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ORIGINAL PAPER

The psychological impact of Peyronie's disease: A retrospective analysis of 603 patients

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Summary *Background: Peyronie's disease (PD) impacts the penile albuginea, leading to deformity, pain, erectile dysfunction (ED), and an anxious-depressive state. Diagnosis of PD involves taking a detailed medical history; examining the penis by palpation; documenting any deformities; performing a dynamic Doppler ultrasound; and administering questionnaires to assess pain, erectile dysfunction (ED), and the patient's psychological status. The aim of this study was to assess the symptoms of PD and their prevalence among patients in the active phase who were seen at our andrology clinic.*

Methods: The inclusion criteria were: data must be available for patients diagnosed with active PD, including a comprehensive medical history, blood test results, penile examination information, photographic evidence of the deformity, color Doppler penile ultrasound, and completed questionnaires, including visual analog scale (VAS) for pain assessment, International Index of Erectile Function (IIEF) for assessing erectile function, and psychometric test. Exclusion criteria: Patients with PD who are in a stable phase or not having data requested for inclusion.

Results: We detected penile curvature in 90.5%, penile pain in 54%; ED in 39.3%, significative anxiety in 89.0%, significative depression in 57.6%, and bother in 93.6%.

Conclusions: Our study revealed that a large number of patients with PD experience significant levels of anxiety and depression, with 38.3% of them experiencing severe anxiety. Psychotherapy should be included as part of the treatment plan for patients with PD to enhance their quality of life and adherence to treatment.

KEY WORDS: Peyronie's disease; Anxiety; Depression.

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INTRODUCTION

Peyronie's disease (PD) is a medical condition characterized by inflammation of the tunica albuginea of the penis, resulting in the development of non-elastic fibrous tissue that causes a penile deformity associated or not with curvature (shortening, indentation, an hourglass shape, the hinge effect, a flail penis, and penile torsion).

PD predominantly affects males who have a genetic predisposition (1, 2). The prevalence of PD is higher, with rates ranging from 3.2% to 13% in the Western world (3, 6). In East Asian countries, PD is less common, with prevalence rates ranging from 0.6 to 5% (7, 8).

While the exact pathogenesis of this chronic disease is not completely understood, the traumatic theory is widely accepted among scientists. The traumatic theory proposes that injuries to the penis (trauma or repeated microtraumas) can result in excessive collagen deposition, leading to the development of a fibrous plaque that causes a penile deformity (9-11).

PD develops in two stages: an initial inflammatory phase that lasts 12-18 months, marked by the formation of plaques, fibrosis, and possible calcification, accompanied by pain and worsening deformity, followed by a chronic stable phase with reduced pain and stable plaque size and deformity.

Conservative medical therapy is indicated in the early stage of the disease, and generally includes oral medications, iontophoresis, intralesional injections, topical creams, shockwave and penile vacuum therapies, and traction devices (12-21).In the scientific literature, numerous articles published in the current century have highlighted the significant role of "oxidative stress" in the pathophysiology of PD (22-31). This has led to great interest and inspired numerous studies that have successfully tested the use of antioxidants for the treatment of early-stage PD.

Surgical treatment is typically advised when PD has stabilized, the curvature is pronounced, and/or there is severe ED (32-38). The main symptoms of PD are penile deformity, pain, ED, and finally, a fourth symptom, an anxious-depressive state, which is generally ignored or at least underestimated (39-42). Regarding the PD symptoms, some authors have accurately defined this disease as "*a psychologically and physically devastating disorder…*" since all these symptoms can significantly affect the physical and mental well-being of affected patients (43).

There are several scientific articles related to the anxious-depressive state of PD, which unfortunately is not taken into consideration by some physicians, even specialists in the field (44-58). This underestimation by some healthcare professionals unfortunately reflects on patients with PD, favoring the persistence of their emotional problems and the worsening of their anxious-depressive state, with inevitable negative repercussions on their sexual life, social relationships, and *quality of life* (QoL).

