

## Research Article

## The Impact of Spring Catarrh in Healthcare Facilities with Limited Resources

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### Abstract

**Background:** Pediatric Vernal Keratoconjunctivitis (VKC) is a prevalent allergic condition that, if left untreated, can lead to adverse outcomes. As a result, the purpose of the present study was to investigate

the impact of resource-constrained health settings on spring catarrh outcomes.

**Methodology:** We conducted this prospective descriptive study between January 1, 2024, and March 25, 2024. The research investigation was conducted at the Doctor Khalil Clinic in El-Obeid, North Kordofan, Sudan. This study encompassed individuals who were under the age of 17. Individuals who were older than 17 years of age were excluded from the study.

**Results:** The majority of patients, accounting for 85.6%, exhibited recurrent VKC, while the remaining 14.4% of patients presented for the first time. We detected discharge in 31.9% of patients, which led to darkening in both eyes for 95% of them. Furthermore, papillae were observed in 31% of both eyes. About 71.9% of patients experienced pseudogerontoxon, which affected both eyes. 16.3% of patients experienced corneal opacity in both eyes, 4.4% in the right eye, and 3.8% in the left eye. Shield ulcer infection was observed in 1.9% of patients bilaterally and in 1.3% of patients bilaterally. The prevalence of keratoconus in individuals is 5%, with the highest occurrence observed in the left eye, followed by the right eye, and in both eyes, accounting for 50%, 38%, and 12%, respectively. Conclusion: Pediatric VKC is prevalent in Sudan, despite the fact that adverse outcomes are relatively uncommon. The country's limited resources contributed to the recurrence of the disease. Males are more likely to experience VKC, which typically manifests before the age of 5 years.

**Keywords:** Corneal opacity; Keratoconus; Shield ulcer; Spring catarrh; Vernal keratoconjunctivitis

### Introduction

VKC is a debilitating ocular allergy condition that causes conjunctiva and corneal inflammation and may cause blindness. The disease primarily affects children in humid, mild climates. Managing VKC clinical presentations improperly can cause problems and corneal damage. Around 55–60% of VKC patients had allergen sensitivity, specific serum IgE, or specific tear IgE. These data demonstrate that both IgE-mediated and non-IgE-mediated pathways cause VKC [1].

Recurrent conjunctival allergic irritation can affect both eyes. These incidents often occur seasonally. Early in the disease, especially in the milder months, seasonal exacerbations are common. Eventually, the condition becomes perpetual. Allergic conjunctivitis includes verrucous keratitis. Many other forms exist, including atopic keratoconjunctivitis, giant papillary, permanent and seasonal rhinoconjunctivitis, and others. Palpebral, limbal, and mixed VKC are the main types by eye area [2].

Allergic conjunctivitis is prevalent, often ignored, and most often noncancerous. Allergic conjunctivitis has become one of the most common clinical diseases over the past decade. The complicated causes of allergic conjunctivitis include hereditary vulnerability, inflammatory reactions, air pollution exposure, atopy, pollen contact, and domesticated animal contact. Allergic conjunctivitis can lead to

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keratoconjunctivitis, affecting eyesight. Though it rarely affects vision, it can lower patients' quality of life [3].

The well-being of individuals impacted by VKC has experienced a notable decline. An extremely severe outcome in the latter stages is the development of a shield ulcer, which, if not treated, leads to irreversible blindness [4]. Despite the high prevalence of VKC in most regions of Sudan, there is a dearth of literature on the topic. Consequently, the purpose of this research was to determine whether and how health facilities with restricted resources influence the outcomes of spring catarrh.

## Materials and Methods

We conducted this prospective descriptive investigation between January 1, 2024, and March 25, 2024. The research investigation was carried out at the Doctor Khalil Clinic located in El-Obeid, North Kordofan, Sudan. This study encompassed individuals who were 17 years of age or younger. The study excluded individuals who were 18 years of age or older. The study included all children who had symptoms and signs of spring catarrh, irrespective of their gender or other medical issues.

**Ethical consent:** One or both parents provided their consent for their child to participate in the study.

**Ethical approval:** The Human Research Ethics Committee at MRCC granted approval for this study's proposal (Approval Number: HREC 0007/MRCC.3/24).

