INTRODUCTION

Vernal keratoconjunctivitis (VKC) is a severe form of chronic allergic conjunctivitis. It is a bilateral disease with males predominantly affected. It is a fairly common disease in hot and dry climates and represent as much as 3% of severe ophthalmic diseases in some of these countries. In tropical climates, a typical seasonal occurrence is uncommon and the disease tends to occur throughout the year. Like all allergic eye diseases itching is the cardinal feature.

Among the established signs of VKC, a new and consistent sign has been noted in recent years which is the presence of spotty pigmentation in the interpalpebral conjunctiva. The predominant cause of this pigmentation is inflammation as there is a direct relationship between melanocytic activity and inflammatory reaction of adjacent connective tissue because when the inflammation subsides, the melanocytic activity also decreases which is also observable clinically.

Inflammation in VKC is mediated by both an immediate and delayed hypersensitivity response. The limbus is also actively involved in the immunology of VKC as it contains melanocytes, mast cells and antigen transporting Langerhans cells (LC). It is suggested that the presence of perilimbal pigmentation may be a manifestation of the ocular surface changes reflecting the effector limb of the immune response that occurs after processing of the inciting antigen in the regional lymph nodes.

A variety of cells involved in the immune response such as mast cells and macrophages secrete proinflammatory cytokines such as histamine and others which are responsible for causing melanogenesis seen as perilimbal pigmentation.

In this study, we evaluated this sign to assess the severity of perilimbal pigmentation and compare it with age matched normal controls and to correlate with the disease duration.

METHODOLOGY

Children with symptoms and signs suggestive of VKC were enrolled in the study after informed consent from the parents. Children who attended the department for refraction or squint assessment were enrolled as controls. The study was approved by the institutional ethical committee.

The inclusion criteria were children with clinical features suggestive of vernal conjunctivitis, aged 3-15 years. Exclusion criteria were children whose eyes had ...
suffered ocular injury, eyes with seasonal allergic conjunctivitis and trachoma.

Demographic data included age, sex and residence. The age of onset of symptoms, duration of symptoms and type of symptoms were noted. The severity of symptoms was graded on a scale of 1-3. A personal and family history of other atopic diseases was recorded.

Signs were recorded on Slit lamp examination which included the tarsal papillae, limbal papillae and Horner trantas dots. Cornea was examined for presence of punctate epithelial keratitis, epithelial necrosis, shield ulcers, superficial pannus, sub-epithelial scarring and keratoconus.

The presence or absence of perilimbal pigmentation was recorded in both the controls as well as the cases. Those eyes which had perilimbal pigmentation, their extent was recorded as the number of quadrant involvement on a scale of 1-4, the density of pigmentation was noted as mild to severe on a scale of 1-3 and intensity of colour was recorded as brown to black on a scale of 1-3.

Pigmentation of the palisades of Vogt were also recorded in both the cases and controls. The extent, density and colour of palisadal pigmentation were recorded exactly on the same scale as for perilimbal pigmentation.

The colour of skin was also recorded in both cases and controls. The colour was graded as 1 (little or no tan) II (minimal tan) III (light brown) IV (brown) V (dark brown) and VI (black).17

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) 16.0 for windows. Descriptive statistics were used to describe the clinico-demographic data. Mean and standard deviations were used for numerical data and ratios for nominal data. Mann Whitney-U test was selected for performing the statistical analysis as the data was non-parametric. This test was applied to compare the extent of perilimbal conjunctival pigmentation among patients and controls and also limbal palisadal pigmentation between patients and controls. The grades of skin pigmentation between patients and controls were also analyzed using Mann Whitney-U test. A relationship between the duration of symptoms and severity of conjunctival pigmentation among patients was analyzed using Spearman’s rho test. A p-value < 0.05 was considered statistically significant.

**RESULTS**

Average age of the patients with VKC was 7.5 ± 3.3 years and for controls it was 8.6 ± 2.9 years. Male to female ratio among children with VKC was 3:1 and for controls 2:1. Among patients a personal history was positive for bronchial asthma, eczema and allergic rhinitis in 3 out of 50 patients and a family history of allergic conjunctivitis was reported in 4 out of 50 patients whereas 3 patients reported a family history of eczema and bronchial asthma.

The predominant type of vernal conjunctivitis was of the mixed type (n=30) followed by tarsal (n=14) and limbal (n=6). Among the tarsal type of vernal conjunctivitis, 5 patients had giant papillae. Limbal papillae were larger than 1 mm in 11 patients. Corneal complications were noted in only 2 patients who had a superficial pannus and punctate epithelial erosions.

