2 Epidemiology of Peyronie's Disease

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SUMMARY

Epidemiological studies of Peyronie's disease (PD) reported the prevalence of this condition as much higher than once thought, highlighting the potential physical and psychosocial impact of the disease on society. For this reason, knowledge of the epidemiology of PD is important for allocating and managing health care resources and assessing intervention strategies. The true prevalence of PD is unknown; it is estimated as between 3.7% and 7.1%, but the actual prevalence of this disease may be higher because of patients' reluctance to report this embarrassing condition to their physicians for cultural and psychological reasons. Several risk factors, such as hypertension, diabetes, hyperlipidemia, and smoking, have been suggested. The estimated prevalence of PD at younger ages is around 8% and shows a more acute onset and a lower incidence of associated erectile dysfunction. This chapter reviews the contemporary state of knowledge of the epidemiology of PD.

Key Words: Epidemiology; penis; Peyronie's disease; prevalence; risk factors.

Peyronie's disease (PD) is an acquired disorder of the tunica albuginea characterized by the formation of the plaque of fibrous tissue that may be associated with erectile dysfunction (ED) and pain on erection. There may be difficulty of penetration as a result of the curvature, and the condition may be accompanied by some impairment of erectile capacity *(1)*.

Although the "nodus penis" had been described centuries before, François de la Peyronie described the disease that bears his name in 1743 *(2)*. He considered chronic irritation through sexual abuse as well as sexually transmitted disease to be causative factors. Despite the negative impact of PD on patient quality of life, neither the etiological factors of the disease nor the exact pathophysiological mechanisms are clearly understood. One of the causes of the poor understanding of the disease is the lack of definite epidemiological data.

Epidemiology deals with the distribution and determinants of health-related states or events in specified populations, and the application of this study is to control health problems *(3)*. Briefly, epidemiology deals with frequency and nature of diseases and

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identification of risk factors. Epidemiology may be considered as minor to physical sciences because it does not investigate the biological mechanism leading from exposure to disease. But, without epidemiological data, the extent of a disease in a community cannot be determined, and the etiology or cause of a disease and the risk factors cannot be identified. Also, data obtained from epidemiological studies are vital for allocating and managing health care resources and assessing intervention strategies.

This work reviews the contemporary state of knowledge of the epidemiology of PD. Studies used in the context of the chapter were identified using a PubMed search on April 1, 2005, for "Peyronie's disease" for all available years in modern literature. The selected articles were all in peer-reviewed journals and in the English literature. Basically, the studies performed on the epidemiology of PD were divided into cross-sectional studies or case series. A study was considered cross sectional if all cases of PD in a defined population were reported *(4)*. On the other hand, a study was considered as a case series when the size of the population from which cases were drawn was not known. This search revealed a number of cross-sectional studies undertaken to quantify the incidence and prevalence of PD. *Incidence* is defined as the number of new cases with a certain condition during a specific time period in relation to the size of the population studied *(4)*. *Prevalence* characterizes the proportion of a given population that at a given time has the condition.

The negative impact of PD on patient quality of life is significant. A questionnaire based study done by Gelbard et al. demonstrated that 77% of patients with PD complained of "physiological effects" of this condition *(5)*. For this reason, defining the prevalence of this disease is important. However, in the case of PD, the incidence and prevalence are usually measured using different instruments, such as the definition of PD (curvature vs plaque) or the means of detection (questionnaire vs examination) *(1)*. Moreover, in the literature, epidemiological studies conducted in a multinational fashion using large pool data are still lacking.

