

ORIGINAL RESEARCH

Prevalence and Potential Risk Factors of Peyronie's Disease: A Cross-Sectional Study of 68 Cases

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Abstract: **Introduction:** Peyronie's disease (PD) is characterized by the formation of fibrous, scar-like tissue in one or more areas of the tunica albuginea. Several potential risk factors for PD have been investigated. We aimed to evaluate the frequency of potential risk factors in PD patients. **Methods:** In this retrospective cross-sectional study, we included men diagnosed with PD who presented to a referral outpatient urology clinic between March 2019 and August 2024, in Tehran, Iran. Due to the relatively low prevalence of PD and the study's focus on specific risk factors within this population, purposive sampling was employed. The frequency of potential risk factors and the correlation between different risk factors were assessed. **Results:** A total of 68 patients with PD were studied. The mean age of the disease onset was 53.7 ± 8.0 (range: 28–72) years. The most prevalent risk factors were DM in 20 (29.4%) patients and smoking in 18 (26.5%) patients. There was no significant difference regarding the frequency of risk factors between the two age groups of <55 and ≥ 55 years ($P > 0.05$ for all risk factors). Among patients with diabetes mellitus (DM), the median duration of DM since diagnosis was 8.5 (IQR: 2–30) years, while the median duration of hypertension among hypertensive patients was 10 (IQR: 4–20) years. For smokers, the median cumulative smoking exposure was 20 (IQR: 10–30) pack-years. Patients who developed PD before the age of 55 had a significantly longer duration of DM compared to those who presented with the disease at ≥ 55 years (15 vs. 5 years; $p = 0.039$). Correlation analysis revealed a strong positive correlation between the use of vasoactive erectile drugs and erectile dysfunction ($r = 0.64$). A negative correlation was observed between a history of penile trauma and age of PD onset ($r = -0.40$). **Conclusion:** Based on the findings of the present study, the most frequent potential risk factors were DM and smoking in this series of PD cases. The longer duration of DM may be associated with an earlier onset of PD and its presentation in ages < 55 years.

Keywords: Erectile dysfunction; Penile induration; Peyronie's disease; Risk factors; Sexual dysfunction

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1. Introduction

Peyronie's disease (PD) is a condition characterized by the formation of fibrous, scar-like tissue in the tunica albuginea, and with progression of the disease and forming contraction resulting in penile curvature (1). Its prevalence ranges from 0.5% to 13%, with higher rates in older populations, reaching 4% in men aged 60–69 years and 6.5% among men over 70 (2, 3). Increased awareness of sexual health and the use of

erectile dysfunction medications may contribute to the rising incidence, as more men seek medical attention for the condition (4).

PD can significantly impact sexual function and quality of life, with 81% of affected individuals reporting emotional distress, and 54% experiencing inconveniences in relationships (5). Self-esteem and body image are often negatively affected, leading many patients to avoid sexual activity. In addition, patients frequently report pain, discomfort, difficulty reaching orgasm, and loss of erection during intercourse (6). Several potential risk factors have been investigated, including DM, age, hypertension, penile trauma, and erectile dysfunction. To this day, managing this condition is still a major challenge for urologists, and a wide variety of treatments from oral medications to interventions have been suggested.

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Newer methods, including laser therapy, have been investigated that may have a moderate efficacy in the short term (12). Despite clinical observations suggesting a need for further research, studies focusing on PD within the Iranian population remain limited. In the realm of preventive medicine, data about indigenous risk factors and predisposing conditions are lacking in our country. Therefore, we aimed to evaluate the frequency of potential risk factors in patients with PD in our target population.

2. Methods

2.1. Study design and setting

This retrospective cross-sectional study looked at male patients with PD who sought care at a referral outpatient urology clinic in Tehran, Iran, between March 2019 and August 2024. Since PD is relatively uncommon and we aimed to focus on specific risk factors, we used purposive sampling to select participants. We then analyzed how often different risk factors appeared and tried to find statistical correlations.

The researchers adhered to the principles of Helsinki's ethical considerations for biomedical research and the confidentiality of patients' information. This study was approved by the ethics committee of Shahid Beheshti University of Medical Sciences (Ethics code: IR.SBMU.MSPREC.1400 723).

2.2. Participants

Adult patients with the presence of a palpable penile plaque or a plaque detected by ultrasound imaging were included. Patients with a documented history of PD, regardless of disease progression or prior surgical intervention, were also included. Patients with an incomplete profile were excluded.

2.3. Data gathering

A comprehensive medical history was obtained from each patient. The history of DM and its duration, history of hypertension and its duration, history of cigarette smoking (including duration and quantity, measured in pack-years), history of penile and perineal trauma, prior diagnosis of PD, presence of Dupuytren's contracture, history of beta-blocker use, history of penile vasoactive drug use, and history of genital and perineal medical interventions (e.g., catheterization, cystoscopy, surgical procedures or other interventions potentially traumatizing the genital tract), histories of erectile dysfunction, urolithiasis, hypogonadism, and infertility as a potential risk factors of PD were collected for each patient. Data was retrospectively collected using a predesigned checklist by a trained medical student from patients' profiles.

