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Epidemiological and Clinical Characteristics of Pterygium in Two Cameroonian Hospitals

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Abstract

Background: Pterygium is a fibrovascular proliferation that invades the cornea. This proliferation can lead to blindness by altering its transparency. The wide variability in its prevalence is linked to the influence of the living environment. **Objective:** We sought to determine the epidemiological and clinical characteristics of this condition in our environment. **Materials and Methods:** We conducted a 5-year descriptive cross-sectional study of patients diagnosed with pterygium in two hospitals in the city of Douala. The variables studied were age, sex, visual acuity, astigmatism, stage, location, and laterality of the pterygium. Chi-square and Student's t-tests were used to compare qualitative variables and means. The significance threshold was $p < 0.05$. **Results:** We examined 248 patients, with a male-to-female ratio of 0.78. The authors found a hospital prevalence of 0.73%, with a female predominance (M:F ratio 0.78) and a mean age of 48.16 years. Pterygium was most often bilateral, located nasally, and associated with astigmatism, typically presenting in its early stages. **Conclusion:** Pterygium remains a rare condition in our setting, affecting mainly women in their forties. It develops selectively in the nasal part of the palpebral fissure area and is often associated with inflammation and astigmatism.

Keywords

Pterygium, Epidemiology, Clinical, Cameroon

1. Introduction

Pterygium is a fibrovascular conjunctival degeneration in the shape of a "butterfly

wing" with corneal tropism, first described by Sushruta, the first known eye surgeon, in 1000 BC [1]. Its prevalence ranges from 0.07% to 53%, varying from one region of the globe to another, with peaks observed in hot, windy, and dry regions [2]. In a systematic review, Rezvan *et al.* estimated it at 12% [3], while its prevalence in sub-Saharan Africa is estimated to be between 5 and 8.8% in the general population, reaching up to 31% in certain exposed groups [4]. The area of highest prevalence in the world is the pterygium belt located by Cameron between 37˚ degrees of latitude north and south [1]. In Cameroon, Ebana *et al.* reported a prevalence of 1.1%, while Moukoury *et al.* in 2008, then Eballe *et al.* in 2018, found 1.28% [5] and 3.6% [6], respectively, in hospital studies. Among the risk factors studied, exposure to ultraviolet rays is the most significant [1], with a cumulative risk that increases with the duration of exposure [7]. Chronic exposure to irritants, dryness and inflammation of the ocular surface, as well as genetic predisposition, also play a role in the development of pterygium [1] [2] [4]. Pterygium may be asymptomatic or cause pain and signs of irritation of the ocular surface [4] [8] [9]. In its progressive form, pterygium leads to two frequent and intertwined morbid conditions: irritation of the ocular surface and visual impairment of varying severity due to induced astigmatism, alteration of the tear film, or invasion of the visual axis in advanced forms, with a consequent and significant deterioration in quality of life [2] [4] [9]. Management poses a threefold challenge: functional, as symptoms must be relieved and visual function improved or preserved; anatomical, given the need to restore the aesthetics of the eye; and prognostic, due to the high risk of recurrence after treatment. The etiopathogenesis of this condition remains unclear, and successful treatment depends on many factors [9]. Diversifying studies on the subject in sub-Saharan Africa, particularly in countries in the pterygium belt, could contribute to a better understanding of the evolution of this condition over time and space, and to identifying potential epidemiological factors that could be targeted by prevention strategies. The aim of our study was to describe the epidemiological and clinical characteristics of pterygium in a multicenter hospital study conducted in Douala.

2. Methodology

2.1. Study and Sample Characteristics

We conducted a five-year descriptive cross-sectional study in two hospitals in the city of Douala: the Douala Gynecology-Obstetrics and Pediatrics Hospital and the Douala General Hospital. We recruited all patients diagnosed with pterygium. The study data inputs, and the analysis lasted five months (January 1 to May 31, 2022). Sampling was non-probabilistic, consecutive, and exhaustive. All patients with a diagnosis of pterygium were previously identified. The discriminating data were age, sex, place of residence, occupation, reason for consultation, positive and topographical diagnosis of pterygium, and visual acuity.