**Statistical analysis:** Data sets were imported into the statistical package for social sciences (SPSS Inc., Chicago, IL, version 24), from which the results were derived. The chi-square test deemed P-values less than 0.05 significant.

## Results

This study examined 160 children aged 4 to 17 years, with an average age of 10 years. The majority of patients were aged 7-9 years, followed by age groups 10-12 and 13-15, which represented 45/160 (28%), 41/160 (26%), and 33/160 (21%), respectively. Males and females had approximately comparable age distributions. Out of 160 patients, 110 (69%) were males and 50 (31%) were females, yielding a male-female ratio of 2.20:1.00. The vast majority of patients came with both eyes afflicted, as seen in (Table 1 & Figure 1).

Variable	Males	Females	Total
<b>Age</b>			
≤6 years	18	7	25
7-9	31	14	45
10-12	31	10	41
13-15	21	12	33
≥16	9	7	16
Total	110	50	160
<b>The affected eye</b>			
right	1	1	2
left	2	0	2
both	107	49	156
Total	110	50	160

Table 1: Distribution of the cases by sex, age, and affected eye.

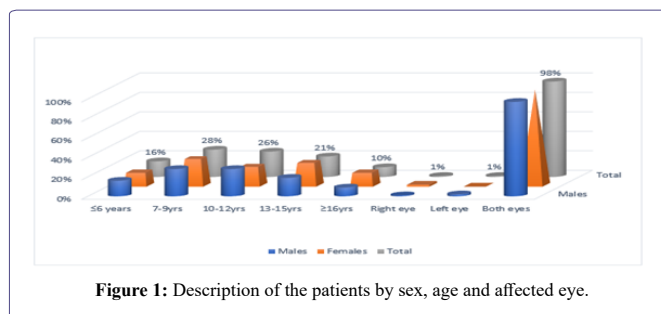


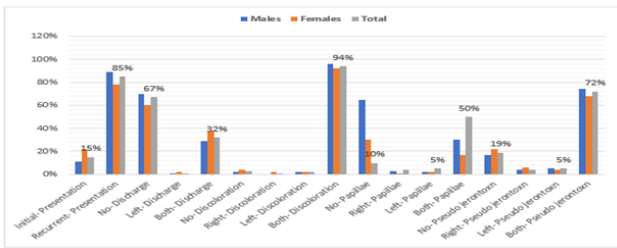
Figure 1: Description of the patients by sex, age and affected eye.

The distribution of the study subjects by sex and clinical presentation was summarized in (Table 2 & Figure 2). Most patients presented with recurrent VKC, representing 137/160 (85.6%), and the remaining 23 (14.4%) patients presented for the first time. Discharge was observed in both eyes in 51 (31.9%) patients; hence, discoloration was experienced in both eyes in 152 (95%). Moreover, papillae were seen in both eyes, 50 (31%). Pseudogerontoxon was detected in both eyes in 115 (71.9%) patients (see image 1).

Variable	Males	Females	Total
<b>Presentation</b>			
Initial	12	11	23
Recurrent	98	39	137
Total	110	50	160
<b>Discharge</b>			
No	77	30	107
Left	1	1	2
Both	32	19	51
Total	110	50	160
<b>Discoloration</b>			
No	2	2	4
Right	0	1	1
Left	2	1	3
Both	106	46	152
Total	110	50	160
<b>Papillae</b>			
No	71	30	101
Right	3	1	4
Left	3	2	5
Both	33	17	50
Total	110	50	160
<b>Pseudogerontoxon</b>			
No	19	11	30
Right	4	3	7
Left	6	2	8
Both	81	34	115
Total	110	50	160

Table 2: Distribution of the study subjects by sex and clinical presentations.

Around 26 (16.3%) patients had corneal opacity in both eyes, 7 (4.4%) in the right eye, and 6 (3.8%) in the left eye. Three (1.9%) patients in both eyes and two (1.3%) in the right eye reported shield ulcers. About 5% of the patients, representing 4 (50%), 3 (38%), and 1



**Figure 2:** Description of the study subjects according to sex and clinical presentations.



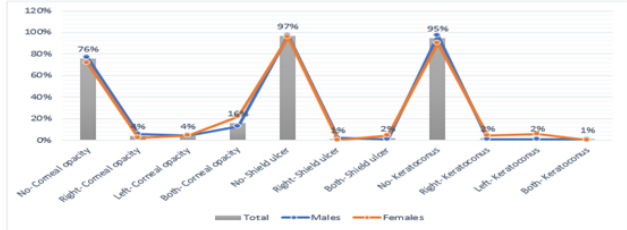
**Image 1:** Showing bilateral Pseudogerontoxon.

