

Retrospective Analysis of Corneal Ectatic Disease and Associated Risk Factors at a Tertiary Hospital in Thailand

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Abstract

Background: A study on the prevalence and related factors of corneal ectasia at the Ophthalmology department at Thammasat University Hospital. To provide public health information on ways to prevent corneal ectasia and its impact on vision impairment, blindness and other aspects of quality of life.

Methods: The study is retrospective and descriptive in nature, covering a period from 1st January 2018 to 31st December 2022 inclusive, conducted at Thammasat University Hospital.

Results: The data encompasses a total of 68 cases, with 64 (94.11%) cases attributed to keratoconus, 2 (2.94%) cases of pellucid marginal degeneration and 2 (2.94%) cases classified as unspecified corneal ectasia. The study reveals a gender distribution of 33 (48.53%) female patients to 35 (51.47%) male patients. The highest prevalence is found within the age group of 20-29 years (52.94%). Among the 68 cases, 49 individuals (72.05%) have a diagnosis of allergic conjunctivitis. 55 individuals (80.88%) have a history of eye rubbing. 23 individuals (33.82%) have documented allergic rhinitis. 18 individuals (26.47%) have a history of wearing contact lenses. 10 individuals (14.70%) have a history of obstructive sleep apnea.

Conclusion: The study provides valuable insights into the prevalence and characteristics of corneal ectatic diseases, particularly keratoconus. These insights may contribute to a better understanding of the profile of patients with corneal ectatic diseases in the specified population, facilitating improved diagnosis in terms of more prompt detection and management strategies.

Keywords: Corneal ectasia, Keratoconus

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Background

Corneal ectatic disease is a condition characterized by abnormalities in the shape of the cornea, namely thinning and changes in the regularity of the corneal surface. The consequences range from distorted vision to corneal oedema to debilitating corneal ulcers. This condition affects vision and may cause visual impairment and blindness, significantly impacting the quality of life of affected patients.

Currently, this group of disease includes three main entities: keratoconus, keratoglobus, and pellucid marginal degeneration. A study conducted by Santodomingo-Rubido et al. (2022) on the prevalence of these diseases indicated an occurrence of approximately 0.2-4790 cases per 100,000 population, with an incidence rate of 1.5-25 cases per 100,000 people per year. Diagnosis of most corneal ectatic diseases often starts around the age of 20-30 years.¹

Significant factors associated with corneal ectatic diseases include a family history of the condition, eye rubbing, atopic dermatitis, asthma, and allergies. However, research on this topic has primarily been conducted in Western and East Asian countries, with limited studies conducted in South East Asia or Thailand.

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The scarcity of studies in Thailand may be attributed to the slow-onset of the disease course and the need for modern diagnostic instruments which may not yet be widely accessible in many settings. Despite its relatively low prevalence, corneal ectatic diseases have severe consequences for patients, impacting their quality of life significantly.²

Therefore, it is believed that studying the prevalence and associated factors of corneal ectatic diseases in the hospital setting of Thammasat University Hospital, would be beneficial. This could provide possible insight on the situation and serve as a kindle for future studies of risk factors of these diseases in Thailand in the future.

Methods

Study design

The study is retrospective and descriptive in nature, covering a period from 1 January, 2018 to 31 December, 2022 at Thammasat University Hospital, inclusive. The focus of the study is on patients diagnosed with various corneal ectatic diseases, including keratoconus, keratoglobus, pellucid marginal degeneration, and cases of unspecified corneal ectasia. This research is done by evaluation of data from past medical records at Thammasat University Hospital. This study protocol was approved by The Human Research Ethics Committee of Thammasat University (MTU-EC-OP-0-016/66)

Subject

Inclusion criteria

Patients diagnosed with corneal ectatic diseases in the Thammasat University Hospital database include those diagnosed with the following entities:

Keratoconus

Keratoglobus

Pellucid marginal degeneration

Corneal ectasia

These diagnoses are based on the available medical records and diagnostic information within the hospital's database. All diagnoses of corneal ectatic diseases are confirmed by standard corneal topography measurements (OCULUS Pentacam®).

Exclusion criteria

Patients who, upon consideration of their medical history, physical examinations, and diagnostic tests, did not meet the criteria for any corneal ectatic diseases.

