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Prevalence of ocular pseudoexfoliation in type II diabetes mellitus

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Abstract

Background and objective: Pseudoexfoliation syndrome is a systemic disorder related to age mostly affects the anterior structures of the eye. It is characterized by increased production and accumulation of abnormal fibrillar material inextraocular and intraocular tissues. There was a variation in the prevalence of pseudoexfoliation syndrome in diabetic patients compared with non-diabetic patients. The aim of the study is to estimate the prevalence of pseudoexfoliation syndrome among diabetic patients in a sample of the Iraqi population and evaluate the impacting factor that affects this prevalence

Methods: A cross-sectional study was conducted in the Ophthalmology Department/ Erbil Teaching Hospital during the period from 1st of August 2021 to 31st of March 2022. A convenient sample of 100 patients with an age of ≥50 years old and who were diagnosed with type 2 diabetes were enrolled in the current study. The questionnaire included sociodemographic characteristics of the patients (age, gender, smoking, and alcohol state), past medical history and investigations (duration of diabetes mellitus and HbA1c), and the results of the ophthalmologic history and examination including intraocular pressure, presence of diabetic retinopathy, and the presence of pseudoexfoliation syndrome

Results: About 52% of the patients were aged 50-59 years, while 9% had an age of ≥70 years. The prevalence of pseudoexfoliation syndrome was 9%. While diabetic retinopathy was presented in 37%. The prevalence of glaucoma was 12%. There was a significant association between pseudoexfoliation syndrome incidence and increasing the age of the patients, the highest prevalence was among patients with ≥70 years (P = 0.001). The pseudoexfoliation syndrome was significantly associated with diabetic retinopathy, the presence of glaucoma, and diabetic duration (P-values were 0.001, 0.001, and 0.026, respectively). In addition, the mean intraocular pressure was significantly higher among those with pseudoexfoliation syndrome than patients without pseudoexfoliation syndrome (P = 0.001)

Conclusion: The prevalence of pseudoexfoliation syndrome in diabetic patients was 9%. The duration of diabetes, diabetic retinopathy, glaucoma, and the age of the participants significantly impacted the prevalence of pseudoexfoliation syndrome.

Keywords: Pseudoexfoliation; Diabetes; Retinopathy; Glaucoma.

Introduction

In the pseudoexfoliation syndrome, there is an increased production and accumulation of abnormal fibrillar material in intraocular and extraocular tissues.[1,2] The extracellular accumulation sites include skin, lungs, heart, kidneys and other organs.[3] Cardiovascular and cerebrovascular diseases have been associated with pseudoexfoliation syndrome; however, this association remains controversial.[4]

The abnormal fibrillar material is an extremely cross-linked glycoprotein-proteoglycan complex that primarily

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consists of elastic microfibrillar proteins like fibrillin-1 and latent transforming growth factor binding proteins as well as chaperone molecules like clusterin and cross-linking enzymes like Lysyl Oxidase Like 1.[5]

Although the precise pathophysiological mechanism is still unknown, genetic and environmental factors are believed to be linked to the development and progressive extracellular accumulation of exfoliative material.[2] Exposure to ultraviolet light, viral infection, and trauma to or surgery on the anterior segment are a few environmental factors that have been suggested to contribute to the development of pseudoexfoliation syndrome. Additionally, the prevalence of pseudoexfoliation syndrome rises over time in the following groups: people over 50, those with ocular hypertension, those with glaucoma, those having surgery for their glaucoma, those who are blind from their glaucoma, and those who have absolute glaucoma.[4,6]

The diagnosis of pseudoexfoliation glaucoma mainly depends on the presence of pseudoexfoliation coupled with increased intraocular pressure, changes in computerized perimetry, and/or modifications to the anatomy of the optic nerve.[6] Indeed, one of the most frequent causes of glaucoma is thought to be pseudoexfoliation syndrome. In seven years, glaucoma will develop in about 30% of pseudoexfoliation syndrome patients. The pathogenesis of secondary open-angle glaucoma is still unknown, but it is thought that exfoliation material and pigment combined with obstruction of the outflow pathway causes the condition.[3]

The eyes of people with pseudoexfoliation syndrome dilate poorly and have unstable lens zonules, which may increase their risk of complications like capsular bag rupture, zonular dialysis, and vitreous loss. Pseudoexfoliation syndrome is linked to technically difficult cataract surgery.[6]