CROSS-SECTIONAL STUDIES

Cross-sectional studies provide descriptive data on prevalence of diseases useful for health care planning. To our knowledge, there are only two population-based epidemiological cross-sectional studies that addressed the prevalence of PD; these studies were from the United States and Germany. The report by Lindsay et al. provided the first cross-sectional study giving the incidence and prevalence rates on PD *(6)*. Their study was carried out in Rochester, Minnesota, using the Mayo Clinic's centralized medical records linkage system. A search of the indexing system for diagnoses of PD was assessed. They calculated the age-adjusted incidence rate of 25.7 per 100,000 population per year, and the prevalence rate was 388.8 per 100,000 (0.39%) population. They estimated that approx 423,000 men in the United States had PD at that time; thus, there should be 32,000 new cases annually. Moreover, the authors calculated that the diagnosis rates per 100,000 increased from 13.6 to 24.6 during a 35-yr period, for an average increase of 3.3% per year. Mean patient age at diagnosis was 53 yr (range 19–83 yr). The highest incidence (66%) was reported for the 50- to 59-yr age group. The prevalence of PD was 4.3, 4.6, 30.2, 46.3, 7.8, and 19.1% for men 20–29, 30–39, 40–49, 60–69, 70–79, and greater than 80 yr old, respectively (Table 1). Also, they noted that rheumatoid arthritis (7.9%) and hypertension (16.8%) were more common comorbid diseases among the patients with PD compared to the Rochester population.

Table 1
Incidence or Prevalence of Peyronie's Disease According to Age

Cross–sectional studies	*Age (yr)*					
	Overall	*<40*	*40–49*	*50–59*	*60–69*	*>70*
Lindsay et al. *(6)*	0.39	0.089[a]	30.2[a]	66.0[a]	46.3[a]	7.8[a]
Sommer et al. *(7)*	3.2	4.5	3.0	3.0	4.0	6.5
Case series						
Rhoden et al. (14)	3.67	NR	NR	3.19[b]	4.49[b]	3.81[b]
Mulhall et al. *(15)*	8.9	—	2.8	8.6	9.7	10.9
La Pera et al. (*16*)	7.1	NR	NR	5 (50–54 yr) 5.9 (55–59 yr)	7.6 (60–64 yr) 9.1 (65–69 yr)	NR
Kadioglu et al. *(27,33)*	1	9.4	20.5	44.2	23.4	2.28

NR, not reported.
[a]Incidence rates per 100,000 population for PD by age groups at diagnosis.
[b]Number of men examined stratified by age with Peyronie's plaques.

The German study performed by Sommer et al. provided the first prevalence rates for PD in a cross-sectional study in Europe *(7)*. The study was a validated questionnaire survey of 8000 men 30–80 yr old in greater Cologne; and 142 (3.2%) of 4432 men who responded to questionnaire reported palpable plaque in the penis. The prevalence of the disease was 1.5, 3.0, 4.0, and 6.5% for men 30–39, 40–59, 60–69, and greater than 70 yr old, respectively. They found a statistically significant relationship between diabetes mellitus (DM) (18.3 vs 6.0%) and therapy with β-blockers (22.5 vs 14.2%). However, they found no association of PD with other comorbid diseases such as heart insufficiency and atherosclerosis, hernia, history of other drug therapies and any other operations, lower urinary tract symptoms, pelvic surgery, drinking alcohol, and smoking.

CASE SERIES

From the aspect of the case series, the epidemiological data on PD are variable. Polkey reported on 550 case reports up to 1928, and an Italian publication, published in 1966, described 3600 affected patients *(7–9)*. In 1968, Ludvik and Wasserburger established a rate of 0.3–0.7% in all male patients seen in one urological practice *(10)*. During the same time period, Smith reviewed 100 consecutive autopsies of patients who had no history of symptoms of PD. In 23, there was histological evidence of fibrosis in the subtunical sheath, but no involvement of the corpus spongiosum was reported *(11)*. In 1989, Vorstman and Lockhart described a prevalence of 3 in 300 (1.0%) occurring within a given medical school faculty *(12)*. In one of the first studies on the natural history of PD, Gelbard et al. noted that the prevalence of PD at the Wadsworth Veterans Administration Hospital in Los Angeles was greater than 10 times the prevalence of renal cell carcinoma in the same population *(5)*. Meanwhile, Devine reported on two separate populations of male physicians, with 1% prevalence of a symptomatic PD, which was widely accepted as the prevalence of PD until recent data *(13)*.