PD diagnosis involves examining the penis through palpation, taking photographs to document any deformities

(according to Kelâmi's guidelines), using dynamic *penile echo color Doppler ultrasound* (PCDU), and completing questionnaires like the *visual analog scale* (VAS) for pain assessment and the *International Index of Erectile Function* (IIEF) to assess erectile function (59-62).
However, in our and other authors' opinions, we must also always carry out psychometric questionnaires, such as the *Generalized Anxiety Disorder-7* questionnaire (GAD-7, for the assessment of anxiety), the *Patient Health Questionnaire-9* (PHQ-9, for the assessment of depression), and the *Peyronie's Disease Questionnaire* (PDQ) for the symptom bother, to assess the psychosexual impact of PD (63-68).
The aim of this study was to assess the anxious-depressive symptoms of PD and their prevalence in patients with active PD who accessed our andrology clinic.

Materials and methods

Study design

A retrospective analysis was carried out using the clinical database of our andrology clinic, identifying 603 patients with PD who had visited our Peyronie's care center between January 2013 and July 2025. All patients with PD underwent a comprehensive diagnostic evaluation of their disease, although this article aims to study the prevalence of anxious and depressive symptoms.
However, for further scientific investigation, we also analyzed possible correlations between the GAD-7, PHQ-9, and PDQ symptom bother scores and the other parameters studied, such as the severity of penile curvature and pain (VAS score) and rigidity intensity (IIEF score).
This study was conducted following the guidelines of the Declaration of Helsinki, (*Fortaleza, Brazil, 2013*) and all the participants provided informed consent (69). To protect privacy, their sensitive data were anonymized in compliance with privacy regulations as per Legislative Decree No. 101 of 10 August 2018, adapted to the GDPR requirements.

Inclusion criteria

All patients must be suffering from active PD, be over 18 years old, and all of the following data had to be available in their medical records: detailed medical history (including information on all medical conditions, smoking habits, alcohol consumption, history of recent penile trauma, and previous endourological procedures and radical retropubic prostatectomy); blood test results (basal blood sugar, glycosylated hemoglobin, cholesterol, triglyceride, and homocysteine blood levels); physical examination of the penis; photographic documentation of penile deformity (following Kelâmi's guidelines); dynamic PCDU; and completed questionnaires, such as the VAS for pain assessment, the IIEF, and psychometric types, including the Generalized Anxiety Disorder-7 (GAD-7) for anxiety assessment, the Patient Health Questionnaire-9 (PHQ-9) for depression assessment, and the PDQ for evaluating the psychosexual impact of PD.

Exclusion criteria

The exclusion criteria were as follows:
- PD patients in the stabilized phase with a stable penile curvature for at least 6 months and a stable penile plaque volume for at least 6 months; PD patients with a previous medical history of neurological diseases, anxiety, and depression;
- All patients who had not undergone the specified test data mentioned above.

Clinical data

The medical records from the initial visits of patients suspected of having PD at our clinic were reviewed. The clinical information was extracted from the records of 603 patients with PD. All the patients underwent three validated psychometric assessments: the Generalized Anxiety Disorder-7 questionnaire (GAD-7) for anxiety evaluation, the PHQ-9 for depression assessment, and the PDQ symptom bother to assess the psychosexual impact caused by PD.
The GAD-7 anxiety questionnaire consists of seven questions with four response options, resulting in a score between 0 and 21. Anxiety levels are categorized as minimal (0-4), mild (5-9), moderate (10-14), and severe (15-21). "*Significant anxiety*" is defined as a GAD-7 score exceeding 9 (63).
The PHQ-9 questionnaire, comprising nine questions with four response options, generates a score range from 0 to 27. Depression severity is classified as minimal (0-4), mild (5-9), moderate (10-14), moderately severe (15-19), or severe (20-27) (64).
"*Significant depression*" is identified if the PHQ-9 score is greater than 9, indicating moderate-to-severe depression (64).
The PDQ evaluates the severity and impact of PD symptoms in relation to three domains: psychological and physical symptoms, penile pain, and symptom bother. We only utilized the third part (PDQ - symptom bother) because we had already utilized different tests for the other PD symptoms (IIEF, VAS, GAD-7, and PHQ-9). The responses are scored from 0 to 4, resulting in a total score ranging from 0 to 16 (65-68).