2.4. Statistical analysis

The collected data were analyzed and presented using descriptive statistics. Continuous variables were reported as

mean $\pm$ standard deviation or median with interquartile range (IQR). The correlation between the incidence of PD and various risk factors was analyzed using the chi-square and Fisher's exact tests. Correlation coefficients were calculated to determine the strength and direction of the relationships. All statistical analyses were performed using SPSS software, with a significance level set at $P < 0.05$.

3. Results

A total of 68 patients with PD were studied. The mean age of the disease onset was 53.7 ± 8.0 (range: 28–72) years. Table 1 shows the frequency of different potential risk factors of PD and compares this frequency between cases with disease onset of less than and more than 55 years. The most prevalent risk factors were DM in 20 (29.4%) patients and smoking in 18 (26.5%) patients. There was no significant difference regarding the frequency of risk factors in patients with < 55 and ≥ 55 years ($P > 0.05$ for all risk factors).

Among patients with diabetes mellitus (DM), the median duration of DM since initial diagnosis was 8.5 (IQR: 2–30) years, while the median duration of hypertension among hypertensive patients was 10 (IQR: 4–20) years. For smokers, the median cumulative smoking exposure was 20 (IQR: 10–30) pack-years. Table 2 compares the duration of the 3 risk factors between cases with less and more than 55 years. Patients with the incidence of PD in < 55 years had significantly longer DM duration compared to the cases with the presentation of disease after 55 years (15 versus 5 years; $p = 0.039$). This may suggest that a longer duration of diabetes may be associated with an earlier onset of PD.

Correlation analysis revealed a strong positive correlation between the use of vasoactive erectile drugs and erectile dysfunction ($r = 0.64$). A negative correlation was observed between a history of penile trauma and age of PD onset ($r = -0.40$), suggesting that trauma is associated with earlier disease onset. Other correlation coefficients are displayed in Table 3.

4. Discussion

Risk factors and predisposing conditions currently represent a broad area of study in Peyronie's disease. Certain studies suggest an elevated prevalence of PD among diabetic patients (particularly with $HbA1c > 7\%$) (3, 7). The condition is also widely associated with aging, with the highest prevalence observed in individuals over 50 years of age (4, 8). In one study, 40% of patients reported a history of penile trauma (9). Some studies suggest that both duration and intensity of smoking might pose a risk factor. However, findings on smoking remain inconsistent (3, 10). Associations with hypertension, beta-blocker use, Dupuytren's contracture, and penile vasoactive drug use have also been suggested (3, 11).

DM is a frequent finding among PD patients. Diabetic PD patients tend to be older and have a longer history of PD, lower probability of painful erections, and a worse case of curvature. Impaired wound healing process and a wide variety of metabolic changes may be the cause of this predisposition among the diabetic population (13). Another widely studied PD risk factor is erectile dysfunction, but it is unclear which condition occurs first. The proposed pathogenesis of this association is an abnormal plaque formation and fibrotic change to micro-trauma. On the other hand, the successful treatment of older ED patients with 5-phosphodiesterase inhibitors has led to the identification of more PD cases. (4, 14). This study investigated the frequency of potential risk factors for Peyronie's disease (PD) while paying particular attention to age of onset in a sample of 68 Iranian patients. DM was the most prevalent risk factor (29.4%), exceeding the estimated national prevalence of 10.8%, and it is significantly higher in the 55–64 age group (21.7%) (15). Similarly, PD also shows a higher prevalence in individuals over 55 years of age. In contrast, hypertension was less common in our PD population (8.8%), which is lower than the general prevalence of hypertension among Iranian men aged 30–59 (16.5%) (16). These findings contrast with a study by Crocetto et al. (2022), which reported a higher prevalence of hypertension in PD patients compared to non-PD individuals (17).

The prevalence of cigarette smoking among our PD patients was 26.5%. Notably, a multicenter Italian study found a significant correlation between smoking and PD in men aged 50–69 but no significant association with other risk factors like diabetes and hypertension. (10).

These risk factors were presumptively prevalent. They did not show strong correlations with each other in this study, suggesting that their coexistence may be coincidental. The strongest correlation ($r = 0.68$) was found between erectile dysfunction and the use of erectile dysfunction medications. This may be because patients with erectile dysfunction, who were inherently at risk for developing PD, often turned to erectile dysfunction medications.

No statistically significant differences were found in the prevalence of investigated risk factors between younger patients (under 55 years) and older patients (55 years and above), indicating that these factors may not play a differential role in the development of PD in younger individuals.

The quantitative risk factors examined included the duration of DM, hypertension, and cumulative smoking exposure; the mean durations were 8.5 years for DM, 10 years for hypertension, and an average of 20 pack-years for smoking exposure. A comparison between the two age groups revealed a statistically significant difference in the duration of diagnosed DM, with younger patients having a longer history of diabetes compared to older patients. This finding suggests that longer durations of diabetes may be associated with an

earlier onset of PD. This is consistent with a study by Karakus et al. (2024), which found a correlation between early-onset diabetes, elevated HbA1c levels, and early PD development (18).