Since 1995, great effort has been made to understand the pathophysiology and treatment of PD by urologists. One of the consequences of this effort is the constitution of large series by the centers of excellence on PD. Like the historical case series, data based on case series published since 1995 contributed a number of advances and scientific understanding about its epidemiology and pathophysiology.

In one of these studies, Rhoden et al. aimed to ascertain the prevalence of PD in a male population over 50 yr old who originated from southern Brazil and attended a prostate cancer screening program *(14)*. In addition to the prostate digital examination, all patients were examined for the presence of a palpable plaque with extension of the penis. Of 954 men, 35 individuals were found to have palpable plaque that had not been previously diagnosed. The prevalence of PD in this group of patients was 3.67%. The mean age in this population was 60.7 yr. The distribution of patients in accordance to the age of men showed that 3.19% of these were between the ages of 50 and 59 yr, 4.49% were aged 60–69 yr, 3.81% were aged 70–79 yr, and 0% were over 80 yr.

With a similar study design to that of Rhoden et al., Mulhall et al. made an analysis of the prevalence of PD in a population of men presenting for prostate cancer screening *(15)*. Of 534 men, 48 patients were found to have a palpable penile plaque on physical examination, for a prevalence rate of 8.9%. The mean age of men with PD was 68.2 yr compared with a mean 61.8 yr in men without PD. The prevalence of PD based on age groups in decades was 2.8% for those 40–49 yr, 8.6% for patients 50–59 yr, 9.7% for those 60–69 yr, 10.9% for those 70–79 yr. In this series, specifically the prevalence of hypertension (43.8 vs 27.7%) and DM (25 vs 11.4%) was significantly increased in patients with PD. Coronary artery disease (10.4 vs 8.5%) and hyperlipidemia (33.3 vs 27.1%) were more common in PD cases but did not attain statistical significance. Dupuytren's contracture was also found more frequently in patients with PD (8.3 vs 0%). On the other hand, smoking was significantly less common in patients with PD.

In another study, La Pera et al., from Italy, evaluated the results of a questionnaire administered by an andrologist at each of 10 centers throughout the country in men aged 50–69 yr *(16)*. Their cohort of men revealed a prevalence of 7.1% for PD. The prevalence of the disease varied in different age groups, with a higher prevalence in older men. It was 5% at 50–54 yr compared to 9.1% at 65–69 yr. In addition, the prevalence of the disease at 55–59 yr and 60–64 yr was 5.9 and 7.8%, respectively. Further analysis of the study revealed that the probability for smokers developing PD was 4.6 times higher than for nonsmokers. The authors also detected a significant correlation in the subjects who had smoked 10,000 packs during their life, which is equal to a pack per day for 28 yr. However, statistical analysis did not reveal any significant correlation between PD and cardiovascular diseases, DM, drugs or alcohol.

RACIAL DIFFERENCES IN THE EPIDEMIOLOGY OF PEYRONIE'S DISEASE

There are only a few studies giving data on the racial differences in PD. In one of these, Shaw et al. retrospectively reviewed data from three hospitals in New Orleans from 1994 to 2000 *(17)*. The racial distribution for PD was as follows: 77.6% Caucasian, 9.4% African American, and 2.9% Hispanic. In the Brazilian study conducted by Rhoden et al., 88.6% of patients diagnosed as having PD were Caucasian, and 11.4% were African American *(14)*.

NATURAL HISTORY OF PEYRONIE'S DISEASE

PD has been previously characterized as a process of gradual spontaneous resolution *(18)*. In one of the first studies on PD including patients with PD for a duration of 1–5 yr, Gelbard et al. reported that 13% of the patients with PD will gradually resolve, 47% will remain stable, and 40% will worsen *(5)*. Certain features that predispose against

spontaneous resolution include PD greater than 2-yr duration at presentation, presence of Dupuytren's contractures, plaque calcification, and curvature greater than 45°.