Study endpoints

In addition to identifying demographics, clinical characteristics, and lifestyle habits associated, we have identified the following endpoints.
Primary endpoints:
- Identification of the demographics, clinical characteristics, and lifestyle habits associated with high levels of alcohol and tobacco use in patients with PD;
- Research on the frequency of anxiety and depressive symptoms in patients with PD;
- Research on the PDQ bother score to evaluate the psychosexual impact in patients with PD.

Secondary endpoints:
- Research on the potential correlation between GAD-7 and PHQ-9 scores; GAD-7 and PDQ bother scores; PHQ-9 and PDQ bother scores; anxiety intensity (GAD-7 scores) and severity of penile curvature; depression intensity (PHQ-9) and severity of penile curvature; PDQ bother intensity and severity of penile curvature; GAD-7 and VAS scores; PHQ-9 and VAS scores; PDQ bother and VAS scores; GAD-7 and IIEF

scores; PHQ-9 and IIEF scores; PDQ bother (psychosexual impact of PD) and IIEF scores.

Statistical analysis

We utilized CalculatorSoup® software (*version of 7 March 2023, Ashland, MA, USA*) for statistical analysis, including calculating the *Interquartile Range* (IQR) and Median value.

The Pearson correlation coefficient was computed using Statistics Kingdom statistical software (*version 2017, Melbourne, Australia, http://www.statskingdom.com*) and Excel (*version 2011, MS Office, Redmond, WA, USA*).

A significance level of 5% (p-value < 0.05) was employed in the statistical analyses to establish statistical significance.

Table 1.

Demographic and social characteristics of 603 patients with Peyronie's disease.

Demographic characteristics	**N. Patients (Out of 603) (%)**
Race/ethnicity	
Caucasian	598 (99.1)
Indian	1 (0.16)
Pakistani	1 (0.16)
Kurdish	1 (0.16)
Arab	1 (0.16)
Armenian	1 (0.16)
Ages of patients ranged from 21 to 74 years	
Mean age = 49.27 years	
Standard deviation: ± 12.23	
Age range (years)	**N. patients (out of 603) (%)**
21–40	145 (24.04)
41–74	458 (75.95)
Type of school education	**N. patients (out of 603) (%)**
Elementary school	18 (2.9)
Secondary school	441 (73.1)
University degree	144 (23.8)
Type of employment	**N. patients (out of 603) (%)**
Artist/dancer	2 (0.3)
Employee	340 (56.3)
Teacher	46 (7.6)
Physician	10 (1.6)
Psychologist	5 (0.8)
Business manager	60 (9.9)
Journalist	4 (0.6)
Construction worker	3 (0.4)
Agricultural worker	3 (0.4)
Student	21 (3.4)
Pensioner	53 (8.7)
Unemployed	56 (9.2)
Marital status	**N. patients (out of 603) (%)**
Married	284 (47.0)
Unmarried	319 (52.9)

Table 2.

Clinical conditions associated with PD and their prevalence in 603 patients with Peyronie's disease.

Clinical conditions associated	**N. Patients (Out of 603) (%)**
Diabetes mellitus	22 (3.6)
Hypertension	30 (4.9)
Benign prostatic hyperplasia	38 (6.3)
Prostatitis	150 (24.8)
Hyperlipidemia	21 (3.4)
Hyperhomocysteinemia	11 (1.8)
Obesity	15 (2.4)
Hypothyroidism	5 (0.8)
Hyperthyroidism	1 (0.16)
Dupuytren disease	34 (5.6)
Ledderhose disease	15 (2.4)
Autoimmune diseases	29 (4.8)
Previous acute myocardial infarction	14 (2.3)
Arteriopathy (carotid, femoral, aorta)	14 (2.3)
Previous endourological maneuvers *	17 (2.8)
Previous radical retropubic prostatectomy (RRP)	5 (0.8)
History of recent penile trauma	118 (19.5)
Excessive consumption of alcohol **	21 (3.4)
Cigarette smoking (≥ 10 daily)	43 (7.1)

** Previous endourological procedures included transurethral resection of prostate (TURP) or bladder tumors (TURBs), urethral catheterization, ureteroscopy, and cystoscopy.*

*** High-level wine consumption (>500 mL per day) and/or regular consumption of spirits.*

Results

The 603 patients diagnosed with PD were aged from 21 to 74 years, with a mean age of 49.27 years (standard deviation ± 12.23). Upon their initial visit to our clinic, all the patients indicated that their symptoms had worsened over the last 6 months, specifically noting increased penile curvature and pain (when present).

