

The effect of COVID-19 imposed lockdown on Italian children with Vernal Keratoconjunctivitis

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To the Editor,

Vernal keratoconjunctivitis (VKC) is a rare inflammatory-allergic disease of the cornea and conjunctiva¹. Immunologic, genetic² and environmental factors³, such as light exposure, have been supposed to play a role in the pathogenesis of ocular inflammation and in the worsening of VKC. In fact VKC prevalence is highest in sunny and hot places and it is almost absent in countries with short sunlight exposure, supporting the hypothesis of a pathogenic role of sunlight exposure in the development of this condition^{4,5}. Theoretically, in order to estimate the real impact of sunlight exposure in the pathogenesis of VKC, patients should not be exposed to sunlight. In real life, this would have remained an impossible scenario to reproduce, until the lockdown period imposed by the Italian Government to tackle the SARS-CoV-2 pandemic. In fact, children in Italy remained confined to their homes from March 5th to the end of May 2020 when free movement was re-admitted. Italian children, forced to stay indoor, spent many hours in front of bright screens which entails combination of watching TV, playing video games, and/or using smartphone and PC, also due to the E-learning initiatives.

The purpose of this study was to evaluate the “lockdown effect” on VKC, that is to verify if the subjects who were forcibly sheltered from sunlight showed VKC symptoms anyway; in addition, we investigated whether the hours spent in front of the light produced by the bright screens influenced the extent of the symptoms, in condition of almost zero sunlight exposure.

As reported elsewhere⁶, in the Vernal Keratoconjunctivitis Multidisciplinary Outpatient of Bambino Gesù Children’s Hospital clinical data, instrumental ophthalmological objectivity, and quality of life are systematically collected. We retrospectively reviewed the data of patients with VKC evaluated from June 2020 to July 2020, which had already been visited from March 2019 to July 2019. Children and adolescents aged between 5 to 12 years with previous diagnosis of VKC, based on clinical history and slit lamp examination of the anterior segment of the eye (presence of mild to severe giant papillary reaction at the upper tarsal conjunctiva and/or at limbus and/or presence of Horner-Trantas dots), were included. All patients were diagnosed in both years before starting any specific therapy, except unsuccessful topical antihistamine treatment. Only four patients were in continuous treatment with immunosuppressive eye drops due to the presence of chronic symptoms: three used topical cyclosporine A and one topical tacrolimus eye drops.

Caregivers were asked for the availability of a garden in their homes and for the number of hours per day spent in front of a bright screens.

Subjective symptoms were evaluated by a predefined 0-to-10 Visual Analogue Scale (VAS) to score the presence of photophobia, tearing, ocular itching and mucous ocular secretions and a VAS total score was calculated (from 0 to 40).

Clinical severity of VKC and Health Related Quality of Life (HRQoL) were evaluated according to Bonini grading scale and to Italian version of the QUICK questionnaire, respectively^{7,8}.

The study was authorized by our local Ethics Committee.

Statistical analysis was performed using the statistical software R (R Core Team, version 4.0.3). Changes in the overall distribution according to clinical severity (Bonini grading scale) were analyzed by Fisher’s exact test. Linear mixed effect regression models were devised using the *lme4* package to measure the effects of different parameters (hours of E-learning, difference in average time spent in front a computer screen between 2020 and 2019, and availability of a garden) on pain and HRQoL, with each subject being included as a random variable. Statistical significance was set at $p < 0.05$.

Twenty-nine male subjects (mean \pm SD age: 8.74 ± 2.40 years) with VKC were included in the study. No statistically significant effects were found for any of the “surrogate” markers of light exposure (Symptom Δ across years, garden available, Δ screen time between years) regarding total VAS (table 1). Similarly, no statistically significant effects were found for changes in Total Quick score between 2019 and 2020 in regard to the variables included in the study (table 2). Overall, the severity of symptoms, as expressed by the

Bonini grading scale, did not significantly differ between 2019 and 2020 ($p = 0.2725$) (table 3). However, we expected these results because we visited the patients in both years during the active phase of the VKC.

In order to verify whether the subjects who were forcibly sheltered from sunlight had the symptoms anyway, we excluded from the analysis patients who have a house with a garden (4/29) and which may have been exposed to sunlight anyway.

Overall, 10 patients (34.4%) benefited from the lack of exposure to sunlight because presented symptoms only upon re-exposure to it and no one had more severe symptoms than the previous year. Indeed, one half of the patients had milder symptoms when reported an increase in hours in front of bright screens [?] 4 times compared to 2019 (average increase 1.35 hours/day); with a 4+ times increase, patients experienced symptoms of the same entity of the previous year (average increase 5.75 hours/day), effectively eliminating the beneficial effect of the lack of exposure to sunlight.

Interestingly, also in the patients with VKC recurrence during lockdown period (15/25) the number of hours spent in front of light sources seem to be a determinant factor of worsening of symptoms. In fact, in 73.3% (11/15) an average increase of 4.09 hours is related to symptoms more severe or of the same severity of the previous year. Furthermore the six patients (24%) who complain more severe symptoms in 2020 spent more hours in front of light screens than in 2019 and compared to patients who had milder symptoms in 2020.

To the best of our knowledge, this study is the first which aimed at evaluating the impact of sunlight and light bright screens on VKC: only in VKC-like Disease adult patients with more vision-related activities (computer, photography) was reported the worst productivity index during the active phase of the disease⁹.

During lockdown period 93.6% of people experienced an increase in their digital device usage per day: the students have logged an average increase in usage of digital devices of 5.18 ± 2.89 hours per day with a statistically significant increase in number, frequency and intensity of digital eye strain symptoms since the lockdown was declared¹⁰.

These data are in line with ours: in fact, even our patients spent a mean of 1.95 ± 1.79 hours/day using PC or bright screens in 2019 and 4.14 ± 2.49 hours/day in 2020 ($p = 0.048$). Interestingly, also in our study this resulted in a worsening of ocular VKC symptoms (6/25) or at least symptoms of the same severity as in spring 2019 (11/25) even in those who, thanks to the reduced exposure to sunlight in spring 2020 compared to that of 2019 (0 months against 3 months) had managed to have no symptoms until re-exposure to sunlight (5/11).

We can conclude that exposure to non-specific triggering factors such as sunlight and bright light screens is a favoring factor for conjunctival inflammation in VKC. Our results suggest that use of sunglasses, hats with visors and swimming goggles should be recommended, as well as the reduction of time spent in front of bright light sources such as smartphones, computers, television in children with VKC.

KEYWORDS : Allergy diagnosis; Quality-of-Life; Vernal Keratoconjunctivitis

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