We observed the natural course of PD in 63 (20.5%) of 307 patients presenting with acute disease for a duration of 5.8 mo and received no treatment *(19)*. In this series, 30.2% of the patients reported progression of the deformity, and 66.7% had stable disease after a mean follow-up of 8.4 mo without any treatment. Complete spontaneous resolution of the penile deformity was observed only in 2 cases in this group. In the chronic phase, which begins when disease duration is greater than 12 mo, the deformity does not change during this stable period.

Lania et al. investigated the natural history of PD in a total of 125 patients maintaining sexual activity and not requiring surgical treatment *(20)*. They were followed for at least 5 yr without any treatment. Regarding curvature and number and size of fibrotic nodules, the authors observed a consistent tendency to stabilize in the group of patients older than 50 yr compared with the patients younger than 50 yr. The percentage of patients who needed surgery for PD was 68 and 31.5% for the former and latter group of patients, respectively. The authors concluded that patients diagnosed before the age of 50 yr have a greater chance that the disease will worsen and require a surgical approach.

PEYRONIE'S DISEASE IN YOUNGER MALES

In the literature, patients with PD are represented by a wide age range, between 20 and 84 yr, with the youngest affected male reported at 19 yr *(6,13,21)*. On the other hand, it is generally observed that PD usually affects male individuals between 40 and 70 (87%) yr *(6)*. The classical image of the patient with PD is a man typically presenting in his 50s and 60s with compromised sexual function caused by penile deformity and, not infrequently, diminished rigidity. However, in studies that give the prevalence rate of PD, mostly men under 50 yr were not taken into consideration because of the much lower prevalence of PD.

In their large community-based study, Lindsay et al. calculated the prevalence rate of patients with PD between 20 and 29 yr and between 30 and 39 yr as 4.3 per 100,000 (0.043%) and 4.6 per 100,000 (0.046%) population, respectively *(6)*. In this study, the percentage of patients with PD who were under 40 yr among all patients was 9.9%. In the study by Sommers et al. that used a mailed questionnaire, only 1.5% of the group between 30 and 39 yr noticed induration on the penis *(7)*.

In our experience, it was reported that the prevalence of patients with PD who presented under age 40 yr is 8.2%, which is similar to the report by Lindsay et al. Of these younger patients, 78.9% presented during the acute phase of the disease, and pain on erection was a part of presenting symptom complex in 52.6% *(21)*. The majority (84%) had a degree of penile curvature less than 60°. Dorsal penile curvature was the most common type of deformity and was observed in 42% *(8)* of patients, whereas lateral curvature was observed in 36.8% *(7)* of the patients. ED was present in 21% of these patients. After a minimum 2-yr follow-up, improvement in penile deformity was observed in 36.8%, and 42.1% had stable disease; 21% experienced deterioration of penile curvature. The authors concluded that, despite the low prevalence of ED in patients with PD, the onset of PD is clinically more active and acute in patients presenting under age 40 yr, and this should encourage the clinician to treat these individuals more vigorously.

In another study, Levine et al. aimed to characterize disease presentation, symptomatology, natural history, and results of therapy in their institution *(22)*. The prevalence of

PD in men younger than 40 was calculated as 4.8% (30 of 626). The mean age at presentation in this group was 31 yr, and the most common complaints were penile pain and palpable nodule. There were 57% of the men who believed it was caused by a specific traumatic event, and 97% of the patients were able to achieve full erection with the deformity. On physical examination, all patients presented with a palpable penile plaque, and the mean curvature of the erect penis was 21°.

Overall, the characteristics of patients with PD who were mentioned in studies performed by our group and Levine et al. at younger ages are as follows: palpable plaque, significant pain, less-severe curvature, good quality of erections, and ability to have intercourse. Levine et al. *(22)* further discussed the main difference of patients with PD younger than 40 yr in comparison with a typical patient with PD by reviewing literature information for more than 1500 patients. They detected that there was a difference in the direction of the curvature; 41 and 81% of the younger men reported dorsal and lateral curvature, respectively, whereas the literature review of a patient classical PD yielded 77% dorsal and 20% lateral curvature. They mentioned that the clinical significance of this is not clearly understood. On the other hand, all the younger males presented with a palpable nodule, whereas in only 67% of typical patients was a plaque identified. Finally, a midshaft plaque was found in 20% of younger men, whereas this finding was reported in 42% of the reviewed patients. These may be because of a different mechanism of injury leading to a more accelerated or robust scar formation response in younger males *(22,23)*.