Study procedures

Collaboration with the Information Technology department at Thammasat University Hospital was done to request necessary information specified in the research criteria covering a period from 1st January 2018 to 31st December 2022 inclusive. Evaluation of data reliability was performed by examination of the medical history, physical examination records, and diagnostic findings specified in the medical records for the following conditions: keratoconus, keratoglobus, pellucid marginal degeneration and unspecified corneal ectasia. Data collection was done on factors that may be related to the disease, aided by past literature review, such as gender, ethnicity, age, family history, eye rubbing, asthma, atopic dermatitis, allergies, contact lens usage, abnormal tissue development disorders, previous eye surgeries, Down syndrome, developmental delay, and other relevant medical history.

Statistical analysis

The clinical characteristics and outcome data were analyzed using descriptive statistics such as percentages, medians, means and standard deviations.

Results

Between 1st January 2018 and 31st December 2022 inclusive, 68 patients were enrolled in this study, with a total of 64 (94.11%) patients attributed to keratoconus, 2 (2.94%) patients with pellucid marginal degeneration and 2 (2.94%) patients classified as unspecified corneal ectasia. The highest number of patients with corneal ectasia was in the age group of 20-29 years, accounting for 52.94% of the total number of patients. The second highest incidence was in the age group of 30-39 years, accounting for 19.11%, as shown in bar graph 1. The average age of all participants was 25.53

± 4.18 years. The average age of keratoconus patients was 20.96 ± 9.23 years. The average age of pellucid marginal degeneration patients was 29 ± 5 years. The average age of unspecified corneal ectasia patients was 40.5 ± 12.75 years. Among all participants, 51.47% were male and 48.53% were female. For patients with PMD and unspecified corneal ectasia, gender distribution was balanced between males and females (50%:50%). Similarly, for patients with keratoconus, distribution was almost equal with 51.56% being male and 48.44% being female.

In the study, the prevalence of specific comorbidities was assessed. Allergic rhinitis was reported in 33.82% of participants, while atopic dermatitis was observed in 2.94%. Interestingly, none of the participants were found to have asthma. Obstructive sleep apnea (OSA) affected 14.70% of cases, and delayed development was reported in 2.94% of cases. Notably, one out of two patients with PMD had allergic rhinitis. Furthermore, none of the participants with PMD

exhibited atopic dermatitis, asthma, OSA, or delayed development. Similarly, participants with unspecified corneal ectasia did not have allergic rhinitis, atopic dermatitis, asthma, OSA, or delayed development, as shown in Table 1.

In the context of ocular comorbidities, the findings revealed a high prevalence of allergic conjunctivitis, with 72.05% of all patients having this condition. Among those specifically diagnosed with keratoconus, 73.44% exhibited allergic conjunctivitis. Both patients diagnosed with PMD had allergic conjunctivitis. In contrast, none of the participants with unspecified corneal ectasia reported having allergic conjunctivitis. Floppy eyelid syndrome was found in a smaller subset of patients, affecting 1.47% of all patients. Notably, 25% of the total participants showed no ocular comorbidity, as shown in Table 1. There is no reported family history of unspecified corneal ectasia, pellucid marginal degeneration or keratoconus in any of the patients.

