

Comparison of Prevalence Data about Digital Eye Strain (DES), Pre-Lockdown versus Post-Lockdown Period in India: A Systematic Review Study

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ABSTRACT

Objective: The purpose of this review study was to identify and synthesize evidence about the prevalence of digital eye strain (DES) before and after the lockdown period in India, the factor associated with it, and also create awareness or spread knowledge about the preventive measures for eye care from digital eye strain.

Methodology: This systematic review was done in order to compare the available data of factors and prevalence of digital eye strain before and after the lockdown period.

Studies, included in the review was targeted interventions towards the digital eye strain conducted before and after the lockdown period in Covid-19 era related to the current research objective.

Results: Prevalence scores were recorded for comparative analysis. Fifteen studies out of 104 total studies that met the inclusion criteria had positive results. 36.9% (n=80) were using digital tasks >5 h in lockdown as compared to 1.8% (n=4) before lockdown in case of study-1, while in study-2, Typically, 93.6% of respondents reported an increase in their screen time since the lockdown was declared. Study-3 encompasses the prevalence of DES was 64.3% in pre-lockdown periods, while in case of study-4 among the 150 participants studied, the overall prevalence of DES (at least 1 symptom present) is 87.3%.

Conclusion: This review provides evidence that Digital eye strain is a very common condition in

this digital era, throughout this lockdown period, prevalence and uses of digital devices were increased. So, we should prevent from DES by utilizes the preventive measures resources and follows the few instructions/guidelines throughout the uses of digital devices.

Keywords: Digital eye strain (DES), Covid-19 pandemic, Lockdown, Asthenopia, Computer vision syndrome

INTRODUCTION

Synonyms of digital eye strain (DES) are visual fatigue (VF) and Computer vision syndrome (CVS), reflective the range of digital devices joined to potential issues and not simply computers/mobiles alone. Given the huge growth in a digital gadget usage in recent years, several lots of people of all age teams are at the risk of DES.¹

Digital Eye Strain describes a bunch of eyes and vision-related issues that succeeding from prolonged use of portable laptop, tablet, e-reader and mobile phone use. Several people expertise eye discomfort and vision issues once exploitation digital devices for extended periods. The extent of discomfort seems to extend with the quantity of digital screen use.²⁻³

From the already done researches, it's quite evident that excessive usages of

computers adversely have an effect on visual health.⁴⁻⁸

Prolonged usage of those devices isn't solely a agent on the sensory system, however additionally causes contractile organ strain⁹⁻¹¹ and unit of time disturbances.¹²

The prevalence of digital eye strain is calculable to vary from 25% to 93%, as reported in various studies.¹³⁻¹⁵ Higher prevalence rates of DES were observed in adolescents using smartphones or in those who were regularly and excessively using digital devices (>2 h daily and continuously).¹⁶

Although the ocular complications of digital device use has been extensively studied in adolescents and young adults, only a few studies have addressed DES in children.¹⁷⁻¹⁸

Various studies revealed up to now have the most limitation of evaluating DES through invalidated unstructured questionnaires, that embrace totally different symptoms keeping with the author and inexact definitions of once a worker should be considered symptomatic enormously compromising the findings.¹⁹⁻²¹

Digital-related eye strain affects folks of all ages. If you pay hours everyday victimization digital gadgets, you may notice your vision blurs, and your eyes feel aching and tired. You may also feel your eyes become dry, and will tear or sting. This eye strain is not different from the symptoms you may have when reading, writing or doing "close work" like sewing for long stretches of time. We are not likely to cut back on cell phone and computer use any time soon.²²

Why/How Do Screens Cause Eyestrain?

Normally, we have a tendency to blink 15-20 times/minute, tear spreads evenly over your eyes, which keeps them from getting dry and irritated. But many researchers have found that people blink less than half as often when they're reading, watching, or playing on a screen. Also, the contrast of text against the background, the

glare, and flickering from digital screens can be hard on your eyes.²³ Digital device usage causes the blink rate to fall significantly.²⁴⁻²⁵

Digital eye strain is a manifestation of evaporative dry eye²⁶ caused by decreased and incomplete blink rate leading to ocular surface compromise, and asthenopic symptoms²⁷ caused by a visible system in an exceedingly state of accommodation and convergence. Alternative environmental factors, like poor ergonomics, improper lighting, glare, cut wetness in air-conditioned rooms,²⁸ are all tributary factors for worsening of those symptoms. Uncorrected refractive errors,²⁹ contact-lens wearers,³⁰ people with a history of ocular illnesses,³¹ diabetics,³² female gender,³³ and autoimmune diseases are at risk for the development of more and severe symptoms than their age-matched counterparts.