(12%), respectively, had keratoconus, most commonly in the left eye, followed by the right eye, and in both eyes (Table 3 & Figure 3).

Variable	Males	Females	Total
<b>Corneal opacity</b>			
No	85	36	121
Right	6	1	7
Left	4	2	6
Both	15	11	26
Total	110	50	160
<b>Shield ulcer</b>			
No	107	48	155
Right	2	0	2
Both	1	2	3
Total	110	50	160
<b>Keratoconus</b>			
No	107	6.45	152
Right	1	2	3
Left	1	3	4
Both	1	0	1
Total	110	50	160

**Table 3:** lists the study subjects according to clinical changes in the cornea.

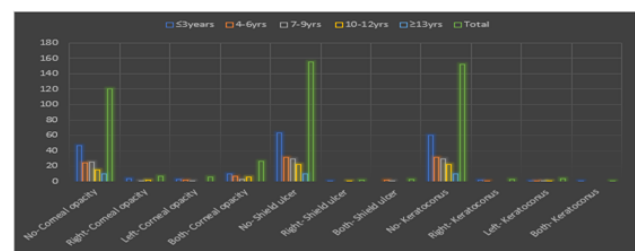
(Table 4 & Figure 4) summarized the study's patients' distribution based on clinical abnormalities in the cornea of the eye and age at the beginning of the disease. Corneal opacity was most common in individuals aged  $\leq 3$  years, followed by 4-6, 10-12 years, and 7-9 years, with 17 (27%), 9 (27%), 8 (35%), and 5 (17%) cases, respectively. Shield ulcers were more common among children aged 4-6 years, accounting for 2/3 (67%). Keratoconus was more prevalent in children under the age of three (25%) (see image 2).



**Figure 3:** Proportionality of clinical changes in the cornea of the eye.

Variable	$\leq 3$ years	4-6yrs	7-9yrs	10-12yrs	$\geq 13$ yrs	Total
<b>Corneal opacity</b>						
No	47	24	25	15	10	121
Right	4	0	1	2	0	7
Left	3	2	1	0	0	6
Both	10	7	3	6	0	26
Total	64	33	30	23	10	160
<b>Shield ulcer</b>						
No	63	31	29	22	10	155
Right	1	0	0	1	0	2
Both	0	2	1	0	0	3
Total	64	33	30	23	10	160
<b>Keratoconus</b>						
No	60	31	29	22	10	152
Right	2	1	0	0	0	3
Left	1	1	1	1	0	4
Both	1	0	0	0	0	1
Total	64	33	30	23	10	160

**Table 4:** Study subjects by clinical changes in the cornea of the eye and age of the disease onset.



**Figure 4:** clinical changes in the cornea of the eye by the age of the disease onset.



**Image 2:** Showing Manson's Signs of Keratoconus.

## Discussion

This investigation examined the effects of the VKC on children residing in the resource-constrained state of North Kordofan, Sudan. According to the results of the current investigation, VKC has a substantial impact on males (69%). A similar result was recently reported in a meta-analysis that assessed the effectiveness of medical interventions for VKC [5,6]. With a 3:1 ratio, the disease is more prevalent in males than in females; however, this disparity may diminish as the age of onset increases [7].

In these cases, pseudogerontoxon, discoloration, papillae, and discharge constituted the most prominent clinical manifestations. Numerous patients with atopic keratoconjunctivitis or limbal vernal syndrome exhibit a pseudogerontoxon lesion, resembling a minor segment of gerontoxon or arcus senilis. It is a significant clinical finding because pseudogerontoxon frequently represents the sole clinical indication of prior allergic ocular disease [8]. The symptoms of VKC often include red eye, dry eye, a searing sensation in the eyelid, a swollen eyelid, a foreign body sensation, and photophobia. Lid edema, chemosis, tarsal papillae, Horner-Trantas-Dots, brownish discoloration of the irises, darkened eyelids, limbal infiltrates, and tarsal papillae are the most frequent indications of VKC [9,10].