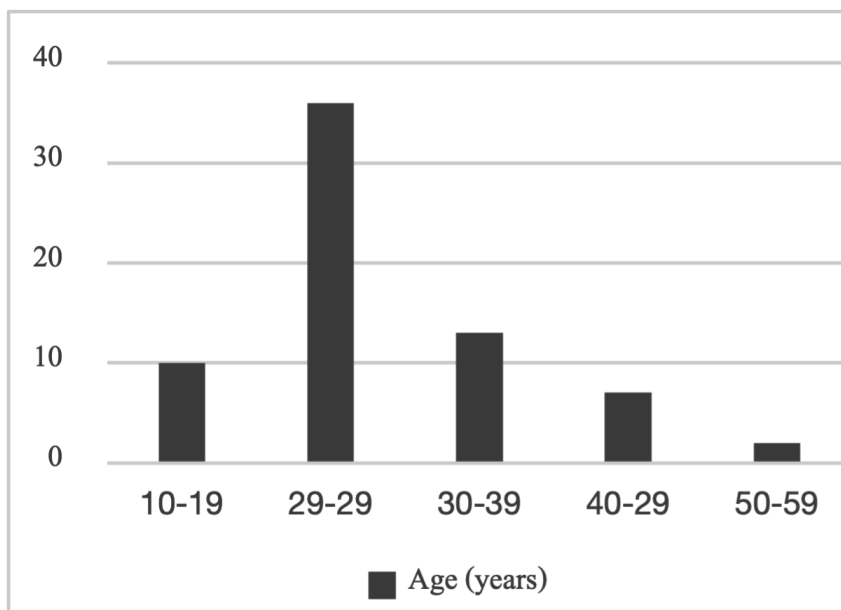


Figure 1: The number of corneal ectasia patients categorized by age group

Table 1: Summary of Demographic Characteristics of Study Patients

Characteristics	KC (n = 64)	PMD (n = 2)	Unspecified corneal ectasia (n = 2)	Overall (n = 68)
Age, year				
Mean (SD)	20.96 (9.23)	29 (5)	40.5 (12.75)	25.53 (4.18)
Median [range]	26 [11-57]	29 [24-34]	40.5 [22-59]	27 [11-59]
Gender, n (%)				
Male	33 (51.56)	1 (50)	1 (50)	35 (51.47)
Female	31 (48.44)	1 (50)	1 (50)	33 (48.53)
Comorbidity, n (%)				
Allergic rhinitis	22 (34.38)	1 (50)	0	23 (33.82)
Atopic dermatitis	2 (3.13)	0	0	2 (2.94)
Asthma	0	0	0	0
OSA	10 (15.63)	0	0	10 (14.70)
Delay development	2 (3.13)	0	0	2 (2.94)
Ocular comorbidity, n (%)				
Allergic conjunctivitis	47 (73.44)	2 (100)	0	49 (72.05)
floppy eyelid syndrome	1 (1.56)	0	0	1 (1.47)
Trachoma	0 (0)	0	1 (50)	1 (1.47)
none	16 (25)	0	1 (50)	17 (25)
Family history, n (%)				
Yes	0	0	0	0

PMD = Pellucid Marginal Degeneration

KC = Keratoconus

Table 2: Summary of associated factors of Study Patients

Associated factors	KC (n = 64)	PMD (n = 2)	unspecified corneal ectasia (n = 2)	Overall (n = 68)
Contact lens use	18 (28.13)	0	0	18 (26.47)
Eye rubbing	53 (82.81)	2 (100)	0	55 (80.88)
Previous eye surgeries	0	0	0	0

PMD = Pellucid Marginal Degeneration

KC = Keratoconus

The study, involving a total of 68 individuals, focused on identifying factors associated with corneal ectasia such as contact lens use, eye rubbing, and previous eye surgeries. Among patients with keratoconus, approximately 28.13% reported contact lens use as an associated factor, while none of the participants in the PMD group and unspecified corneal ectasia groups reported contact lens use. Eye rubbing was prevalent, with 82.81% of keratoconus patients acknowledging it as an associated factor. Both individuals with pellucid marginal degeneration (PMD) reported eye rubbing, while both patients with unspecified corneal ectasia did not, as shown in Table 2. Importantly, none of the participants in this study had undergone previous eye surgeries.

Discussion

This study is a five-year retrospective review of the prevalence of and related risk factors of corneal ectasia in Thammasat University Hospital, covering a period from 1st January 2018 to 31st December 2022. The estimated prevalence of corneal ectasia is 127 per 100,000 population and the estimated incidence of corneal ectasia is 25 per 100,000 population per year in Thammasat University Hospital. Prevalence of keratoconus is 119 per 100,000 population and the incidence of keratoconus is 23 per 100,000 population per year in Thammasat University Hospital. The prevalence of pellucid marginal degeneration (PMD) and unspecified corneal ectasia is 3.75 per 100,000 population. Literature reviews indicate substantial global variation as the prevalence and incidence rates of keratoconus have been estimated to be between 0.2 and 4,790 per 100,000 persons and 1.5 and 25 per 100,000 persons per year, with a high prevalence of keratoconus reported in the Middle East with rates of up to 4,790 per 100,000 in Saudi Arabia. Incidence rates of keratoconus from studies conducted in hospitals and clinics have been reported to be as low as 1.5 per 100,000 persons per year in Finland to over 20 per 100,000 persons per year in Asian and Middle East populations.¹

Differences between studies have been attributed to differences in geographic location and ethnicity, the definition of keratoconus and diagnostic criteria, study design, and the age and cohort of subjects assessed. However, in Thammasat University Hospital-based epidemiological data, the true prevalence of keratoconus may be underestimated since patients with corneal ectasia presenting to a hospital are likely to be those who are symptomatic with access to health care; thus early forms of the disease may be left undetected.

