Prevalence of Allergic Conjunctivitis and Associated Comorbidities among School Going Children in Western Odisha - A Cross-Sectional Observational Study

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ABSTRACT

BACKGROUND

Allergic conjunctivitis (AC) is a common eye condition that is frequent in childhood. The prevalence of allergic diseases in children aged 6 to 14 years varies significantly from 0.3 % to 20.5 %, and is gradually increasing.[1] It is associated with several allergic diseases affecting the ocular surface and it is the most common ocular condition encountered in clinical practice. This study was conducted to determine the prevalence, ocular manifestations of allergic conjunctivitis, and associated comorbidities among school-going children in Western Odisha.

METHODS

A total of 1502 children from 10 schools of Burla, participated in this cross-sectional observational study. Data collection started in September 2018 up to September 2019. All the children underwent meticulous history taking for symptoms of allergic conjunctivitis and any other associated comorbidities, a structured validated questionnaire was used to collect demographic and medical data. Visual assessment, and slit-lamp examination were done to look for signs of allergic conjunctivitis and any associated complications. Interpretation and data analysis was done using Epi Info Software and a chi-square test was used to analyse significant associations among categorical variables.

RESULTS

The prevalence of allergic conjunctivitis was found to be 29.16 % with a males to female ratio of 1.02: 1. Children aged 13 – 16 years recorded the highest number of cases which was 43.60 %. The commonest presenting symptom was itching (100 %), Papillae were the most frequent sign (97.71 %), Seasonal allergic conjunctivitis (SAC) was the most common type of AC reported (59.36 %), and allergic rhinitis (17.8 %) was the most common associated comorbidity.

CONCLUSIONS

The prevalence of Allergic conjunctivitis is high among children aged 5 - 16 yrs. There is a lack of treatment seeking behaviour inspite of such high frequency. Early identification & treatment of patients would help curb complications, improve the child's quality of life and thus the ophthalmic health of the community.

KEYWORDS

Allergic Conjunctivitis, Ocular Comorbidities, SAC

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BACKGROUND

Allergic conjunctivitis (AC) is an inflammation of the conjunctiva due to an allergen.[2-4] Ocular allergy is a collection of ocular surface disorder that ranges from more prevalent non-sight-threatening conditions like seasonal allergic conjunctivitis (SAC), perennial allergic conjunctivitis (PAC), and giant papillary conjunctivitis (GPC) to less prevalent sight-threatening ones such as vernal keratoconjunctivitis (VKC) and atopic keratoconjunctivitis (AKC).[1]

SAC and PAC belong to mild-to-moderate allergic diseases, often associated with allergic rhinitis, involving an IgE mediated hypersensitivity reaction while VKC and AKC are severe chronic inflammatory diseases with more complex pathogenesis that includes a T-helper-mediated response.[1,5]

AC causes ocular discomfort which includes itching, redness, foreign body sensation, burning sensation, watering together with lids, and conjunctiva oedema. Its Pathophysiology is an irritation or inflammation of the conjunctiva due to allergens like pollen or mould spores, dust, animal dander, cosmetics, perfumes, etc. since conjunctiva is easily accessible for the allergens to cause an allergic reaction and produce aforementioned symptoms**.** Allergen renter damages the conjunctiva and degranulation of conjunctival mast cells take place which releases histamines that promotes vasodilation and oedema.[6,7]

Histamine is the principal mast cell mediator in allergic disease and along with other mediators responsible for itching, conjunctival congestion, lacrimation, and a wide variety of sequelae of inflammation in the eye. It binds with the H1 and H2 receptors on the target tissue cell surfaces. Binding to H1 receptors results in vasodilatation and increased blood vessel permeability that causes clinically evident conjunctival hyperaemia, chemosis, and burning sensation.

It also causes pruritus and foreign body sensation. Binding to H2 receptor results in mucus secretion due to goblet cells stimulation and this causes profuse thick mucus ropy discharge which is characteristic of VKC. There also occurs reflex stimulation of the accessory lacrimal glands by histamines leading to profuse watering. Inflammation of the eye, dilation of blood vessels of the eye, swelling, redness, exudates, and discharge which causes Allergic conjunctivitis.

The prevalence of AC is surprisingly high and it is presumed to be the most common allergic disorder. Currently, it is estimated that at least 20 % of the general population suffers from some form of allergic conjunctivitis.[5] This is because of rapid urbanization, industrialization, increased air pollution, and dry eye syndrome.[8]

Allergic conjunctivitis is often under-diagnosed and consequently undertreated. These symptoms would almost invariably affect academic performance and the vision-oriented quality of life of victims resulting in morbidity and loss of productivity.[9–14]

Hence this study was conducted to assess the prevalence, ocular manifestations of allergic conjunctivitis, and associated comorbidities along with ocular allergy amongst school children of the 5 – 16 years of age group.