What is the causes/ risk factors of eye strain?

Focusing on a task for long time durations without blinking can leave your eyes feeling dry and tired. Eye strain from looking at a computer is no difference from strain caused by driving or reading for hours. Sitting near a vent that is blowing hot or cold air in your face can quickly dry out your eyes.³⁴

The ocular symptoms can be split in two categories-^{35-37,13}

1. Those associated with accommodation namely,

- Headache,
- Blurred vision,
- Double vision
- Eye strain,
- Tearing of the eyes
- Difficulty refocusing.

2. Those closely related to dry eye namely,

- Irritated eyes,
- Burning eyes,
- Dry eyes,
- Tired eyes,

- Itching,
- Redness
- Sensitivity to bright light
- Eye discomfort.

Anyone who uses digital gadgets excessively without adequate breaks can present with eyestrain and musculoskeletal issues as a part of the digital eye strain spectrum. This may demand assessment of refractive error, accommodation and vergence assessment, dry eye analysis, and ergonomic assessment.³⁸⁻³⁹

Common causes of eyestrain include:

- focusing on a single task for a long duration of time, such as driving or reading.
- being in an inadequately lit environment, either too dim or too bright light.
- feeling stressed or tired.
- experiencing poor vision or other eye problems like dry eyes.

Some causes specific to digital eyestrain are:

- failing to blink as often as normal value.
- maintaining poor posture when using a digital device.
- holding a digital device too far or too close to your eyes.
- viewing a screen that doesn't have properly adjusted lighting systems.
- being exposed to extend amounts of blue light without any protective wear, which is the light commonly emitted from digital devices.

Screen time?

It is suggested that adolescents must not have screen time for quite hours every day (>2 hours/day). This steering may be difficult for teenagers to follow, significantly since school assignment often needs computer time.

In 2019, the World Health Organization came out with guidelines about media use for children under 5,⁴⁰

Birth to age 1: No screen time

Ages 2–4: Less than 60 minutes of sedentary screen time

More in depth pointers are place forth by the American Academy of Pediatrics (AAP) in 2016 for children up to age five, that embody screen time, the standard of content used, and how parents are using screens with their children.

The screen time limits are as follows:⁴¹

Birth up to 18-24 months: No screen time (except for video calling).

18–24 months: restricted screen time maximum amount as doable.

Ages 2–5: restricted screen time (about a associate hour a day)

Previous studies suggest that the total weekly time spent by adolescents work on computers ranges from 80 to 840 min (1.5- 14 hours/ weeks).⁴²⁻⁴⁷

What can we tend to do regarding the digital eye strain?

Prevention or reduction of the vision issues related to CVS or digital eyestrain involves taking steps to regulate lighting and glare on the device screen, establishing correct operating distances and posture for screen viewing and reassuring that even minor vision issues are properly corrected.

Digital eye strain is a common encounter in most optometric practices. Besides in-office treatments like optical correction, artificial eye drops and vision therapy, practitioners would recommend patients a life-style amendment supported a couple of modifications:

1. Frequent blinking

Humans unremarkably blink about fifteen times/minute. However, studies show that we tend to solely blink about 5 to 7 times/minute while using computers and alternative digital screen devices. Blinking is that the eye's approach of obtaining the wet it desires on its surface.

2. The “20-20-20” rule:⁴⁸

Every twenty minutes take a break for twenty seconds & shift your focus from the screen to things that are at a distance of

twenty feet or additional or provides a slight massage to the eyes.

3. Human Factors and Ergonomic Intervention

It's play a significant role to alleviate in DES. Few counseled changes to relief symptoms include:

(a) Surrounding Light of Workplace

Avoid direct light falling on the screen, ensuring the encompassing the lights are optimal (not too bright or too dim) to present less strain to your eyes.