2.2. Procedure

We requested and obtained ethical clearance from the Institutional Ethics Commit-

tee for Human Health Research at the University of Douala, as well as research authorizations from the two hospitals hosting the study. We recruited patients of interest from the department's archives, using consultation records. The data were collected by the research team using a standardized technical form. All patients underwent an ophthalmological examination including: medical history, clinical examination with a slit lamp, tonometry, and fundus examination. Subjects under the age of 40 underwent cycloplegia before refraction measurement by alternating instillation of tropicamide and cyclopentolate drops, with objective refraction measurement 20 to 30 minutes after the last drop. The 11th International Classification of Diseases (ICD-11) was used as a reference for defining the stages of visual impairment observed. The variables studied were sociodemographic (age, sex, occupation), clinical (associated complaints, history, anatomical characteristics of the pterygium, laterality, topography, signs of progression, stage of progression according to the Vaniscotte and Lacomb classification [10]). Any pterygium associated with eye redness, irritation or burning feeling was considered inflammatory. Corneal astigmatism values were measured using an auto kerato-refractometer and classified. Astigmatism was oblique (30˚ to 60˚ or 120˚ to 150˚), vertical (between 60˚ to 120˚), and horizontal (0˚ to 30˚ or 150˚ to 180˚).

2.3. Limitations

This study has a methodological limitation due to its retrospective nature, which does not allow for a standardized operational definition of pterygium by all ophthalmologists at both study sites, particularly at stage I of the Vaniscotte and Lacomb classification.

2.4. Statistical Analyses

We used a pre-filled technical data sheet for manual data collection and an Excel spreadsheet to create the digital database. We used IBM SPSS Statistics 25.0 software for the analysis. We chose to present the study of qualitative variables in the form of frequency and percentage, and that of quantitative variables using measures of central tendency and dispersion. The chi-square test was used to compare qualitative variables, and Student's t-test was used to compare means. The significance threshold was $p < 0.05$.

2.5. Ethical Considerations

The study met the ethical requirements for research validated by the ethical clearance document No. 4127 from the Institutional Ethics Committee for Research at the University of Douala (CEI-UDo).

3. Results

3.1. Sociodemographic Characteristics

a) Age and gender

We identified 301 cases of patients with pterygium out of 41,434 received, rep-

resenting a hospital prevalence of pterygium of 0.73%. A total of 248 were included in this series. The distribution of the sample by gender showed a female predominance with 139 (56%) female patients compared to 109 (44%) male patients, representing a ratio of 0.78.

The mean age of patients was 48.16 ± 14.20 years (23 - 85 years). The distribution of pterygium cases by age did not follow the normal distribution, and the modal class corresponding to patients between 30 and 40 years of age excluded the mean age (Figure 1).

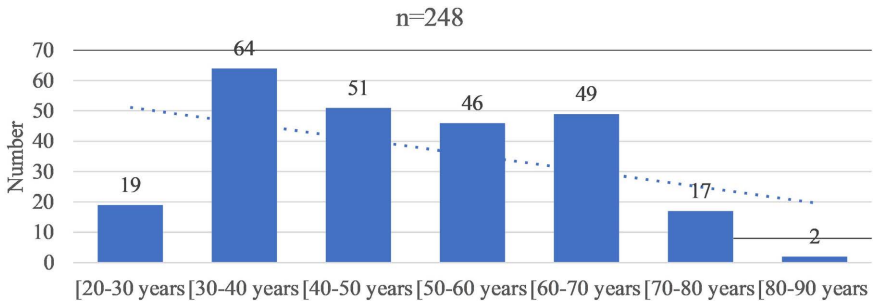

Figure 1. Distribution of the study population by age group.

b) Occupation

Workers employed outdoors accounted for 71.9% of patients, while workers employed indoors (25.9%) and unemployed individuals (2.8%) were less represented (Table 1). Housewives (27.8%) and shopkeepers (12.9%) were the most numerous in our sample. There was no link between occupational activity indoors or outdoors and the stage of pterygium in the right eye (p = 0.94) or left eye (p = 0.72).

Table 1. Distribution of patients according to occupation.