METHODS

Study Design

A total of 1502 school going children between 5 - 16 years of age participated in this community-based cross-sectional, observational study which was conducted for a period of one year from September 2018 to September 2019. Prior permission was taken from school authorities about the visit and appropriate arrangements were made for examination of children with help of school staff.

Study Area

The population of Burla was 46698 and the children population was 4837 (10.36 % of total population) as per 2011 census. The total number schools in Burla town is 23 with 5624 enrolment. Out of this 23, 10 schools were selected by simple random sampling. 1502 students from this 10 schools were selected on the basis of simple random sampling, 150 from each school and 15 students from each class (class I to X)

Sample Size

The following formula was used to calculate the sample size for this prevalence study,

$$n \geq z^2\, p(1-p)/d^2$$

Where p is taken as 21.0 %,[15] absolute precisions as 10 % and Z score which is 1.96 at 95 % Confidence interval. After putting the values, sample size came out to be 1446.

P is the expected prevalence that is obtained from a study conducted by Annamalai T.T. et al., P = 19.1 %, CI (14.4 % - 23.8 %)

Exclusion Criteria

Children unwilling to participate in the survey or absent at the time of visit were excluded.

Study Method

A structured validated questionnaire was used to collect the history, demographics and medical data, family history, and atopy history of the subjects. Visual acuity was assessed by the Snellen's chart.[16] This was followed by a comprehensive examination of the anterior and posterior segment of the eye using a hand-held slit lamp bio microscope and a direct ophthalmoscope respectively. Allergic conjunctivitis was diagnosed based on symptoms like bilateral itchiness, redness, and either burning sensation, foreign body sensation, watering, ropy mucinous discharge, or photophobia. The ocular signs include papillae on the upper tarsal conjunctiva, conjunctival congestion and chemosis, gelatinous limbal thickening and brownish limbal hyperpigmentation in chronic cases, visible horner tranta spots.[17,18]

In the present study, ocular allergy is defined as the one, if a subject had more than three months of eye-itching

reported in the last 12 months.[19] However, to reduce errors related to memory bias, only the symptoms were considered that occurred in the last 12 months.

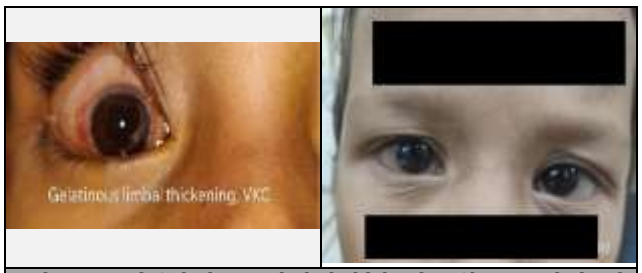

Figure 1. A) Gelatinous Limbal Thickening Characteristic of Bulbar Type of VKC; B) A Thickened Fold of Skin of Eyelids Known as Dennie-Morgan Fold Which Occurs Due to Habitual Rubbing of Eyes Which is the Major Outcome of Itchy Eyes and a Symptom of Allergic Conjunctivitis

Data Analysis

Statistical software- SPSS version 12 / MS-EXCEL was used to calculate the study's sample size and also to analyse the collected data. To determine significant associations in the categorical variables (allergic conjunctivitis, gender, and age-group), chi-Square (× 2) test was used. Statistical significant difference was taken at 5 % error ($P < 0.05$). The results were interpreted through the graphical and tabular presentation.

RESULTS

In our study, among 1502 school-going children, 864 (57.5 %) were males while 638 (42.5 %) were females with the female: male ratio being 1: 1.02. Subjects' ages ranged from 5 to 16 years (mean ± SD, 9 ± 0.72 years).

Prevalence of Allergic Conjunctivitis (Fig 2)

The prevalence of AC in school going children was found to be 29.16 % i.e., 438 out of the 1502 children had AC. The prevalence by age and gender has been clearly shown in Fig 1. Out of the 438 diagnosed cases of AC, 53.42 % (234) were males while 46.58 % (204) were females. Children between 13 and 16 yrs. of age group recorded the highest number of cases i.e., 43.60 % (191 out of 438). Sex wise, the prevalence of AC in males (53.42 %) was more than in females (46.57 %).