Table 1 displays the demographic and social characteristics of the 603 patients with PD.

Table 2 shows the clinical conditions associated with PD and their prevalence among the 603 patients.

Table 3 displays the main symptoms of PD, along with their prevalence among the 603 patients with PD.

ED was noted in 237 cases, representing 39.3% of all the patients with PD. Of these, 132 patients (55.6%) reported experiencing ED prior to the onset of PD, although to a significantly lesser degree.

Table 4 shows the prevalence and degree of penile curvature in the 603 patients with PD.

Table 5 shows the prevalence and types of penile deformities among the 603 patients diagnosed with PD.

Table 6 shows the prevalence and various degrees of anxiety-depression and psychosexual impact (PDQ-bother) among the 603 patients with PD.

Table 7 shows the statistical correlations among all the possible combinations of variables.

Table 3.
The primary symptoms of PD and their prevalence in the 603 patients with Peyronie's disease.

Primary Symptoms of Peyronie's Disease	N. Patients (Out of 603) (%)	Value Used	Pathological Range of Values	Median Value	Interquartile Range (IQR)
Penile curvature	547 (90.5)	Degrees	5-100	35.0	20
Penile pain	326 (54.06)	VAS score	1-10	4.0	3
Erectile dysfunction (ED)	237 (39.3)	IIEF score	12-25	22.0	4
Anxiety	601 (99.6)	GAD-7 score	3-21	14.0	7
Depression	601 (99.6)	PHQ-9 score	1-27	10.0	7
Psychosexual impact	565 (93.6)	PDQ-bother score	1-16	9.0	4

VAS: Visual analog scale. This is a questionnaire for measuring pain that consists of a sheet of paper with a 10 cm line. Each 1 cm point on the line represents a different level of pain intensity, and patients can indicate their perceived level of pain by marking the corresponding number. VAS scores range from 0 (no pain) to 10 (the most severe pain). The VAS questionnaire is interpreted as follows: 1-5 for mild to moderate, 6-7 for severe, and 8-10 for very severe (61).
IIEF: International Index of Erectile Function. This a questionnaire for assessing erectile function, with scores ranging from 0 to 30 indicating different severities: severe ED (0-10), moderate ED (11-16), mild-to-moderate ED (17-21), mild ED (22-25), and ED (26-30) (62).
The GAD-7 anxiety questionnaire (Generalized Anxiety Disorder-7) consists of seven questions with four response options, leading to a total score ranging from 0 to 21. Anxiety levels are classified as minimal (0-4), mild (5-9), moderate (10-14), or severe (15-21). When the GAD-7 score > 9, it indicates "significant anxiety" (63).
The PHQ-9 (Patient Health Questionnaire-9) is used for measuring depression. The PHQ-9 questionnaire consists of 9 questions with 4 response options, resulting in a score range of 0 to 27. Depression severity was categorized as minimal (0-4), mild (5-9), moderate (10-14), moderately severe (15-19), or severe (20-27) When the PHQ-9 score > 9, it indicates "significant depression" (64).
The PDQ (Peyronie's Disease Questionnaire) assesses the psychosexual impact of PD, with scores ranging from 0 to 30. The PDQ evaluates the severity and impact of PD symptoms in relation to three domains: psychological and physical symptoms, penile pain, and symptom bother. We only utilized the third part (PDQ symptom bother), the responses are scored from 0 to 4, resulting in a total score ranging from 0 to 16 (65-68).

Table 4.
Prevalence and degree of penile curvature in 603 patients with Peyronie's disease.

Penile curvature	N. Patients (Out of 603) (%)	Degrees of Penile Curvature (degrees)	Median Value of Curvature (degrees)	Interquartile Range (IQR)
	547 (90.5)	5-100	35.0	20
			Degrees of Penile Curvature (degrees)	
Penile curvatures classified according to severity	5-12	15-28	30-58	60-100
N. Cases Out of 603 (%)	49 (8.9)	111 (20.3)	334 (61.1)	52 (9.5)

Table 5.
Prevalence and typology of penile deformities among 603 patients with Peyronie's disease.

