embarrassment and difference common in the Central Anatolian Region.

M disrupts penile blood flow and increases penile abnormalities in comparison to men without PD or any other risk factor. There is in vitro and in vivo evidence that bolsters the idea that DM causes the emergence and progress of fibrosis in various organs. From studies reported in the literature, the relation between PD and DM was observed to be between 18.3% and 32.2%. In this study, DM is observed in 17.5% of the patients with PD and this is a significantly higher rate than the one in patients without PD.

Vascular diseases such as HT and dyslipidemia result in a hypoxic microenvironment in erectile tissues and this causes abnormal wound recovery and exacerbation of fibrotic cascade. PD-HT coexistence is observed in different studies with a range of 14.7—27.2%. In this prevalence study, the coexistence rate of PD and HT was 14.3%. The rates of DM and HT in this study were reported to be in accordance with the literature.

There is a significant relationship between smoking and PD. In a prevalence study carried out in Italy, PD prevalence was found to be 7.1% and multivariate analysis showed a significant correlation between smoking and PD (odds ratio = 4.6; 95% CI: 1.506—14.287). In our study, the rate of smoking in the 2 groups was detected to be 73% and 60.9%, respectively ($P = .036$).

PD pathophysiology has been associated with increased fibrotic inclination and the rate of DC occurrence in PD patients has been reported to be between 22% and 39%. As expected in our study, the rate of co-incidence of PD and DC was reported to be 28.8%.

In the analysis of questions which assess the sexual situation of patients with the occurrence of PD, it was observed that sexual satisfaction and erectile capacity were lower in the PD group. In accordance with questions matching the 4th and 5th questions in the Sexual Encounter Profile-4 and International Erectile Function Index (IIEF-Q4 and IIEF-Q5), the rate of erection problems in the group diagnosed with PD was 57%. The incidence rate of ED in the natural course of PD was reported to be between 40% and 58% and this was consistent with the result obtained in this study. The fear of patients that they will cause further damage to their penises decreases the satisfaction they get from sexual intercourse.

Premature ejaculation (PE) is one of the most common sexual health problems. PE prevalence in Turkey has been reported to be 20%. In this study, the ejaculation latency time of men with PD was observed to be shorter. While 25.5% of the participants in the group with PD reported IELT values below 1 min, this rate was found to be 5.3% in the healthy group. This high PE prevalence may be related to the presence of sensory nerve fibers in the inflammation site in PD patients.

When questioned about their preferred sexual position to assess the possible effect of repetitive trauma, woman on top was the preferred position choice of men with PD. In the woman on top position, the cumulative effect of repetitive penile trauma due to perineal collision might be a cause of PD which was
suggested to happen because of microtrauma. It is thought that the penis may be exposed to more trauma with the female on top sexual position.

One limitation of this study was primarily the lack of a validated questionnaire for PD; however, a questionnaire compliant with the content of a validated one (Peyronie’s Disease Questionnaire) was used. Also, the questionnaire was prepared by combining and integrating similar questionnaires used in previous major prevalence studies.

Table 3. Analysis of questions related to Peyronie’s disease

| Question                                                                 | N     | No   | N   | Yes  | P         |
|-------------------------------------------------------------------------|-------|------|-----|------|-----------|
| While your penis is flaccid do you feel any lump or hard tissue under penile skin? |       |      |     |      |           |
| Q13. Do these complaints in your sexual organ prevent you to have sexual intercourse? | 910   | 21 (2.3) | 49  | 23 (46.9) | <.001     |
| Q14. Can you fully open and close your pinky and ring finger (your 4th and 5th fingers)? | 1,108 | 1,040 (93.9) | 56  | 33 (58.9) | <.001     |
| Q15. Is there a hardening or thickening that is formed later in your palm or plantar? | 1,094 | 54 (4.9)  | 52  | 15 (28.8) | <.001     |
| Q16. Did you ever have a trauma to your penis due to straining or blow during sexual intercourse? | 1,086 | 12 (1.1)  | 50  | 6 (12)    | <.001     |
| Q17. When did you have your first sexual intercourse? Mean ± SD          |       |       |     |      |           |
| Median (Q1–Q3)                                                          | 984   | 17.67 ± 3.33 | 46  | 17.48 ± 3.69 | .197     |
| Q18. How many sexual partners did you have in total? Mean ± SD           |       |       |     |      |           |
| Median (Q1–Q3)                                                          | 741   | 16.88 ± 95.87 | 34  | 42.82 ± 139.73 | .012     |
| Partner BMI Mean ± SD                                                  |       |       |     |      |           |
| Median (Q1–Q3)                                                          | 580   | 24.32 ± 4.05  | 25  | 27.05 ± 5.97  | .028     |
| Q19. In the last 5 years, did your partner have a gynecological disease that prevented sexual intercourse? | 1,050 | 45 (4.3)  | 52  | 5 (9.6)    | .081     |
| Q20. In the last 5 years, did your partner have any disease that may cause vaginal discharge? | 1,041 | 42 (4)  | 53  | 4 (7.5)    | .276     |
| Q21. What’s your favorite sexual position with your current partner?     | 936   | 142 (15.2) | 44  | 15 (34.1) | .001     |
| Female on top                                                           |       |       |     |      |           |
| Male on top                                                             | 794   | 84.8  | 29  | 65.9     |           |
| Q22. During sexual intercourse how many minutes does it take to ejaculate after you enter? |       |       |     |      |           |
| n (%)                                                                   | 1,026 | 54 (5.3)  | 51  | 13 (25.5) | <.001     |
| Below 1 min                                                             |       |       |     |      |           |
| 1–2 min                                                                | 1,026 | 54 (5.3)  | 51  | 13 (25.5) | <.001     |
| 2–5 min                                                                | 1,026 | 54 (5.3)  | 51  | 13 (25.5) | <.001     |
| Above 5 min                                                             | 1,026 | 54 (5.3)  | 51  | 13 (25.5) | <.001     |
| Q23. Are you satisfied with your sexual intercourse duration? (Yes), n (%) |       |       |     |      |           |
| Q24. Do you have difficulty in erection that prevents sexual intercourse? | 1,053 | 124 (11.8) | 54  | 31 (57.4) | <.001     |
| Q25. Can you keep your erection until you complete sexual intercourse? (Yes), n (%) | 1,053 | 919 (87.3) | 54  | 24 (44.4) | <.001     |
Another limitation might be the fact that despite the process maintaining privacy, some participants shied away from replying some questions during the face-to-face interview. In some regions (eg, Central Anatolian), more embarrassed patients also affected the prevalence rates. Finally, no age and comorbidity adjustments were performed because these 2 groups were compared as a whole.

CONCLUSION

This is the first study carried out by employing face-to-face interviews with participants, reporting PD prevalence in accordance with geographical regions and etiological factors. At the end of the study, the PD prevalence of 5.3% in Turkey was found to be compliant with other prevalence studies carried out earlier. When the associated factors were examined, it was observed that DM, HT, smoking, and the position of sexual intercourse are related to PD. This study has contributed to improving the awareness of PD in the society, and may enable more men to obtain the necessary diagnosis and treatment for PD.

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STATEMENT OF AUTHORSHIP

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