Erectile dysfunction, which is also commonly observed in PD patients, tends to have psychogenic causes in younger individuals, whereas older patients are more likely to experience a vascular etiology."

. In our study, 14.7% of PD patients developed erectile dysfunction before the onset of the disease. In comparison, Deveci et al. and Paulis et al. reported erectile dysfunction in 20% and 56.4% of PD patients, respectively, before disease onset (19, 20).

This study provides valuable insights into the demographic characteristics and the prevalence of various risk factors in a sample of 68 PD patients from the Iranian population. DM and smoking emerged as the most prevalent risk factors in this sample. The analysis of DM duration showed that individuals with a longer history of diabetes tend to experience an earlier onset of Peyronie's disease. Additionally, the findings suggest that PD is most commonly observed in middle-aged individuals in our target population. There was no significant difference in the prevalence of risk factors between younger and older patients. Although most risk factors exhibited weak correlations, this study underscores the complexity of PD and highlights the need for further research to better understand the interplay between these factors.

4.1. Limitation

This is a case series study, and all limitations of these studies exist for the present study. The low number of studied cases and the retrospective method of data gathering were among the important limitations of this study.

5. Conclusion

Based on the findings of the present study, the most frequent potential risk factors were DM and smoking in this series of PD cases. The longer duration of DM may be associated with an earlier onset of PD and its presentation in ages < 55 years.

6. Appendix

6.1. Acknowledgment

None.

6.2. Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this article.



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6.4. Authors contributions

All authors passed four criteria for authorship contribution based on recommendations of the International Committee of Medical Journal Editors.

6.5. Availability of data

It is available.

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Table 1: Prevalence of different risk factors of Peyronie's Disease in studied cases

Variable	Total	Age (year)		P value
		< 55	≥ 55	
Diabetes	20 (29.4)	10 (29.4)	10 (29.4)	1.00
Hypertension	6 (8.8)	3(8.8)	3(8.8)	1.00
Smoking	18 (26.5)	10(29.4)	8(23.5)	0.691
Penile trauma	7 (10.3)	5(14.7)	2(5.9)	0.427
Dupuytren's disease	7 (10.3)	3(8.8)	4(11.8)	0.535
Use of vasoactive erectile drugs	7 (10.3)	3(8.8)	4(11.8)	0.703
Beta-blocker use	9 (13.2)	4(11.8)	5(14.7)	0.731
Penile interventions ¹	11 (16.2)	7(20.6)	4(11.8)	0.509
History of erectile dysfunction	10 (14.7)	4(11.8)	6(17.6)	0.502
Urolithiasis	10 (14.7)	7(20.6)	3(8.8)	0.301
Prostatectomy	0 (0.0)	0 (0.0)	0 (0.0)	NA
Others ²	2 (3.0)	1(2.94%)	1(2.94%)	NA

1: Medical and surgical interventions; 2: Hypogonadism, developmental sexual disorders, infertility; NA: not applicable.

Table 2: Comparing the duration of 3 risk factors of Peyronie's Disease in patients with less and more than 55 years

Variable	Total	Age (year)		P value
		< 55	≥ 55	
Duration of DM (year)	8.5 (4.5-13.5)	15 (8-18)	5 (4-10)	0.039
Duration of hypertension (year)	10 (5-15)	5 (4-20)	12.5 (10-15)	0.668
Smoking (pack-years)	20.0 (10-30)	15 (15-20)	30 (10-50)	0.290

DM: Diabetes mellitus.

Table 3: Matrix of correlations between different risk factors

Variables	Age ¹	DM	HTN	Smoking	Trauma	Dupuytren	Beta-Blocker Use	Drug for erection use	ED History	Urolithiasis
Age	0	0.94	0.20	0.51	0.002	0.23	0.18	0.79	0.61	0.30
DM	0.94	0	0.49	0.09	0.21	0.70	0.19	0.70	0.63	0.63
HTN	0.20	0.49	0	0.12	0.52	0.49	0.80	0.49	0.80	0.31
Smoking	0.51	0.09	0.12	0	0.81	0.86	0.32	0.44	0.57	0.57
Trauma	0.002	0.21	0.52	0.81	0	0.48	0.37	0.34	0.37	0.056
Dupuytren	0.23	0.70	0.49	0.86	0.48	0	0.23	0.62	0.96	0.26
Beta-Blocker Use	0.18	0.19	0.80	0.32	0.37	0.23	0	0.26	0.15	0.59
Drug for erection use	0.79	0.70	0.49	0.44	0.34	0.62	0.26	0	1.52	0.26
ED History	0.61	0.63	0.80	0.57	0.37	0.96	0.15	1.52	0	0.15
Urolithiasis	0.30	0.63	0.31	0.57	0.05	0.26	0.59	0.26	0.15	0

1: age of disease onset; DM: diabetes mellitus; HTN: hypertension; ED: erectile dysfunction.