Perilimbal and bulbar conjunctival pigmentation among the patients with vernal conjunctivitis and controls is described quadrantwise in Table I. There were 3 patients who had no perilimbal conjunctival pigmentation. Among the patients, pigmentation was densest at the limbus and gradually faded towards the fornices. It was light to dark brown in colour and had a fine granular appearance.

Among the controls, perilimbal conjunctival pigmentation was not seen in all 04 quadrants in any control. Only one control demonstrated pigmentation in 3 quadrants. Seven controls had pigmentation in 2 quadrants and 22 controls had only one quadrant of pigmentation. In a vast majority of controls which were 20 in number there was no perilimbal conjunctival pigmentation. The difference in the extent of perilimbal conjunctival pigmentation between patients and controls was statistically significant (p < 0.0001).

Pigmentation of the palisades of Vogt was also quantified among patients and controls. The quadrantic distribution of pigmentation of palisades of Vogt among patients and controls is described in Table II. The difference in the extent of palisadal pigmentation among patients and controls was statistically significant (p = 0.004).

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Skin pigmentation grades were also compared statistically between patients and controls and there was no statistically significant difference between skin colour among the patients and controls \((p = 0.777)\).

There was no statistically significant correlation between the duration of disease and severity of conjunctival pigmentation \((r = -0.24) (p = 0.086)\).

**DISCUSSION**

Perilimbal pigmentation in the interpalpebral conjunctiva in VKC was first reported by Rao and Padmanabhan as a new sign in the Indian population.\(^6\) In a second study carried on a cohort of Chinese patients with VKC, the presence of perilimbal pigmentation was also described as a consistent finding.\(^18\) In Pakistan, this is the first study and internationally the third study to-date with the largest number of patients and controls compared to the previous two studies.

Previous studies and the present have been carried out on the Asian population including Asians Caucasians and Mongoloids. The influence of other racial groups such as Negroids and light coloured Europeans on this pigmentation needs to be studied further as no study to-date has been reported in them.

Perilimbal pigmentation may be influenced by the severity of skin pigmentation as seen in racial melanosis of conjunctiva. In racial melanosis, this pigmentation is most intense at the limbus and tends to fade out towards the fornices whereas, in VKC this pigmentation is not only intense at the limbus but also significantly involves the interpalpebral conjunctiva up to the fornices.\(^4\) In this study the influence of skin pigmentation on conjunctival pigmentation was statistically insignificant as both cases and controls had similar skin colours.

The appearance of this pigmentation is fine, granular, discrete, dot like and multiple. The colour varies from light brown to dark brown.\(^6\),\(^18\) There is neither involvement of tarsal conjunctiva nor cornea.\(^4\) Corneal pigmentation occurs when limbal stems cells are involved\(^19\) so it might be suggested that limbal involvement in VKC does not disturb the epithelial stem cells.\(^4\) Our patients also had a similar clinical appearance.

Clinically other entities that may simulate a similar clinical picture include severe Vitamin A deficiency and chemical injury of the conjunctiva. Perilimbal pigmentation seen in Vitamin A deficiency is differentiated by the presence of Bitot spots from VKC. In chemical injury pigmentation of the bulbar conjunctiva is sometimes seen but apart from the history of trauma this pigmentation tends to have a blotchy appearance and lacks the fine granularity seen in VKC.\(^18\)

The relationship between the duration of disease and the severity of conjunctival pigmentation showed that the density does not correlate with disease chronicity. A similar result has been reported by Luk et al.\(^18\)

There is no relationship of pigmentation between age and severity of inflammation.\(^18\) The pigmentation persists even when the disease goes into remission.\(^4\)

Rao et al. have reported that perilimbal pigmentation is an early sign in VKC.\(^4\) Hence the presence of perilimbal pigmentation is a useful diagnostic sign in mild or early VKC and may help in differentiation from seasonal and perennial allergic conjunctivitis. Also making a diagnosis of VKC especially in children means long duration of treatment which can have a significant psychological impact on the parents.

Further studies are needed to compare the features of perilimbal pigmentation between the various types of allergic conjunctivitides and also evaluate whether this sign can predict the development of VKC later on in the years to follow.

**CONCLUSION**

The presence of perilimbal conjunctival pigmentation in VKC is an important sign in a cohort of Asian patients which can help in the early diagnosis of this disease.

**REFERENCES**


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