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RESEARCH ARTICLE

DIGITAL EYE STRAIN

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ABSTRACT

One of the most important ways to lessen the effects of the COVID-19 pandemic, which has caused an unprecedented global health crisis, is through vaccination. Despite the controversy surrounding COVID-19 vaccines, Covishield has been India's most popular vaccine. One and a half years after vaccination, this study examines the persistence of antibodies against COVID-19, particularly those produced by Covishield. 350 participants in total, equally split between the sexes, were chosen for this analysis. Serious public health consequences may result from the presence of antibodies years after vaccination. Our results demonstrate the effectiveness of vaccination, as 68% of samples had adequate antibody titers (>0.80 U/mL) against COVID-19. The concurrent emergence of neurological, respiratory, and cardiovascular adverse effects in those who mounted a sufficient antibody response was a noteworthy finding, though. On the other hand, individuals who were unable to produce adequate antibody levels frequently had a significant medical history, indicating that a serious illness could impair the immune response to vaccination. The significance of additional research into the variables influencing antibody development and vaccine effectiveness is underscored by these findings, which show the delicate relationship between vaccine efficacy and individual health status.

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INTRODUCTION

The rapid advancement of digital technology has transformed modern education, healthcare, and workplace environments. Computers, smartphones, tablets, and other digital devices have become indispensable tools in daily life. While these devices improve productivity and connectivity, prolonged and improper use has led to various health concerns, among which Digital Eye Strain (DES) is the most common ocular complaint.Digital Eye Strain refers to a group of eye and vision-related problems resulting from extended use of digital screens. Unlike printed text, digital screen characters have reduced contrast, glare, and pixelation, which increase visual demand and strain on the eyes. Reduced blink rate during screen use further contributes to tear film instability and dry eye symptoms.Recent studies indicate a high prevalence of DES among students, office workers, and healthcare professionals, particularly in developing countries where awareness and ergonomic practices are limited. The COVID-19 pandemic further aggravated this problem due to increased reliance on online platforms for education and work.Despite the rising burden, Digital Eye Strain often remains underdiagnosed and underestimated. Understanding its magnitude, contributing factors and preventive measures is essential for planning effective interventions. Therefore, this research focuses on evaluating Digital Eye Strain and emphasizing the need for early identification, awareness, and preventive strategies to promote visual health. Studies report that the prevalence of Digital Eye Strain ranges widely from about 25% to over 90% among different populations globally. Pre-COVID figures ranged from ~5% to 65%, rising sharply with increased screen exposure during and after the pandemic.
A cross-sectional study in a Nepal tertiary hospital reported 94.3% prevalence of DES symptoms among adult digital device users (n = 318). General estimates suggest that 50% or more of regular computer users experience some form of digital eye strain symptoms. Among university students engaged in virtual learning, 68.5% reported DES symptoms in one study. In medical and nursing students in North India, the overall prevalence was 70.4%, with 96.5% having at least one symptom. Some school-based studies have reported DES rates of 44.1% among children in Palestine and up to 89.9% in adolescent samples in India. Trend Changes After Increased Digital Use a Systematic reviews indicate that pre-pandemic prevalence was 5–65% but surged to 80–94% during periods of increased digital exposure (e.g., lockdowns, online learning/work).

Definition: Digital Eye Strain (DES), also termed **Computer Vision Syndrome (CVS)**, refers to a constellation of ocular, visual, and extra-ocular symptoms arising from prolonged use

of digital devices such as computers, laptops, tablets, and smartphones. It encompasses discomfort, visual fatigue, and vision-related problems attributed to sustained fixation and accommodative stress during digital screen use.

Cause

DES is multifactorial with several contributing factors: Prolonged screen time: Extended daily exposure to screens increases accommodative and convergence demand, leading to fatigue.

Reduced blink rate: Concentrated screen viewing decreases the natural blink frequency, leading to tear film instability and dry eyes.

Poor ergonomics: Incorrect viewing distance, improper posture, and suboptimal screen positioning strain extra-ocular muscles causing discomfort.

Screen glare and lighting: Harsh contrast, glare, and inadequate ambient lighting increase visual stress.

Uncorrected refractive errors: Inaccurate or outdated spectacle prescriptions force extra ocular effort.

Clinical Features: Clinical manifestations of DES are broadly categorized into ocular, accommodative/visual, and extra-ocular symptoms: Ocular Symptoms are Dryness of eyes, burning sensation, itching, Redness and foreign body sensation, Blurred vision and watering, these arise due to decreased blinking and tear film disruption. Accommodative/Visual Symptoms are Temporary blurred vision at near or distance, Difficulty in refocusing between distances, Diplopia (double vision) these are related to sustain accommodative and convergence stress during screen use. Extra-ocular Symptoms are Headache, Neck, shoulder or back pain related to posture, General fatigue these symptoms correspond to musculoskeletal strain during prolonged digital device use. In an Indian tertiary care study, the most common symptoms among DES sufferers were headache (77.8%), dry eyes (61.6%), red eyes (49.4%), blurred vision (44.7%), and difficulty in gaze shift between distances (51.3%).

Complications

If unmanaged, DES can lead to: **Persistent dry eye disease:** Chronic tear film instability and surface damage.

Progression of myopia: Excessive near work and prolonged screen use are linked to onset and progression of myopia, especially in younger users.

Visual fatigue and reduced productivity: Ongoing discomfort affects concentration and work output.

Sleep disturbances: Blue light exposure at night may disrupt circadian rhythms (e.g., melatonin suppression), worsening sleep quality.

Prevention: Preventive strategies focus on reducing visual stress and improving ergonomic and behavioural practices:

20-20-20 rule: Take a 20-second break every 20 minutes of screen time to view distant objects (≈20 feet), reducing accommodative load.

Proper ergonomics: Maintain adequate viewing distance (≈50–60 cm), adjust screen height to slightly below eye level, and reduce glare through lighting adjustment.

Frequent blinking: Conscious blinking maintains tear film stability.

Regular breaks: Scheduled short breaks during prolonged tasks improve comfort and reduce musculoskeletal strain.

Corrective vision care: Update refractive correction and use appropriate lenses, including anti-reflective coatings where indicated.

Awareness and education: Institutional policies and awareness campaigns (e.g., ergonomic training and Pragyata digital education guidelines recommended by Indian authorities) help users adopt healthy screen habits.

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