A third group investigated the clinical presentation of PD with 20 patients under 40 yr compared with 28 patients over 40 yr *(24)*. They reported that the difference between IIEF domain scores and subjective reduction of penile length was significant between the two groups. Also, they noted the only significant risk factor for PD was hypercholesterolemia. Overall, they confirmed the conclusions obtained from the studies by our group and Levine et al. that PD in younger patients shows a more acute onset and a lower incidence of associated ED.

COMORBID DISEASES IN RETROSPECTIVE COHORTS

The exact etiology of PD is still unknown, but current research suggests that PD represents a localized aberration of the wound-healing process *(25)*. The impact of systemic disorders such as DM, hypercholesterolemia, hyperlipidemia, and hypertension has been hypothesized to have a role in the pathogenesis of PD.

In one of the first studies for this issue, Carrieri et al. investigated the role of risk factors in a case-control study consisting of 134 men with PD and 134 age-related male controls *(26)*. Patients who underwent invasive procedures on the penis (i.e., urethral catheterization, cystoscopy transurethral prostatectomy) had 16.1-fold (13% of cases and 1% of controls) increased risk for PD; nearly a three-fold increase was observed among patients who had genital or perineal trauma. A history of urethritis (3.1-fold), uricacidemia (5.4-fold), and lipoma (5.2-fold) was also significantly associated with an increased risk of PD. Among cases, 20% were affected by Dupuytren's contracture, and 4% reported a family history of PD; none of the controls reported such conditions. Furthermore, a familial history of gout was more common among cases than among controls. Interestingly, no associations with risk of PD were noted with a history of diabetes and hypertension. In addition, this was the only study that interviewed both cases and controls on the past diseases of the genital tract of the female partner. The results of this survey revealed that inflammatory (3.7-fold) and fibromatous lesions (2.5-fold) or surgical intervention in the genital tract of the partner were more common by the cases.

Usta et al. evaluated the impact of risk factors on the severity of penile deformity in a total of 469 patients *(27)*. In their series, the most frequently documented comorbid conditions in association with PD were hypertension in 27.3% (128) of cases; smoking in 25.5% (120); hypercholesterolemia in 18.3% (86); DM in 17.2%, with 2.1% (10) of those with type 1 and 15.1% (71) of those with type 2; hyperlipidemia in 15.7% (74); history of penile trauma in 13.2% (62); previous pelvic surgery in 1% (5); and a urethral catheterization in 0.08% (4). Of these patients with PD, 68% had at least one of these comorbidities (Table 2). Also, 31.7, 16.4, and 19.6% of patients had one to three comorbidities, respectively. Statistical analysis of the study revealed no positive linear trend between individual comorbidities and the severity of the penile deformity.

In our experience, at least one risk factor for systemic vascular disease, with hypercholesterolemia the most common, was identified in 67.5% of 307 patients *(19)*. A positive family history was obtained in 3 (0.01%) of the cases. A detailed questionnaire revealed history of penile trauma during sexual intercourse in 26 (8.5%) men and a history of urethritis related to sexually transmitted diseases in 8 (2.6%). In this series, 13 (4.2%) patients had a history of pelvic surgery such as transurethral prostatectomy in 8 (2.6%), open prostatectomy in 3 (0.9%), and radical retropubic prostatectomy in 2 (0.6%); 5 (1.6%) patients had transurethral manipulation or catheterization.

