



COVID-19 and children's eyes

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KEYWORDS

Severe acute respiratory syndrome coronavirus 2, COVID19 virus, eyes, eye manifestation, children, pediatrics

Dear Editor

I read with great interest the recent paper by AlShamlan et al. entitled “Myopia progression in school children with prolonged screen time during the coronavirus disease confinement” [1]. While the study is valuable, I would like to reflect on some issues that would define the scope of future studies on COVID-19 and children's eyes.

Several studies have been conducted on the ocular manifestations of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, mostly in adults, but notably fewer have been conducted on children [2-21]. The direct effects of coronavirus disease 2019 (COVID-19) on the eyes are wide-ranging, involving ocular aspects from the lid to the cornea, anterior segment, posterior segment, retina, choroid, uvea, orbit, and neuro-ophthalmic manifestations. The ocular manifestations of COVID-19 are summarized in Table 1 [2-21], while those manifestations in children are highlighted with an asterisk. However, the literature thoroughly deliberates those manifestations in adults, but less so in children.

The ocular manifestations of COVID-19 in children may be divided into isolated events attributed to a new entity associated with COVID-19, named multisystem inflammatory syndrome in children (MIS-C) [13]. One of the pioneering systematic reviews showed that conjunctivitis was the main ocular manifestation in patients with MIS-C, which may be missed easily due to its non-purulent characteristics. Therefore, during the COVID-19 pandemic, pediatricians, ophthalmologists, optometrists, and healthcare professionals should remain vigilant to determine the early signs of this possibly fatal post-COVID-19 inflammatory syndrome [19].

On the other hand, the retinal manifestations of COVID-19 should not be neglected. In a comprehensive review of post-COVID-19 posterior segment and imaging features, the manifestations ranged from normal funduscopy to multiple cotton-wool spots, retinal hemorrhage, macular hemorrhage, inflammation of the optic nerve head, retinal venous vasodilatation, tortuous vessels, drusen, white and yellowish lesions at the macula, hard exudates, retinal pigment epithelium (RPE) hyperplasia or hyperpigmentation, optic nerve swelling, subretinal fluid, choroidal folds, disc hyperemia, microaneurysms, Roth spots, subtle whitish parafoveal lesions, vitritis, peripheral retinitis, subretinal exudates, vitreous exudates, tubercular choroidal abscess, and optic disc edema [20]. Some of these retinal signs have also been presented in children [2, 13].

Most accounts of COVID-19-related ocular manifestations in children have been published as case reports [2, 3, 8, 12] rather than as comprehensive systematic reviews [19] and meta-analyses. On occasion, the ocular findings could not be precisely attributed to the effect of the virus because of the potential existence of underlying illness, hospital admission effects, and medicines taken by the patients [16].

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Table 1. Direct [2-21] and indirect [1, 22-29] ocular effects of coronavirus disease-2019

Direct effects [2-21]
<ul style="list-style-type: none"> Neuro-ophthalmic manifestations <p>Optic neuritis * Cranial nerve palsy (abducens, oculomotor, or trochlear nerve) * Neuromyelitis Optica * Opsoclonus * Adie's tonic pupil Miller fisher syndrome Ocular myasthenia Non-arteritic anterior ischemic optic neuropathy Opsoclonus-myoclonus-ataxia syndrome</p>
<ul style="list-style-type: none"> Eyelid manifestations <p>Blepharitis Eyelid dermatitis</p>
<ul style="list-style-type: none"> Orbital manifestations <p>Rhino-orbital cerebral mucormycosis * Orbital inflammatory disease * Orbital cellulitis and cavernous sinus thrombosis * Orbital myositis * Dacryoadenitis * Orbital abscess *</p>
<ul style="list-style-type: none"> Cornea and anterior segment manifestations <p>Dry eye disease * Corneal epitheliopathy * Keratitis * Conjunctivitis * Episcleritis * Keratoconjunctivitis Scleritis</p>
<ul style="list-style-type: none"> Retinal and uveal manifestations <p>Asymptomatic retinal changes * Retinal vein thrombosis * Central retinal vein occlusion * Retinal vasculitis * Retinitis * Anterior uveitis * Acute retinal necrosis * Intermediate, posterior, or panuveitis Central retinal artery occlusion Papillophlebitis Vitritis Chorioretinitis Endophthalmitis Central serous chorioretinopathy Paracentral Acute Middle Maculopathy Acute Macular Neuroretinopathy</p>
Indirect effects [1, 22-29]
<ul style="list-style-type: none"> Increased incidence, prevalence, or progression of myopia *
<ul style="list-style-type: none"> Increased axial length *
<ul style="list-style-type: none"> Digital eye strain *
<ul style="list-style-type: none"> Increased risk of amblyopia *

Note: The asterisk indicates the presence of ocular manifestations in children's eyes.

The COVID-19 pandemic has an indirect consequence on children's eyes [22, 23], as summarized in Table 1. Prolonged near-work activities and indoor confinement that increased during the COVID-19 lockdown may be associated predominately with myopia progression [24]. Other studies have revealed that near-work time increased significantly, while children's outdoor activities decreased during the COVID-19 pandemic [25, 26].

The results of a study in East Asia on more than 20 500 children showed that the myopia prevalence in children was increased as compared to that before the pandemic, and that lifestyles did not revert to those of the pre-COVID-19 era. During the pandemic, younger children and those from lower income were at a higher risk of myopia development [27].

In another study on school-age children in Europe, the researchers found an increase in prevalence of myopia and premyopia following the COVID-19 peak. Further analysis showed a decrease in the spherical equivalent and an increase in the axial length of children's eyes after the COVID-19 pandemic, as compared to the pre-pandemic measures [28]. Similarly, progression of myopia accelerated in children in the Middle East region during the COVID-19 pandemic [1].

The focus on online learning during the pandemic has boosted the number of cases of symptomatic digital eye strain (DES). The frequency of DES increased among trainees, after the COVID-19 lockdown. However, future randomized trials with face-to-face interviews are required to prove the associated risk factors [29].

In addition to the prevention of infection and focus on the ocular effects of COVID-19 on the eye in childhood, research, policy, and practice ought to concentrate on addressing the indirect and persistent consequences of the pandemic, while the effects on anatomical development of the eye and ocular health may be long-lasting [28]. This shows the importance of clinical guidelines that fundamentally should be designed by international associations. However, academic literature on primary care guidelines for COVID-19 are lacking in eye clinics, whereas I found two comprehensive general guidelines in your journal, which were published only a few weeks after the onset of the pandemic [30, 31]. Now is the time to both overhaul the past and to reimagine a brighter future by proposing universally accepted clinical guidelines, particularly in pediatric ophthalmology.

Finally, pediatricians and eye care professionals need to maintain a high level of clinical suspicion of cases with manifestations of COVID-19 for detailed systemic and ocular examinations. With evolution of the pandemic, several variants of SARS-CoV-2 have been detected. Therefore, it is likely that additional ocular and systemic manifestations associated with COVID-19, will be diagnosed and reported [2].

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