In this study, the highest prevalence and incidence rates of corneal ectasia, typically occurring in individuals aged from 20 to 30 years, correlate with from Santodomingo-Rubido, et al.'s review (2022). The results also indicate that corneal ectasia affects both sexes similarly, with 51.47% being male and 48.53% being female.

From review of literature, allergy and atopy have long been associated with keratoconus. This study reports the prevalence of allergic rhinitis as 33.82% and atopic dermatitis as 2.94% in individuals with corneal ectasia. However, the prevalence of asthma in corneal ectasia patients in this particular study was zero. The prevalence of asthma in individuals with corneal ectasia may be underestimated in this study due to various factors. Underdiagnosis of asthma could occur if patients are not routinely screened for respiratory conditions. Access to objective testing for asthma may also be limited. Moreover, even when objective tests are available, they do not necessarily exclude asthma, as the disease can have variable presentations and may not always be captured by standard diagnostic tests. Asthma is a complex condition with a range of clinical manifestations, and individuals may not always exhibit typical symptoms or seek medical attention for respiratory issues. Additionally, the correlation between asthma and corneal ectasia might be influenced by other various factors such as genetic predisposition, environmental factors, or shared underlying mechanisms. Asthma is also a disease which may have spontaneous improvement after adolescence and many individuals may not recall a history of childhood asthma.

A prospective study investigating the correlation between asthma and corneal ectasia would be beneficial. Diagnosis of asthma should be standardized incorporating both clinical presentation and supportive confirmatory investigations. A missed diagnosis of asthma may underestimate the actual number of corneal ectasia with asthma.

Additionally, this study reports the prevalence of keratoconus in obstructive sleep apnea (OSA) to be 14.70%. This might imply that OSA could be a factor influencing the development of keratoconus. Further prospective studies are warranted to explore more in-depth causal relationships between the two conditions.³

The study findings indicate a significant prevalence of allergic conjunctivitis, with 72.05% overall showing symptoms of this condition. Among individuals specifically diagnosed with keratoconus, 73.44% exhibited allergic conjunctivitis. Eye rubbing was also prevalent, with 82.81% of individuals with keratoconus engaging in this behavior. These findings suggest a strong association between keratoconus, allergic conjunctivitis, and eye rubbing in the studied population. Further prospective studies should be warranted to validate the association between keratoconus, allergic conjunctivitis, and eye rubbing.

Additionally, 28.13% of the individuals with keratoconus reported a history of wearing contact lenses. It might imply that contact lens wear could be a factor influencing the development of keratoconus. Some studies suggest that prolonged and improper use of contact lenses may contribute to the progression of keratoconus in susceptible individuals. Factors such as poor lens fitting, extended wear, and inadequate hygiene practices have been proposed as potential risk factors. Mechanical stress on the cornea from contact lens wear may play a role in weakening the corneal structure over time. On the other hand, many contact lens wearers do not develop keratoconus, and the majority of the normal population are able to use contact lenses without any issues.

The causes of keratoconus are likely to be multifactorial, involving both genetic and environmental factors, so further prospective studies are warranted to explore more in-depth causal relationships between risks and disease.

Study limitations

This study may have underestimated a significant portion of corneal ectasia patients as those with subclinical or early ectasia may be asymptomatic and yet to present to the clinic or have received diagnostic clinical evaluation to establish a diagnosis of corneal ectasia. Moreover, further studies that evaluate the association between aforementioned exposures or risks and disease are needed to confirm the correlation as a true causation.

Conclusion

The study provides valuable insights into the prevalence and characteristics of corneal ectatic diseases, particularly keratoconus. These insights may contribute to a better understanding of the profile of patients with corneal ectatic diseases in the specified population, facilitating improved diagnosis in terms of more prompt detection and management strategies.

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