In the update of this series, 484 patients were retrospectively evaluated in terms of risk factors for systemic vascular diseases and ischemic heart disease to assess the impact of these risk factors on the severity of penile deformity *(28)*. Of 484 patients, systemic vascular disease such as hypercholesterolemia (35.1%) was the most common, followed by DM (28.3%), hypertriglyceridemia (21.1%), and hypertension (16.7%); ischemic heart disease (9.1%). The comorbidities were identified in 62.4% (302) of the patients. Of the patients with severe deformity (>60°), 82.4% had at least one of these risk factors. In patients with deformity less than 30°, no risk factor was detected in 40.2% of the patients. The authors concluded the impact of risk factors on the severity of penile deformity is obscure, but the patients with at least one risk factor were more likely to have a deformity greater than 60°.

In another study, Perimenis et al. retrospectively evaluated 134 cases to investigate the clinical features of the disease *(29)*. They found that in 11 (8.2%) the onset of disease was noticed after autoinjections of vasoactive drugs, and 18 (13.4%) had a history of penile trauma (fracture) during sexual activity. Of patients with PD, 8 (6%) had DM, and 3 (2.2%) had Dupuytren's contracture.

In conclusion, there are contradictory results in the literature about the role of risk factors for systemic vascular diseases such as smoking, DM, hyperlipidemia, and hypertension and drugs. Further research with large epidemiological studies is needed to identify the definitive relationship between PD and these comorbidities. Further details on the etiology and pathophysiology of PD are discussed in other chapters.

EFFECT OF ORAL PHARMACOTHERAPY ON THE PREVALENCE OF PEYRONIE'S DISEASE

Most of the opinion leaders in this field note that the number of patients with PD has increased since the advent of oral pharmacotherapy for the treatment of ED *(30,31)* because up to 80% of patients with PD may have concurrent ED *(32)*. With more men successfully treated for ED, an increasing number of Peyronie's cases are becoming manifest and presenting for evaluation. PD may be diagnosed during a standard diagnostic evaluation for ED.

Table 2
Comorbid Factors Among Peyronie's Disease in Different Studies

	Most common comorbid factors among patients with Peyronie's disease (%)									
Cross-sectional studies	*DM*	*Arthritis*	*β-Blockers*	*HT*	*DC*	*CAD*	*HL*	*HC*	*Smoking*	*PT*
Lindsay et al. *(6)*	6.9	7.9	5.9	16.8	4	NR	NR	NR	NR	NR
Sommers et al. *(7)*	18.3	NR	22.5	NR	NR	NR	NR	NR	NR	NR
Case series										
Mulhall et al. *(15)*	25	NR	NR	43.8	8.3	10.4	33.3	NR	15	NR
	OR 2.6		OR 2.3				OR 0.32			
La Pera et al. *(16)*	NR	NR	NR	OR 0.7	NR	OR 1.7	NR	NR	OR 4.6	NR
Kadioglu et al. *(27)*	33.2	—	—	14.7	NR	8.1	28.3	NR	NR	NR
Carrieri et al. *(25)*	16	NR	NR	31	20	NR	NR	NR	76	13
	OR 1.6		OR 1.6					OR 19.3		
Usta et al. *(26)*	17.2	—	—	27.2	0.08	2.3	15.7	18.3	25.5	13.2
Kadioglu et al. *(33)*	25.2	NR	NR	16	NR	8.92	21.8	34.5	NR	NR
Perimenis et al. *(29)*	6	NR	NR	NR	2.2	NR	NR	NR	NR	21.6

CAD, coronary artery disease; DC, Dupuytren's contracture; DM, diabetes mellitus; HC, hypercholesterolemia; HL, hyperlipidemia; HT, hypertension; NR, not reported; OR, odds ratio compared to control; PT, penile trauma (including invasive procedures to the penis).