The exact clinical diagnosis of the pseudoexfoliation syndrome is based on slit lamp observation including gonioscopy and pupillary dilation.[5,7] The lens manifests as a "dandruff-like" substance in the anterior chamber or, more notably, as a double concentric ring pattern on the anterior lens capsule. The movement of the iris on the anterior lens surface is thought to have caused the clear zone that separates the rings. The peripheral ring is only visible after pupil dilation, while the central ring is situated near the iris sphincter.[4]

The corneal endothelium may have pseudoexfoliative material and pigment, which may be mistakenly interpreted as inflammatory precipitates, according to slit-lamp examination.[7]

Iris changes are a well-known clinical feature of pseudoexfoliation syndrome. The pupillary border is where exfoliation material is most noticeable next to the lens. Pseudoexfoliation syndrome is characterized by the loss of pigment from the sphincter region of iris and deposition on the structure anterior chamber.[8]

In situations where zonule changes, the presence of iridodonesis, or subluxation of the lens are suspected, ultrasound biomicroscopy may be useful. Iris fluorescein angiography can detect any potential ischemia in the iris. Since diurnal intraocular pressure levels in pseudoexfoliation glaucoma exhibit significant fluctuations, intraocular pressure curve measurement is a crucial test to track intraocular pressure levels throughout the day to assist clinicians in the therapeutic management of patients.[7]

Type 2 diabetes mellitus is caused by a combination of insulin resistance and an insulin secretory defect in the -cells, which over time leads to beta-cell exhaustion and eventually destruction. Type 1 diabetes mellitus is characterized by autoimmune-mediated destruction of insulin-producing -cells.[9]

Diabetes mellitus is a leading cause of morbidity and mortality worldwide and it contributes substantially to healthcare costs.[10] The majority of the burden associated with diabetes is caused by

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macrovascular complications like stroke, coronary heart disease, and peripheral vascular disease as well as microvascular complications like nephropathy, retinopathy, and neuropathy.[11]

This study aims to estimate the prevalence of pseudoexfoliation syndrome among diabetic patients in a sample of the Iraqi population and evaluate the impacting factor that affects this prevalence.

Methods

Study design and setting

A cross-sectional study was conducted in the Ophthalmology Department/ Erbil Teaching Hospital during the period from the 1st of August 2021 to the 31st of March 2022. A convenient sample of 100 patients with an age of ≥50 years old and who were diagnosed with type 2 diabetes were enrolled in the current study. All subjects who were pseudophakic or aphakic in any eye were excluded from the study, in addition to the patients who refused to participate in the current study.

Data collection

A structured questionnaire was used to gather the data. It included sociodemographic characteristics of the patients (age, gender, smoking, and alcohol state). Past medical history and investigations (duration of diabetes mellitus and HbA1c), and the results of the ophthalmologic history and examination including intraocular pressure, presence of diabetic retinopathy, and the presence of pseudoexfoliation syndrome.

Ophthalmologic examination:

Conventional slit-lamp examination was performed to investigate the presence of pseudoexfoliation material before and after papillary dilatation. Fundoscopy was used for the diagnosis of patients with diabetic retinopathy. In addition, automated tonometry was used to measure intraocular pressure.

Ethical approval

The study has been proposed and subsequently approved by the scientific committee of the College of Medicine/ Hawler Medical University. Fully informed consent was obtained from the patients verbally after explaining the aim of the study thoroughly and clearly. All participants were assured of anonymity and confidentiality of information.

Statistical analysis

The data was entered and analyzed by software package of social science (SPSS) version 22. Descriptive statistics were presented as frequencies and were applied to explain the characteristics of participants. The comparison between the study groups was done by t-test, Chi-Square test, and Fisher's Exact test. A *P*-value less than 0.05 was considered statistically significant.

Results

A total of 100 diabetic patients were enrolled in the current study. Male constituted the largest percentage of the sample (56.%). About 52% of the patients were aged 50-59 years, while 9% had an age of ≥70 years. As shown in Table 1.

Table 1 Age, gender, and duration of diabetes among the participants

Age and gender		No.	%
Gender	Male	56	56.0
	Female	44	44.0
Age group (years)	50-59	52	52.0
	60-69	39	39.0
	≥70	9	9.0
Duration of diabetes (years)	>10	68	68.0
	≤10	32	32.0

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The prevalence of pseudoexfoliation syndrome was 9%. While diabetic retinopathy was presented in 37%. The prevalence of glaucoma was 12% (Table 2).