Total Number of Penile Deformities, Not Including Curvature	N. Cases 537 89.05% Out of 603		
Type of Penile Deformity	N. Cases (Out of 603) (%)	Associated with Penile Curvature N. Cases	Not Associated with Penile Curvature N. Cases
Penile shortening *	532 (88.2)	495	37
Flail penis **	2 (0.33)	2	0
Penile hourglass	76 (12.6)	64	12
Penile divot	49 (8.1)	30	19
Penile torsion	13 (2.1)	11	2
Solitary penile deformities (not intended as a penile curvature)	408 (67.6)	-	-
Cases in which different penile deformities are present in the same patient ***	129 (21.3)	-	-
Total number of patients with penile deformity (not intended as a penile curvature)	537 (89.05)	-	-
Total number of patients without penile curvature or deformation	56 (9.28)	-	-

** Penile shortening varied from 1 to 4.5 cm.*
*** "Flail" penis is a term used to describe a situation where the penis, when erect, is soft, flaccid, and mobile at the tip, while the base remains rigid as usual.*
**** In these cases, more than one penile deformity was present in the same patient, and they had two associated deformities.*

Table 6.
Prevalence and varying levels of anxiety, depression, and psychosexual impact (PDQ-bother) found among 603 patients with PD.

	GAD-7 Score Range	No. Cases (Out of 603) (%)	Median Value	Interquartile Range
No anxiety	0	2 (0.33)	0	0
Minimal anxiety	1–4	4 (6.6)	4.0	0.5
Mild anxiety	5–9	60 (9.95)	6.0	1
Moderate anxiety	10–14	306 (50.7)	13.0	1
Severe anxiety	15–21	231 (38.3)	20.0	1
Total number of cases with anxiety status	3–21	601 (99.6)	14.0	7
"Significant anxiety"	10–21	537 (89.05)	14.0	7
	PHQ-9 Score Range	**No. Cases (Out of 603) (%)**	**Median Value**	**Interquartile Range (IQR)**
No depression	0	2 (0.33)	0	0
Minimal depression	1–4	61 (10.1)	4.0	1.5
Mild depression	5–9	193 (32.0)	7.0	2.0
Moderate depression	10–14	221 (36.6)	12.0	4.0
Moderately severe depression	15–19	100 (16.5)	16.0	2.0
Severe depression	20–27	26 (4.3)	22.0	2.0
Total number of cases with depression status	3–27	601 (99.6)	10.0	7.0
"Significant depression"	10–27	347 (57.5)	14.0	4.0
	PDQ-Symptom Bother Score Range	**No. Cases (Out of 603) (%)**	**Median Value**	**Interquartile Range (IQR)**
No bother	0	38 (6.3)	0	0
Bother	1–16	565 (93.6)	9.0	4.0
Minimal bother	1–4	54 (8.9)	3.0	1.0
Mild bother	5–8	169 (28.0)	7.0	1.0
Moderate bother	9–12	307 (50.9)	10.0	2.0
Severe bother	13–16	35 (5.8)	13.0	2.0

GAD-7: Generalized Anxiety Disorder-7 questionnaire anxiety. PHQ-9: Patient Health Questionnaire-9. This is used to measure depression. The PDQ (Peyronie's Disease Questionnaire) evaluates the severity and impact of PD symptoms in relation to three domains: psychological and physical symptoms, penile pain, and symptom bother. We only utilized the third part (PDQ symptom bother).
The interpretations of the three questionnaires mentioned above have already been presented in Table 3.

Table 7.
List of possible statistical correlations between different variables.

Statistical Correlation Analysis	Pearson Correlation Coefficient (r)	p-Value	Correlation Present? YES or NO
Between GAD-7 score and PHQ-9 score	0.654	< 0.00001	YES
Between GAD-7 score and PDQ bother score	0.905	< 0.00001	YES
Between PHQ-9 score and PDQ bother score	0.594	< 0.00001	YES
Between GAD-7 score and Severity of penile curvature	0.0039	0.923	NO
Between PHQ-9 score and Severity of penile curvature	−0.0270	0.507	NO
Between PDQ bother score and Severity of penile curvature	0.0165	0.685	NO
Between GAD-7 score and VAS score	0.1192	0.003	YES
Between PHQ-9 score and VAS score	0.2499	< 0.00001	YES
Between PDQ bother score and VAS score	0.1422	0.0004	YES
Between GAD-7 score and IIEF score	−0.3012	< 0.00001	YES
Between PHQ-9 score and IIEF score	−0.0424	0.298	NO
Between PDQ-bother score and IIEF score	−0.1872	< 0.00001	YES

Discussion

In our results, the average age of the patients with PD was 49.27 years, which is similar to the mean ages previously reported in some studies, ranging from 48.2 to 49.6 years (5, 67, 70).