With colleagues, we analyzed the characteristics of these patients compared with patients presenting with classical complaints of PD during a 10-yr period in our institution *(33)*. Of 448 patients, 15.8% (71) were detected with PD during a diagnostic workup for ED, which consisted of a standard questionnaire for sexual function and combined injection and stimulation test. Of 7594 patients with ED who were seen at our outpatient clinic during this period, 1% (71) were found to have PD. The patients presenting with ED only were significantly older (57.4 yr) compared to the other patients with PD (52.2 yr). In this study, at least one comorbidity for systemic vascular diseases was observed in 73% of the cases, with DM (40.8%) and hypercholesterolemia (36.6%) the leading ones. The severity of deformity was significantly less in these patients compared to other patients with PD, which may be an important factor in their awareness of their disease. The mean degree of deformity was 31.5° in these patients; it was 41.1° in the other patients with PD.

On the other hand, pure notching deformity may be another factor for incidentally diagnosed PD during standard diagnostic workup. We compared the erectile status of patients with isolated notching deformity (57) with patients having any kind of penile curvature by history (534). We found that the leading presenting symptom was ED in 31.5% of patients with pure notching deformity; it was 14.2% in patients with any kind of curvature. There is no study regarding the prevalence of PD in patients receiving oral pharmacotherapy.

CONCLUSIONS

Epidemiological studies of PD revealed that the prevalence of PD in the population has continuously increased during the last 30 yr, and now its prevalence is estimated as between 3.7 and 7.1%. It is much higher than previously believed. The increase in prevalence of PD in case studies was also confirmed by Lindsay et al.'s cross-sectional study *(6)*. In this study, it was reported that the prevalence rates per 100,000 population increased from 13.6 to 34.6 during a 35-yr period, for an average increase of 3.3% per year. Although it was previously considered a rare condition, its prevalence seems to be equivalent to that of important public diseases like diabetes or urolithiasis, both estimated in 3–4% of the general population and greater than many cancers *(7)*.

The actual prevalence of this disease may be higher because of a patient's reluctance to report this embarrassing condition to the physician because of cultural and psychological reasons. On the other hand, because the symptoms may not be disabling, individuals do not seek medical help, and therefore they are not examined and registered in the medical system. Of concern is the belief by some authors that even the most recent data (7.1%) underestimate the true prevalence of PD, and there is no study addressing actual prevalence of PD diagnosed by physical examination as well as penile ultrasonography. PD at younger ages seems to have notably different characteristics, such as clinical hallmarks and outcome.

REFERENCES

1. Pryor J, Akkus E, Alter G, et al. Priapism, Peyronie's disease, penile reconstructive surgery. In:Sexual Medicine, Sexual Dysfunctions in Men and Women (Lue TF, Basson R, Rosen R, Giiliano F, Khoury S, Montorsi F, eds.). Health Publications, Paris, France, 2004, pp. 383–409.
2. Dunsmuir WD, Kirby RS. Francois de La Peyronie (1678–1747). The man, the disease he described. Br J Urol 1996; 78: 613–622.
3. Last JM (ed.). A Dictionary of Epidemiology. 4th ed. Oxford University Press, New York, 2001.