There was a significant association between pseudoexfoliation syndrome incidence and increasing the age of the patients, the highest prevalence was among patients with ≥70 years (*P* = 0.006). The highest prevalence was among patients aged ≥70 years, as shown in Table 3. A significant association was obtained between pseudoexfoliation syndrome and diabetic retinopathy, the presence of glaucoma, and diabetic duration. In addition, the intraocular pressure was significantly elevated in participants with pseudoexfoliation syndrome. As shown in Table 4 and 5.

Table 2 Prevalence of pseudoexfoliation syndrome, diabetic retinopathy, and glaucoma

Ocular disease	No.	%
Pseudoexfoliation syndrome	9	9.0
Diabetic retinopathy	37	37.0
Glaucoma	12	12.0

Table 3 Distribution of the prevalence of pseudoexfoliation syndrome according to gender and age group

Age and gender		Pseudoexfoliation syndrome No. (%)	*P*-value
Gender	Male	5 (8.9)	0.978
	Female	4 (9.1)	
Age group (years)	50-59	1 (1.9)	0.006
	60-69	5 (12.8)	
	≥70	3 (33.3)	

Table 4 Association between pseudoexfoliation syndrome and Diabetic retinopathy, glaucoma, diabetic duration, and intraocular pressure

Medical characteristics		Pseudoexfoliation syndrome No. (%)	*P*-value
Diabetic retinopathy	Yes	8 (21.6)	0.001
	No	1 (1.6)	
Glaucoma	Yes	7 (58.3)	0.001
	No	2 (2.3)	
Diabetic duration	<10 years	0 (0.0)	0.026
	≥10 years	9 (13.2)	

Table 5 Distribution of the intraocular pressure according to the presence of pseudoexfoliation syndrome

Medical characteristics	Intraocular pressure (mmHg) Mean (±SD)	*P*-value
Participants with pseudoexfoliation syndrome	20.8 (±1.6)	0.001
Participants without pseudoexfoliation syndrome	17.7 (±2.4)	

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Discussion

The first finding of the current study was that the prevalence of pseudoexfoliation syndrome was 9%. In comparison, Sidra et al. concluded that diabetic patients have a comparatively less pseudoexfoliation prevalence than non-diabetics.[12] In Egypt, Tarek et al. found that there was no statistically significant association between pseudoexfoliation and diabetes mellitus.[13]

Diabetic retinopathy was presented in 37% of the participants. This agreed with another study that was done in Iraq, the Kurdistan region by Latif et al. in 2019 and revealed that the prevalence of diabetic retinopathy was 33.2%.[14] This variation might be related to the medical characteristics of the participants like the duration and severity of diabetes and the health system with screening programs.

In the current study, the prevalence of glaucoma was 12%. In comparison, another study that was done by Karma et al. in India revealed that the prevalence of glaucoma among diabetic patients was 20%.[15]Another study done by Minwen et al. obtained a significant association between glaucoma and diabetes mellitus.[16]

A significant association was obtained between the age of participants and the prevalence of pseudoexfoliation syndrome. Martynas et al. revealed the same results in their study that was done in 2012.[17] A significant association was obtained in the study that was done in Erbil city in 2018.[18] This agreed with another result that was done in Ethiopia by Sherief et al.[19] These results were expected as the pseudoexfoliation syndromeis an age-related disease.

In the current study, there was a significant association between pseudoexfoliation syndrome and diabetic retinopathy, glaucoma, and duration of Diabetes. In comparison to another study, Tarek et al. concluded a significant association between pseudoexfoliation syndrome and glaucoma.[13]

Finally, the mean intraocular pressure was significantly higher in participants with pseudoexfoliation syndrome than in other participants. A significant association was obtained by another study that was done in Turkey by Hatice et al.[20] The same results were obtained by Alime et al.[21] In agreement with these results, another study that was done in Iraq, the Kurdistan region, concluded that the mean IOP in people with pseudoexfoliation syndrome was 18.51 (±3.2) mmHg compared to 15.7 (±2.7) in those without pseudoexfoliation syndrome.[18]

The strength point of the study was it involved different age groups with different impacting factors that could affect the prevalence of pseudoexfoliation syndrome. Although the current study had a limitation that it included patients from Erbil City and was not generalized to the Kurdistan region or Iraq.

Conclusion

The prevalence of pseudoexfoliation syndrome in diabetic patients was 9%. The duration of diabetes, diabetic retinopathy, glaucoma, and the age of the participants significantly impacted the prevalence of pseudoexfoliation syndrome.

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Not applicable.

Competing interests

The authors declare that they have no competing interests.

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