Occupation	Frequency	Percentage
Lawyer	1	0.4
Boilermaker	12	4.8
Hairdresser	2	0.8
Retailer	32	12.9
Accountant	4	1.6
Taxi driver	1	0.4
Seamstress	**16**	6.5
Farmer	**18**	7.3
Electrician	1	0.4
Teacher	13	5.2
Nurse	5	2.0
Laboratory technician	3	16
Sailor	6	18
Mechanic	12	4.8

Continued

Housekeeper	69	27.8
Carpenter	16	6.5
Military	1	0.4
Motorcycle taxi	19	7.7
Fisherman	10	4.0
Unemployed	7	2.8
Total	248	100.0

The distribution of patients by exposed occupation and gender showed an imbalance with a statistically significant association between these two variables (p = 0.000), as shown in Figure 2.

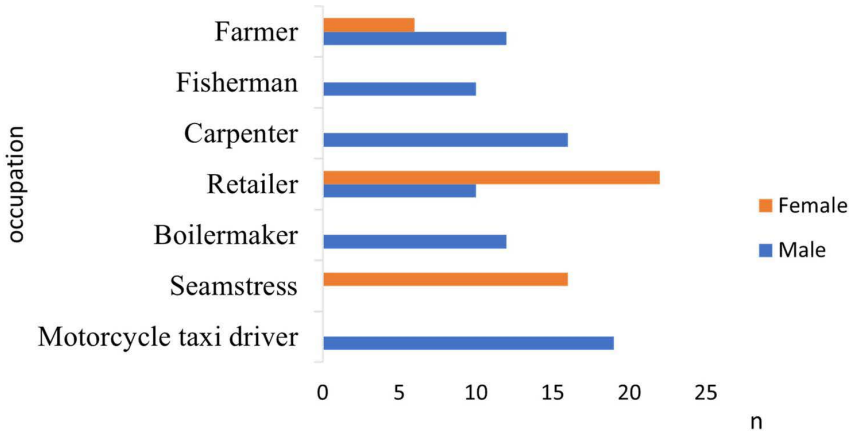

Figure 2. Distribution of patients by exposed occupation and gender.

3.2. Clinical Characteristics

- Symptoms (N = 248)

The most common symptoms were decreased visual acuity (52.82%), foreign body sensation (30.24%), and eye pain (25.81%). Other functional signs included tearing (24.60%), itching (23.39%), redness (22.98%), and double vision (2.02%).

- History (N = 248)

The main contributing ophthalmological history included wearing corrective lenses (27.82%), trauma (8.87%), and previous treatment for pterygium (8.87%) without presuming the location. General medical history included high blood pressure (18.54%), diabetes (10.48%), and allergies (2.82%). A family history of pterygium was found in 12 (4.83%) cases.

- Signs
  - Visual acuity

The acuity of the eye affected by pterygium was less than 10/10 in 81.14% of cases, with 69 (17.83%) eyes having low vision, while 73 (18.86%) eyes had a visual acuity of 10/10.

  - Laterality

Pterygium was unilateral in 109 (43.96%) cases and bilateral in 139 (56.04%) cases. In unilateral cases, the left eye was most commonly affected in 58 (53.21%) cases.

- Location

The nasal location of pterygium was predominant, observed in 93% of cases. The temporal location accounted for 6% of observations and the temporal and nasal forms accounted for 1%.

- Classification

Stages 1 (169 cases) and 2 (164 cases) were predominant, accounting for 86.05% of observations. As shown in Table 2, no stage 4 pterygium was observed, while stage 3 accounted for 13.95% of cases. There was an association between stage and history of eye trauma, with proportionally more stage 2 or 3 cases in patients with trauma to the right eye ($p = 0.025$) or left eye ($p = 0.003$). Patients wearing corrective lenses had significantly fewer stage 3 pterygia than those who did not ($p = 0.013$), as shown in Table 2.

Table 2. Distribution of pterygium stages according to whether or not optical correction is worn.

Stage of pterygium		Optical correction		Total
		No	Yes	
RE	1	23	11	34
	2	29	17	46
	3	5	1	7
Total		**57**	**29**	**87**
LE	1	43	15	58
	2	36	17	53
	3	5	4	10
Total		**84**	**36**	**121**

RE: Right eye/LE: Left eye.

- Inflammation

The inflammatory form of pterygium was observed in 70% of cases and the non-inflammatory form in 30% of cases.

- Associated pathologies

Pterygium was associated with ametropia in 197 (79.43%) cases, cataract in 20 (8.06%) cases, and glaucoma in 17 (6.85%) cases.