4. Lilienfield AM, Lilienfield DE. Foundations of Epidemiology. 2nd ed. Oxford University Press, New York, 1980.
5. Gelbard MK, Dorey F, James K. The natural history of Peyronie's disease. J Urol 1990; 144: 1376–1379.
6. Lindsay MB, Sehain DM, Grambsch P, Benson RC, Beard M, Kurkland T. The incidence of Peyronie's disease in Rochester, Minnesota, 1950 through 1984. J Urol 1991; 146: 1007–1008.
7. Sommer F, Schwarzer U, Wassmer G, et al. Epidemiology of Peyronie's disease. Int J Impot Res 2002; 14: 379–383.
8. Polkey HJ. Induratio penis plastica. Urol Cut Rev 1928; 32: 287–308.
9. Urologia. International Inquiry on the Therapy of Induratio Penis Plastica. Trevisco, 1966: 33: Fasc II.
10. Ludvik W, Wasserburger K. Die radiumbehadlung der induratio penis plastica. Z Urol Nephrol 1968; 61: 319–325.
11. Smith BH. Subclinical Peyronie's disease. Am J Pathol 1969; 52: 385–390.
12. Vorstman B, Lockhart J. Peyronie's disease. Probl Urol 1987; 1: 507–509.
13. Devine CJ. Introduction to Peyronie's disease. J Urol 1997; 157: 272–275.
14. Rhoden EL, Teloken C, Ting HY, Lucas ML, Teodosio da Ros C, Ary Vargas Souto C. Prevalence of Peyronie's disease in men over 50-yr-old from Southern Brasil. Int J Impot Res 2001; 13: 291–293.
15. Mulhall JP, Creech SD, Boorjian SA, et al. Subjective and objective analysis of the prevalence of Peyronie's disease in a population of men presenting for prostate cancer. J Urol 2004; 171: 2350–2353.
16. La Pera G, Pescatori ES, Calabrese M, et al. and the Simona Study Group. Peyronie's disease: prevalence and association with cigarette smoking. Eur Urol 2001; 40: 525–530.
17. Shaw K, Puri K, Ruiz-Deya G, Hellstrom WJG. Racial considerations in the evaluation of Peyronie's disease. J Urol 2001; 165(5), suppl: 170.
18. Williams JL, Thomas GG. The natural history of Peyronie's disease. J Urol 1970; 103: 75.
19. Kadioglu A, Tefekli A, Erol B, Oktar T, Tunc M, Tellaloglu S. A retrospective review of 307 men with Peyronie's disease. J Urol 2002; 168: 1075–1079.
20. Lania C, Grasso M, Franzoso F, Blanco S, Rigatti P. Peyronie's disease, natural history. J Urol 2004; 171(4), suppl: 331.
21. Tefekli A, Kandirali E, Erol H, Alp T, Koksal T, Kadioglu A. Peyronie's disease in men under 40: characteristics and outcome. Int J Impot Res 2001; 13: 18–23.
22. Levine LA, Estrada CR, Storm DW, Matkov TG. Peyronie's disease in younger men: characteristics and treatment results. J Androl 2002; 24: 27–32.
23. Seftel AD. Peyronie disease in younger men. J Androl 2003; 24: 33–34.
24. Briganti A, Barbieri L, Deho F, et al. Clinical presentation of Peyronie's disease in young patients. Int J Impot Res 2003; 15(suppl 6): S44–S47.
25. Gholami SS, Gonzales-Cadavis NF, Lin C, Rajfer J, Lue TF. Peyronie's disease: a review. J Urol 2003; 169: 1234–1241.
26. Carrieri MP, Serraino D, Palmiotto F, Nucci G, Sasso F. A case-control study on risk factors for Peyronie's disease. J Clin Epidemiol 1998; 51: 511–515.
27. Usta MF, Bivalacqua TJ, Jabren GW, et al. Relationship between the severity of penile curvature and the presence of comorbid diseases in men with Peyronie's disease. J Urol 2004; 171: 775–779.
28. Oktar T, Kendirci M, Sanli O, Kadioglu A. The impact of risk factors on the severity of penile deformity in 484 Peyronie's patients. J Urol 2003; 169(4), suppl: 274.
29. Perimenis P, Athanasopoulos A, Gyftopoulos K, Katsenis G, Barbalias G. Peyronie's disease: epidemiology and clinical presentation of 134 cases. Int J Urol Nephrol 2002; 32: 691–694.
30. Hellstrom WJG, Bivalacqua TJ. Peyronie's disease: etiology, medical, and surgical therapy. J Androl 2000; 21: 347–354.
31. Hellstrom WJG. History, epidemiology and clinical presentation of Peyronie's disease. Int J Impot Res 2003; 15(suppl 5): S91–S92.
32. Jarow JP, Burrnet AL, Geringer AM. Clinical efficacy of sildenafil citrate based on etiology and response to prior treatment. J Urol 1999; 162: 722–725.
33. Kadioglu A, Oktar T, Kandirali E, Kendirci M, Sanli O, Ozsoy C. Incidentally diagnosed Peyronie's disease in men presenting with erectile dysfunction. Int J Impot Res 2004; 16: 540–543.

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