However, other authors have cited a mean age for patients

with PD ranging from 52 to 57 years (3,71-73). The age difference observed may have been because those studies were published many years ago.The mean age of patients with PD has decreased over time, possibly because sexual relationships have started at a younger age in recent years, leading to a higher chance of penile trauma. In the present study, which had a larger sample size compared with our previous study, we observed a higher prevalence of PD among younger patients, with 24.0% of all the patients aged 40 years or younger (see Table 1) (73). The symptoms of PD (curvature, pain, and erectile dysfunction) directly affect the penis, forming the basis of the patient's strong emotional and psychological involvement. Consequently, these symptoms have a significant impact on the patient's psychological and social spheres, as well as on their social and sexual relationships.

As observed in the scientific literature and in our previous studies, as well as in more recent ones, our current research has found a high percentage of penile curvature (90.5%) (40-42, 72, 74, 75).

In our study, we found that dorsal curvature was the most common type, followed by left and right lateral, and less commonly ventral. This aligns with the findings from other studies and reviews (40, 70, 72, 76-79).

Furthermore, in our analysis simple penile deformity was frequently associated with penile curvature (532 cases, 88.2%). These results contrast with those of Kadioglu, who noted penile deformation with curvature in 52.4% of cases and isolated penile deformation in 12.3% of cases (41).

We observed that 54.0% of cases reported penile pain, a finding that aligns with the existing scientific literature, where the prevalence of penile pain has been documented by different researchers, with reported percentages ranging from 17% to 70% (40, 72, 76-78, 80).

In our study, we identified ED in 39.3% of the cases. Various authors have reported the prevalence of ED, with percentages ranging from 15% to 60.1% (39-41, 72, 76-78).

Previous studies have noted that ED can manifest before the onset of PD, with a prevalence ranging from 39.8% to 57.6% (81-83). In line with this, our study found that 55.6% of patients reported experiencing ED even before the development of PD.

Another important symptom of PD that is underestimated by many doctors, as we have already mentioned in the introductory section of this article, is the anxious-depressive state. Numerous chronic inflammatory diseases, such as Crohn's disease, ulcerative colitis, chronic prostatitis, chronic pelvic pain, *systemic lupus erythematosus* (SLE), rheumatoid and psoriatic arthritis, and *chronic obstructive pulmonary disease* (COPD), can cause anxiety and depression in affected patients. The associated pain and bothersome symptoms severely impact psychological well-being. In fact, there are numerous studies in the literature that document the use of psychometric tests in patients with chronic inflammatory diseases (72, 82-87). Even in PD, the resulting symptoms, such as penile pain, deformation, curvature, and ED, along with the functional limitations they impose on the sexual organ, can have a significant psychological impact on patients, directly affecting their sexual lives and social relationships. Two eminent urological authors (Taylor and Levine, 2007) in the field of PD described the condition in this way: "*Peyronie's disease is a psychologically and physically devastating disorder*…." (43).

The presence of penile deformation negatively affects patients' mental health and their QoL, including both affective and non-affective social relationships. The presence of the deformation frequently causes a series of negative psychological effects which include alteration or loss of one's body image, lower or the loss of self-esteem, less satisfaction in sexual intercourse, low-level confidence or a loss of confidence in one's sexual ability, decrease or the loss of libido, possible sexual aversion, avoidance of sexual encounters, and sexual performance anxiety with possible psychogenic ED (44, 47, 49, 50).

While the presence of depressive symptoms in PD is well-documented in the literature, the presence of anxiety symptoms is not specifically described; however, some articles document the presence of "*distress*" and "*emotional difficulties*" during PD in approximately 80-81% of cases (45, 50). In our previously published studies, we have always investigated and described the anxious symptoms (along with depression) in patients with PD, detailing their prevalence and severity (42, 52, 73, 90-92). In the present study, the prevalence of "*significant anxiety*" (89.05%) was higher compared with the rates documented in other studies that mention "*distress*" and "*emotional*" issues (80-81% of cases) (45, 50).

