



Review Article

COMPUTER VISION SYNDROME IN CHILDREN: AN AYURVEDIC AND MODERN REVIEW

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ABSTRACT

The growth in the use of digital devices in education and recreation has dramatically increased exposure to screens among children and the rate of Computer Vision Syndrome (CVS) or digital eye strain is growing rapidly. This review provides an overview of the existing body of evidence on prevalence, risk factors, clinical presentation and management of CVS in children in a contemporary biomedical viewpoint as well as analyzing how the condition is perceived and managed under Ayurveda. A narrative review of the literature on studies published 2021-2024 suggests that there is a high burden of CVS among school-aged children which is mainly related to long hours of screen time, poor ergonomics of vision, decreased blinking, and distance education. The Ayurveda notion links CVS to a *Dosha* imbalance, specifically between *Vata* and *Pitta* and stresses the benefits of prevention eye care and lifestyle change. A contemporary, Ayurvedic-based integrative approach can be used to aid in successful prevention and management. More studies should be done to prove the traditional interventions and define the integrative clinical guidelines.

INTRODUCTION

Childhood learning, communication as well as entertainment have undergone massive changes with the digital revolution. The use of smart phones, tablets, laptops, and computers has led to unprecedented screen time exposure to children. Although there are positive educational and social effects of digital technology, the intensive and uncontrolled use of it has already been linked to several health problems, one of which is Computer Vision Syndrome (CVS) that has become more accepted [1].

Computer Vision Syndrome is a complex of visual and extra-ocular complaints, which emerge as a result of the prolonged exposure to digital displays. Although the first time it was defined in the context of adult computer users, as of late, it can be argued that children are even more susceptible to it because of their immature visual systems, bad visual habits, and lack of awareness about the ergonomic habits.

This issue was further magnified by the COVID-19 pandemic since it shifted education to online platforms, thus exposing school-aged children to more screen time every day [2].

From a modern medical perspective, CVS is understood as a multifactorial condition involving accommodative stress, binocular vision anomalies, tear film instability, and musculoskeletal strain [3]. In contrast, Ayurveda conceptualizes visual disorders through the lens of *Dosha* imbalance, improper use of sense organs (*Asatmya Indriyarthā Samyoga*) and lifestyle factors. Understanding CVS in children through both paradigms may provide a broader framework for prevention and management [16].

Epidemiology and Prevalence of CVS in Children

A high prevalence of CVS is always recorded among children and adolescents as per the recent studies. Surveys that have been made at cross-sectional occurrences during the COVID-19 pandemic have reported moderate to very high prevalence rates in various geographical locations. The research conducted in Saudi Arabia, India, China, and other nations has shown that over 50 percent of school-aged children report at least one or more symptoms of CVS at some point in time during extended use of digital devices [4].

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Such findings have been supported by systematic reviews and meta-analyses which show that CVS is a worldwide problem that is not confined to a specific socioeconomic or cultural setting. It seems to be more prevalent in the periods of pandemic-related lockdown when the use of online education and outdoor activities are minimized. The discrepancy in prevalence between studies could be explained by the differences in study design, diagnostic criteria, age groups, and patterns of screen exposure [17].

Risk Factors of CVS among children

A combination of environment, behavioral, and visual factors has an impact on the development of CVS in children. The risk factor that is most reported is prolonged screen time, especially when exposure surpasses the recommended amount of time. Constant closely working with no rest causes the heavy load on the accommodative and vergence apparatus to result in visual fatigue [5].

Visual strain is even further increased by poor viewing ergonomics that include incorrect screen height, poor lighting and little viewing distance. Slow blink rate during screen time is also a factor that leads to the instability of the tear film and symptoms

of dry eyes, which are also becoming common even among children. Others are the presence of uncorrected refractive errors, pre-existing abnormalities in the binocular vision, and the use of small digital gadgets like smartphones [18].

Contributory factors have also been reported to include psychosocial stress, sleep disturbances, and absence of parental supervision when using screens, and therefore, CVS in children can be considered as multifaceted [6].

Clinical Manifestations

Ocular symptoms related to CVS are common in children and they might complain of eye strain, headache, blurred eyesight, burning eyes, redness, and watering of the eyes. Extra-ocular symptoms such as neck pain, shoulder aches, and fatigue can be used with visual symptoms [19].

Unlike adults, children may have difficulty articulating their symptoms, leading to underreporting and delayed identification. In some cases, CVS is associated with accommodative insufficiency, convergence anomalies, and reduced binocular efficiency, which may negatively affect academic performance and attention span [7].