(b) Posture of the User and Height and Angle of the Visual Screen

Sitting upright, back rested and feet on the floor are the proper posture to provide the best comfort, visually and physically.

(c) Screen Brightness and Background Contrast

A adaptive/auto screen brightness mode can dramatically reduce the likelihood of visual symptoms, and should not leave at default settings.

(d) Anti-reflective coating over screens/glasses or Blue-cut/ Blue-filter lenses.

(e) Adjust your display settings

The display settings of your laptop or digital gadgets may be adjusted to assist minimize eye strain and fatigue.

(f) Text size and color

Adjust text size and color- black text on a white background is best on the eyes.

4. Use of Lubricants

Frequent use of tear substitutes is suggested in excessive use of digital gadgets.

5. Eye exercises

There are a variety of eye exercises that relieve the digital eye strain.

a) Palming: Heat palms by rubbing & then cup them over closed eyes, fingers overlapping at forehead, for two minutes

b) Near-far focus: Keep thumb or pencil fifteen centimeters from the nose. Focus on tip of the pencil for short time then change the focus to an object three meters away. Repeat 10-20 times.

c) Shut eyes tightly for a few seconds in between work.

d) Massage: Circular motions over the eyes with mild pressure for few minutes with tip of ring finger, especially once use of lubricants, provides nice relaxation to the eyes.

6. Check the air:⁴⁹

You may notice that you simply pay time in a place that has poor air quality. Dry or impure environments and places with fans, heating and cooling units could cause fatigue. So that you may need to:

- improve the air with a humidifier.
- turn down the heating and cooling system.
- relocate to a spot that doesn't have a similar air problem.

7. Medications

Consult your Eye health care professionals, get regular eye exams. You would possibly ought to use a special pair of glasses when you're working on a computer.

OPTOMETRIST CONSULTATION

An Optometrist play a vital role here & consult to give eyes the best help they can get to adapt in a world where the use of computers and devices is the way of life. Allow me to discuss "Tips to relief digital eye strain "

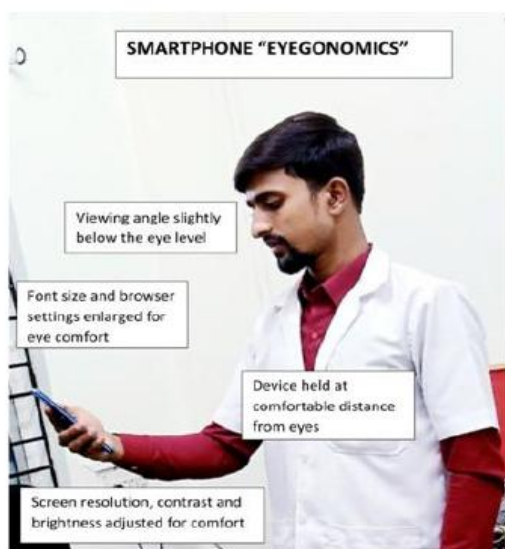


Fig-1: "Smartphone ergonomics"

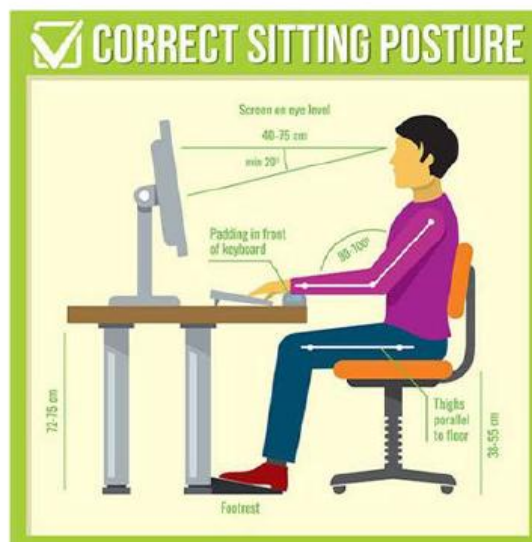


Fig-2: "Correct sitting posture"

Source by- <http://www.goodliferehab.com>

MATERIALS & METHODS

Studies, included in the review was targeted interventions towards the digital eye strain conducted before and after the lockdown period in Covid-19 era related to the current research objective, Fifteen studies out of 104 total studies that met the inclusion criteria had positive results, in which prevalence data of four (two pre-lockdown & two post-lockdown) studies were compared.