- Astigmatism

Astigmatism was present in 255 (65.89%) eyes, with oblique astigmatism being the most common (35.14% of eyes and 53.33% of astigmatism cases observed), followed by vertical astigmatism (25.06% of eyes) and horizontal astigmatism (5.68%).

The mean dioptric value of astigmatism was 0.90 ± 0.90 D (0-4) in the right eye

and 0.86 ± 0.65 D (0-3) in the left eye, with no significant difference (P = 0.68).

4. Discussion

4.1. Prevalence

The prevalence of pterygium in our series was 0.73%, well below the 3.60% reported by Omgbwa *et al*. in the same city, in a hospital study [6]. This difference could be related to the methodology, as that study included only patients aged 40 years or older, unlike ours, which was more inclusive. For a country located in the pterygium belt of Cameroon, these prevalences appear low, suggesting an admission bias, which is characteristic of many observational hospital studies. Community-based studies show higher prevalence in sub-Saharan Africa, where a systematic review estimated its prevalence at between 5% and 8.8% of the general population [4]. This prevalence reached 53% in China according to a meta-analysis [3].

4.2. Age

Pterygium mainly affected young adults in our series, as shown by the modal age group between 30 and 40 years, with a mean age of 48.16 years. Omgbwa *et al*. found a peak prevalence in patients over 40 years of age with a mean age of 50.9 years in another hospital in Douala [6], while Santos *et al.* in Togo found a mean age of 47.35 years [8]. It was 10 years lower in Ethiopia, where Alemayehu *et al.* estimated it at 38.18 years, with a peak prevalence among younger patients in the 18 - 26 age group [2]. In temperate and cold regions of the globe, the average age of onset is higher, with peaks in prevalence occurring beyond 40 or even 50 years of age [11]. This variation in modal age across geographical regions can be explained by differences in exposure to ultraviolet radiation in terms of intensity and duration, which explains why the disease occurs at an earlier age in sub-Saharan African countries located in the Cameroon pterygium belt [1].

4.3. Gender

We noted a predominance of female patients, with a male-to-female ratio of 0.78, which is comparable to that previously reported by Omgbwa *et al*. [6]. This ratio is higher than the ratio of 0.55 reported by Santos in Lomé [8], while Alemayehu *et al*. in Ethiopia highlighted a male predominance in a community survey, with 73 men out of 112 patients [2]. All these authors point to working in ambient air as the main risk factor for pterygium. It is difficult to comment on the real influence of gender in the distribution of pterygium in the first two studies due to a probable admission bias linked to their hospital nature. Although the Ethiopian study was community-based, it cannot be generalized to all of sub-Saharan Africa, because according to the International Labor Organization (ILO), 92.1% of women work in the informal sector, compared to 58.1% worldwide [12]. However, it is in this informal sector that outdoor activities predominate. The socio-anthropological characteristics of professional occupations can vary depending on the context and type of activity. This is the case in our series, where all the profession-

als in the motorcycle taxi trade were male. As suggested by Djouda Feudjio, the arduous nature of this profession and the context in which it emerged in our country may explain its absolute masculinization [13]. The influence of gender on professional activity and, consequently, on the distribution of pterygium in Arab-Muslim societies has been highlighted by Alsarahani *et al*., who explained the male preponderance [14]. This observation cannot be generalized, and the influence of gender on the occurrence of pterygium remains to be clarified in our region.

4.4. Occupation

Workers exposed to ambient air constituted the majority in our series (71.9%), confirming the key role of environmental factors in the development of pterygium. Three groups of environmental risk factors were associated with the development of pterygium: exposure to ultraviolet radiation, factors irritating the ocular surface (dust, wind), and dry eye [4]. Among these, exposure to ultraviolet rays present in sunlight is the most important [4] [15]. This radiation acts by modifying cell behavior through alterations to their DNA, RNA, and extracellular matrix, and induces the production of cytokines and growth factors by pterygium epithelial cells via UVB radiation [4]. According to Rezvan, the risk factors for pterygium fall into three categories: demographic, environmental, and lifestyle-related. The author believes that of the three, exposure to sunlight is the most important [3]. The major role of ultraviolet radiation in the development of pterygium explains the concept of the pterygium belt from a geographical point of view and the recommendation of specific protective measures such as wearing UV-protective sunglasses or at least photochromic lenses for people who are exposed. Exogenous factors alone would not suffice to explain the genesis of pterygium, since the role of Ku70 gene polymorphism involved in DNA repair has been demonstrated [4]. The concept of familial pterygium was found in only 4.83% of patients in our sample, a fairly marginal proportion as observed in a previous study [2].