Table 1: Risk factors, clinical features, and management strategies of Computer Vision Syndrome in children from modern and Ayurvedic perspectives

Aspect	Modern biomedical perspective	Ayurvedic perspective
Etiological factors	Excessive screen use, poor ergonomics, reduced blinking	Asatmya Indriyārtha Samyoga, Vata–Pitta imbalance
Major symptoms	Eye strain, headache, blurred vision, dryness	Netrashoola, Rukshata, Daha, Klamata
Preventive measures	Screen-time limits, regular breaks, proper posture	Dinacharya, Netra Raksha, adequate rest
Therapeutic approaches	Vision correction, lubricants, ergonomic advice	Netra Tarpana, Aschyotana, Anjana

Impact of Online Learning and COVID-19 Pandemic

The COVID-19 pandemic represents a critical period in the epidemiology of CVS among children. School closures and the rapid adoption of online learning platforms resulted in a sudden and sustained increase in screen exposure. Several studies conducted during this period reported a marked rise in CVS symptoms, correlating with longer screen time and decreased adherence to visual hygiene practices [20].

The post-pandemic period continues to reflect these changes, as hybrid learning models and digital dependence persist. This underscores the need for long-term strategies to mitigate the visual health consequences of digital education [8].

Modern Medical Management and Prevention

From a modern ophthalmic perspective, the management of CVS in children focuses primarily on prevention and symptom relief. Key strategies include limiting screen time according to age-appropriate guidelines, encouraging regular breaks using principles such as the 20-20-20 rule, and promoting proper viewing ergonomics [21].

Regular eye examinations are essential to detect and correct refractive errors and binocular vision anomalies. Lubricating eye drops may be prescribed to alleviate dry eye symptoms when necessary. Education of parents, teachers, and children regarding healthy screen habits plays a crucial role in prevention [9].

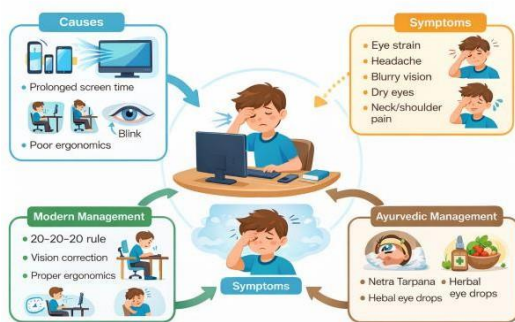


Figure 1: Integrative model of Computer vision Syndrome in children

The figure shows the integrative model of Computer Vision Syndrome in children, showing the association between the duration of digital screens exposure, visual as well as ergonomic stressors, *Dosha* imbalance (*Vata-Pitta*), the clinical presentation of this disorder, and the joint- efficacy of the contemporary preventive measures and Ayurveda management methods

Ayurvedic Perspective on Computer Vision Syndrome

Ayurveda does not describe CVS as a single disease entity; however, its symptomatology can be correlated with various *Netra Roga* resulting from *Dosha* imbalance. Excessive screen use can be interpreted as improper utilization of the visual sense organ, leading primarily to aggravation of *Vata* and *Pitta Doshas*.

Symptoms such as eye strain, dryness, pain, and headache are suggestive of *Vata* predominance, while burning sensation, redness, and irritation reflect *Pitta* involvement. Contributory factors described in Ayurveda include excessive near work, inadequate rest, irregular daily routines, and mental stress [10].

Ayurvedic Preventive and Therapeutic Approaches

Ayurvedic management emphasizes prevention through lifestyle modification and daily eye care practices (*Netra Raksha*). Recommendations include regulated screen use, adequate sleep, balanced diet, and adherence to *Dinacharya* (daily regimen).

Local ocular therapies such as *Netra Tarpana*, *Aschyotana* and *Anjana* are traditionally used to nourish and strengthen ocular tissues. The use of medicated ghee preparations and herbal formulations is aimed at pacifying aggravated *Doshas* and improving visual comfort. Eye exercises, blinking practices, and relaxation techniques are also advocated to reduce visual fatigue [11].

While these approaches are widely practiced, there is a need for systematic clinical research to establish their efficacy and safety in the context of CVS in children [12].

Integrative Approach and Future Directions

A holistic solution to the prevention of CVS in children can be provided by an integrative approach involving both the modern preventive strategies and Ayurvedic principles. This would not only deal with the ocular symptoms but also lifestyle and behavioral interventions that lead to the condition [22].

Future studies would aim at longitudinal research on pediatric subjects and standardization of diagnostic methods as well as controlled clinical trials on traditional interventions [23]. The teamwork of ophthalmologists, pediatricians, and Ayurvedic practitioners could help to create evidence-based integrative guidelines [13].

CONCLUSION

Computer Vision Syndrome has become a major and long-term malady among children during the digital age. The fact that the CVS is highly prevalent, and especially after the COVID-19 pandemic, indicates the urgency of prevention and management strategies. Contemporary medicine offers effective rules to follow concerning visual hygiene and ergonomics, whereas Ayurveda is more holistic and focused on balancing, preventive measures and nourishing the eye. The combination of these methods could lead to a better visual health and well-being of the children in the more digitalized world.

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