Frequency of Various Signs and Symptoms of AC (Fig 3 & 4)

In our study, itching and frequent eye rubbing were the most common symptoms reported by all the subjects, and redness being the second most common. Among the children with AC, redness being the second most common. (Fig 2). Papillae on the upper palpebral conjunctiva were found to be the most frequent sign present in 428 (97.71 %) majority of the cases, followed by conjunctival congestion in 220 (50.22 %), superficial punctuate keratitis in 139 (31.73 %), gelatinous limbal thickening in 80 (18.26 %), Horner Tranta dots in 64 (14.61 %), phlyctenular nodules in 24 (5.4 %) and pseudogerontoxon being the least frequent sign seen in only 24 (5.4 %) of children. (Fig. 3).

Frequency & Prevalence of Different Types of AC (Fig 5)

Simple allergic conjunctivitis was the most common type of AC reported in children with a prevalence of 59.36 % (260 children) followed by Vernal keratoconjunctivitis which was 31.05 % (136 children), few reported with phlyctenular conjunctivitis i.e., 5.47 % (24 children) and Atopic keratoconjunctivitis prevalence were least (4.10 %) among all. (Fig. 4).

Associated Comorbidities Along with Ocular Allergy (Fig 6)

It was observed that 17.8 % of the subjects had allergic rhinitis and some children (5.5 %) had associated dermatitis along with ocular allergy; while asthma was found in only two children representing 0.4 % of total. Almost 76.3 %, nearly 3 / 4th of total reported number of associated comorbidities.[12,13] The frequency of associated comorbidities has been depicted in Fig 5.