We observed corneal opacity in approximately 17% of the patients in this series. Despite extensive scientific investigation and advancement over several decades, corneal opacity continues to be the primary cause of reversible blindness on a global scale [11]. Corneal opacity is a prevalent clinical issue that actively hinders the cornea's ability to transmit light [12].

The prevalence of shield ulcers among the patients in this study was 1.9%. The occurrence of corneal shield ulcers is infrequent, although they pose a significant risk to visual acuity in cases of VKC [13]. Shield ulcer represents a more severe manifestation of VKC. Approximately 3% to 11% of individuals diagnosed with VKC experience shield ulcer, a relatively rare and debilitating corneal manifestation. Patients may exhibit significant pruritus, photophobia, and ocular exudate with a viscous consistency. The consideration of shield ulcer, an infrequent complication of VKC, is crucial for people afflicted with this condition [14]. Surface punctate keratitis-associated VKC disrupts the corneal epithelium, leading to shield ulcers. The pathophysiology of VKC-associated shield ulcers has been explained by the mechanical and toxin hypotheses. The mechanical hypothesis suggests that the presence of gigantic papillae on the upper tarsal conjunctiva causes corneal abrasion, thereby explaining the prevalence of superior shield ulcers [15].

The prevalence of keratoconus in patients is 5%. Keratoconus is a corneal illness that is ectatic in nature and is distinguished by the gradual thinning of the corneal stroma, uneven astigmatism, and impaired visual function. The manifestation of the condition can be either unilateral or bilateral, exhibiting asymmetry. The disease originates throughout puberty and can either swiftly advance to an advanced stage or cease if it begins later and progresses slowly. Kids with keratoconus are more likely to be aggressive than adults with the condition. This is because of a number of factors, such as the disease progressing quickly, being in an advanced stage when it is diagnosed, and having other health problems [16]. Keratoconus represents a prevalent complication associated with VKC. Keratoconus can manifest in as many as 26.8% of patients with VKC, while up to 71% of them may develop aberrant corneal topography. It is more

severe and advances more rapidly in the presence of VKC (P 0.05), accompanied by a marked decline in vision and a greater propensity for keratoplasty [17].

In accordance with the age of onset, the prevalence of VKC is considerably lower in the younger age group and substantially higher in the older age group. While we were unable to locate a study that explicitly examined the age of onset in pediatric patients, the participants in one study ranged in age from 1 1/2 to 30 years. VKC of adult onset affected 10.4% of all patients [18]. This indicates that the onset of the disease decreases with age.

In conclusion, in Sudan, pediatric VKC is prevalent. Patients with VKC have dismal outcomes, despite the country's poor healthcare facilities. VKC is more common in boys and often manifests before the age of five. Additional research in this field is necessary to further understand the impact of spring catarrh in Sudan.

## Author Contributions

**Khalil Ali Ibraheim:** Conception, administration, analysis, drafting, approval of the final version

**Hassan Mohammed Musa:** Conception, design, data acquisition, practical part, approval of the final version.

**Hassan Yousif Adam Regal:** Conception, analysis, drafting, practical part, approval of the final version.

**Ekhlas Alrasheid Abuelfadol:** Conception, design, data acquisition, approval of the final version.

**Inaam Eloshary Mohammed Hayaty:** Conception, analysis, drafting, approval of the final version.

**Ahmed Abdelkerim Ahmed Abdallah:** Conception, analysis, drafting, approval of the final version.

**Salah Eldinn Eltahir Gdmaa:** Conception, analysis, drafting, approval of the final version.

**Mahadi Musa Mohammed Abdallah:** Conception, analysis, drafting, approval of the final version.

**Rogeia Mahmoud Niyle:** Conception, analysis, drafting, approval of the final version.

**Hussain Gadelkarim Ahmed:** Consultation, analysis, drafting, approval of the final version.

## Conflict of interest

Authors declare no conflict of interest.

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## Data Availability

The available from the correspondence author. Email: Hussain-gad5@gmail.com.

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