4.5. History

Wearing corrective lenses was the most common ophthalmological history. The main reason for this is the frequent association of pterygium with astigmatism, especially regular astigmatism. This association was present in 65.89% of eyes in our study. Omgbwa reported it in 57.4% of eyes [6]. It is mainly corneal astigmatism, secondary to the flattening of the anterior surface of the cornea due to the centrifugal growth of the pterygium. The preferred location of pterygium in the nasal (93% of eyes in our study) or temporal (6% of eyes) palpebral fissure explains the high frequency of regular astigmatism.

4.6. Symptoms

Decreased visual acuity was the symptom most commonly reported by patients (52.82%), followed by signs of ocular surface irritation, including foreign body sensation, pain, pruritus, eye redness, and tearing, which are justified by the loca-

tion of the pathology on the ocular surface, particularly in the interpalpebral area, which is more exposed to the environment [15]. A Togolese study reported pain, pruritus, and tearing as the main complaints of patients [8]. These symptoms, taken individually or as a whole, are not specific to pterygium and are also found in patients with dry eye, the two conditions often occurring together [8] [16]. These symptoms are useful to include in the diagnostic process because they contribute to the assessment of the discomfort caused by the disease and to the formulation of the surgical indication. Visual impairment is particularly important because it is directly related to the severity of the pterygium. This visual impairment was objectively measured in 81.14% of eyes with visual impairment. Three mechanisms explain this visual impairment: alteration of the tear film, induced astigmatism, and invasion of the visual axis [15].

4.7. Signs

The pterygium was located in the palpebral fissure area in all cases and was more frequently bilateral. This observation illustrates the predominant role of environmental factors, particularly ultraviolet radiation, in the development of pterygium, as their action is assumed to be greatest on the exposed surface of the limbus. The preferential nasal location observed in our series (93%) is a consistent observation in the literature [2] [6] [15]. The high concentration of light flux in the nasal region results from both the favorable configuration of the orbital frame and from the lateral incidence of light rays at an angle (120˚) that favors their concentration at the nasal limbus [17]. Early forms of pterygium (stages I and II) were more frequently observed in our study. Previous sub-Saharan studies have reported similar observations [2] [6] [8]. This suggests a gradual progression of pterygium under the influence of contributing factors, but also provides information on early diagnosis. Its location on the ocular surface, with a significant impact on the aesthetics of the eye, and its symptomatic nature in most patients could justify early treatment. The association between the concept of ocular trauma and advanced stages of pterygium ($p = 0.003$) can be explained by the role of fibroproliferative factors in the inflammatory markers released by lesions on the ocular surface [15]. Repeated traumatisms can lead to a chronic inflammatory environment. Zidi *et al*. reported that NOS2, NF-κB and Bcl2 local inflammation play an important role in tissue damage and enhanced cellular proliferation, which leads to the pathogenesis of pterygium [18].

The rate of astigmatism in the sample of eyes examined was 65.89%, well above the prevalence of astigmatism in static ametropia among Cameroonian patients in general [19]. The astigmatogenic nature of pterygium is well described in the literature [2] [6] [20]. It is the result of the corneal anchoring of the pterygium mass with a traction effect on the horizontal meridian, responsible for regular astigmatism, and of a power proportional to the size of the pterygium and therefore to its stage [21] [22]. We found a significant variation in cylinder value between stages 1 and 2, with an increase in cylinder power at stage 2, without statis-

tically significant correlation, unlike Omgbwa *et al*. [6]. A longitudinal study could better assess the effect of pterygium on variations in corneal astigmatism in the population of patients suffering from this condition in our setting.

5. Conclusion

Pterygium remains a rare condition in our setting. This pathology mainly affects women in their forties who work outdoors. In our series, pterygium is most often bilateral and develops selectively in the nasal part of the palpebral fissure area. It is seen in its early stages in most cases and is often associated with inflammation and astigmatism.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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