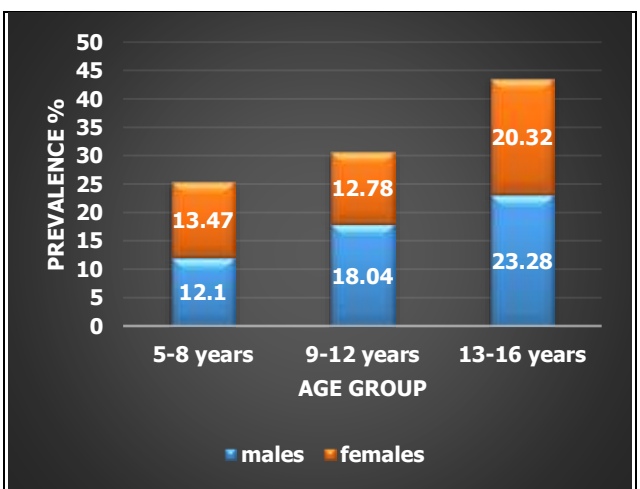

Figure 2. Prevalence of AC by Age and Gender

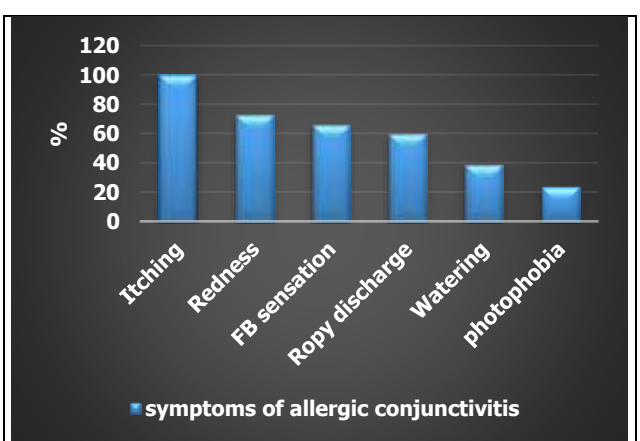

Figure 3. Frequency of Various Symptoms of Allergic Conjunctivitis

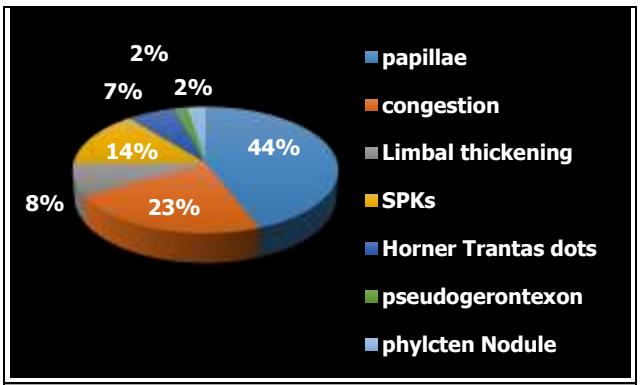

Figure 4. Frequency of Various Signs of Allergic Conjunctivitis

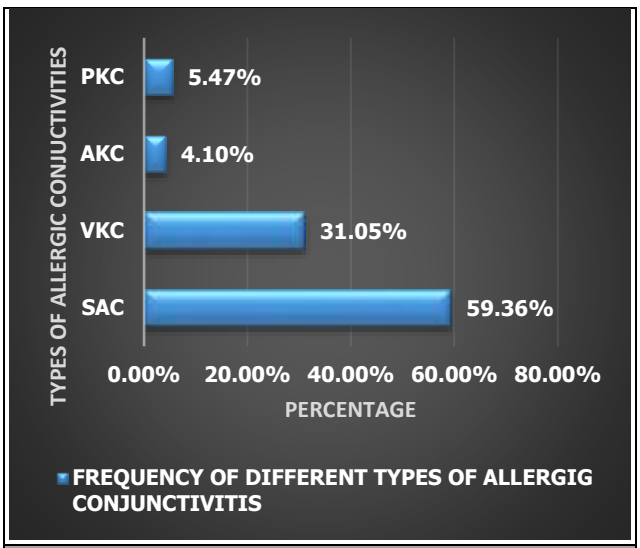

Figure 5. Frequency of Different Types of Allergic Conjunctivitis

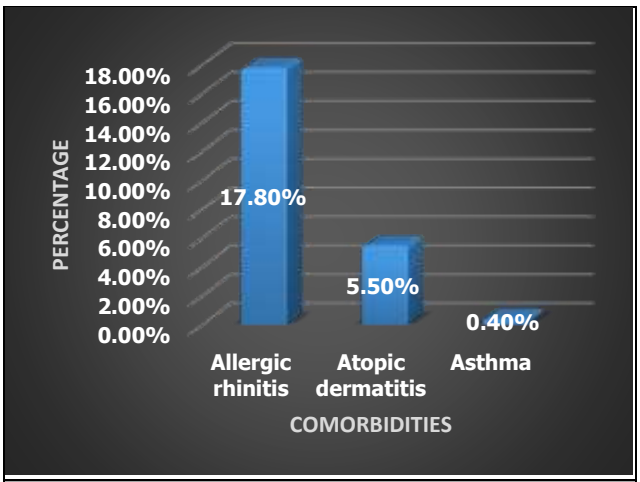

Figure 6. Associated Comorbidities Along with Ocular Allergies

DISCUSSION

Allergies affect 10 to 20 % of the population.[4,1] Conjunctiva is easily accessible for the allergens to cause an allergic reaction and produce symptoms. Although the burden of allergic conjunctivitis is high, ranging from 15 to 20 %.[2,4,20,21] it is frequently overlooked by patients and this condition remains underdiagnosed in a majority of the population.[5]

In our study, the prevalence of allergic conjunctivitis in school children was found to be 29.16 %. Prevalence of AC in males (53.42 %) was more than in females (46.57 %). This aligns with several studies[18,22,23] except for Mar back et al.[24] who found the results opposite. Though the question of which gender was more predisposed to AC is a controversial one the differences in the genetic composition of both the sexes could probably be responsible for the observed difference.[25] Moreover there was greater involvement of boys in outdoor activities as compared to girls.

Itching is frequent and almost invariably indicates that the inflammation of the conjunctiva is allergic in origin.[3] In our study, itching and frequent eye rubbing were the most common symptoms reported by all the subjects, and redness being the second most common.

Other studies such as by Payal kohl et al., G. Nageswarrao et al., Yanqingfeng et al., also suggested similar findings.

Among associated comorbidities along with an ocular allergy, allergic rhinitis was found to be the most frequent one accounting for 17.8 %. Other studies by Payal kohl et al. (23.8 %) and Yanqingfeng et al. (40.4 %) also supported our results.

Children and their parents should be made aware of the consequences of neglecting their ward's ocular health; they can also be taught simple cost-effective measures like cold compression for getting the relief of the symptoms.

Patients should be educated about the following practices: -

- One should avoid rubbing the eyes. If itching is bothersome, use artificial tears, a cool compress, or antihistamine eye drops.
- The patient should be advised to minimize exposure to pollen by staying inside when possible during the peak.
- Children should be taught to wash their hands after touching the eyes, coughing, or sneezing.
- Children should also be taught not to share their handkerchief with fellow mates.

Patients with year-round allergic conjunctivitis should consider consulting an allergy specialist to determine which allergens are responsible for their symptoms[26] (e.g., dust mites, others).

CONCLUSIONS

The prevalence of allergic conjunctivitis is high among school going children, but they are overlooked or under-diagnosed because of a lack of treatment-seeking behaviour. There is no specific treatment for conjunctivitis, good hygiene and timely intervention with safer drugs and educating patients plays a major role in minimizing complications related to allergic conjunctivitis.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.
Financial or other competing interests: None.

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