For example, Levine's research revealed that 80.1% of patients with PD experience "*emotional distress*" (93).

In our study, the prevalence of "significant depression" (57.5%) was higher than the 48% reported in Nelson's studies (46, 47). The larger number of PD cases in our study (603 cases) compared with Nelson's study (92 cases) likely accounts for the difference in the findings.

Additionally, our research revealed a slightly higher psychosexual impact (PDQ bother mean score = 8.78) compared with the values reported by other authors (6.3-8.0) (65, 67, 94).

Furthermore, we identified in patients with PD a statistically significant correlation between the scores of GAD-7, the PHQ-9, and the PDQ. The scores from these three questionnaires completed by all the patients also indicated the significant impact of PD on their psychological well-being (see Tables 6 and 7). Additionally, we found a statistically significant relationship between the VAS and GAD-7, PHQ-9, and PDQ bother scores for the patients with PD (see Table 7). This finding is supported by the consistent results in the existing scientific literature (65, 93, 94).

Moreover, we discovered a statistically significant correlation between the severity of erectile dysfunction (as measured by the IIEF score) and the scores on the GAD-7 and the PDQ for the patients with Peyronie's disease (see Table 7). Several studies in the scientific literature also confirm this correlation (65, 93).

However, unlike other studies on the same topic, we did not find a statistically significant correlation between the severity of penile curvature and the scores on the GAD-7, the PHQ-9, and the PDQ for the patients with PD (see Table 7) (65, 67, 92-94).

Based on these findings, it is important to recognize that

the impact of PD on patients can vary and be complex and may not be directly linked to the degree of penile curvature. For example, some patients with PD with milder curvatures often experience significant discomfort or distress, while others with more severe curvatures may have less discomfort and psychological issues.
In this study, we individually examined the patient data sets related to anxiety, depression, and bother. We often noticed that in the case of less severe curves, the reported scores were higher than those among other patients with a greater degree of curvature. Certainly, we must assume that it is precisely for these reasons that after this statistical study, we were unable to detect a correlation between the scores of the psychometric tests (and bother) and the severity of penile curvature. Importantly, we have found considerations that are very similar to those in the scientific literature (49).
However, the results of our study demonstrate that psychological morbidity in Peyronie's disease is not caused exclusively by penile deformation but is certainly influenced by multifactorial and highly individual components. According to the analysis of the results of our study, anxiety and bother represent a direct consequence of penile pain and ED. Therefore, the diagnostic approach to PD should always investigate the possible presence of psychological disorders using the various psychometric tests already mentioned and the PDQ-bother questionnaire.
After all, we are dealing with a disease that has a considerable prevalence that is not very different from that of diabetes (10.5%), and therefore, the mental state of patients with PD should not be underestimated or ignored (95). Patients with psychological problems should not be underestimated. In cases of severe anxiety and/or depression, regardless of the severity of penile curvature, psychological support should always be considered to ensure the correct continuation of ongoing therapy, thus avoiding possible interruptions of treatments due to disturbed and hyperanxious mental states.

Conclusions

The symptoms of PD (curvature, pain, and erectile dysfunction), which directly affect the penis, affect patients' emotional and psychological states. Consequently, these symptoms have a significant impact on the patient's psychological and social life, as well as on their social and sexual relationships. High levels of anxiety (89%) and depression (57.5%) were common among these patients with PD, with 38.3% experiencing "*severe*" anxiety.
This significant percentage of patients with PD with psychological problems should not be underestimated. We recommend integrating psychotherapy with medical treatment for patients with PD to improve their QoL and prevent them from discontinuing therapy.

Declarations

Ethical approval and consent for participate: *This study was conducted following the guidelines of the Declaration of Helsinki, and all the participants provided informed consent. This study received approval from the Castelfidardo Ethical Commission (protocol code #00251, approval date 1 September 2025) for studies involving humans.*

Consent for publication: *Not applicable.*

Availability of data and material: *The data supporting this study's findings are available from the corresponding author upon reasonable request.*

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