In these all four studies, study-1 & study-3 was a questionnaire based cross-sectional study, while study-4 was a interventional study and study-2 was a observational study and also many more original research studies had been done which explores the factors, prevalence, instructions/guidelines as well as few preventive measures for digital eye strain.

Methodology of this systematic review study included mainly in five steps which is described as-

1. Identification
2. Screening
3. Eligibility criteria
4. Included
5. Data comparison

Inclusion Criteria

The included studies targeted interventions towards the digital eye strain among general population giving a relevant answer to the research question and were conducted either before or after the lockdown period. The inclusion criterion was set and relevant studies that answered the research question were taken. To be included, the studies had to be at least 4-6 months' observational study, proper clinical trials, case reports, or survey in the form of questionnaires with clearly stated methodology.

Search Strategy

As per the pre-decided inclusion criteria, the database was searched using the keywords Digital eye strain (DES), Covid-19 pandemic, Lockdown, Asthenopia, Computer vision syndrome and relevant studies were sorted out.

104 studies were identified from electronic databases including PubMed, Google Scholar, Medline, and Healthstar published either before or after the lockdown period. The references of the reviewed articles and included original publications were also screened for potentially relevant studies.

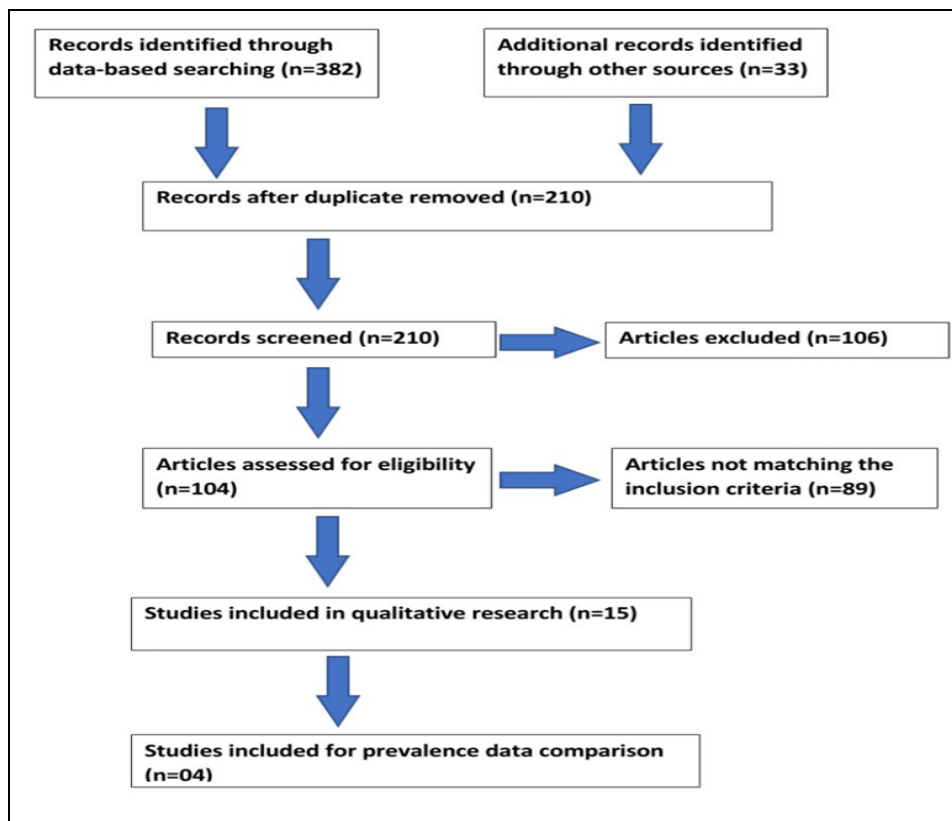


Fig-3: "Methodology"

RESULTS

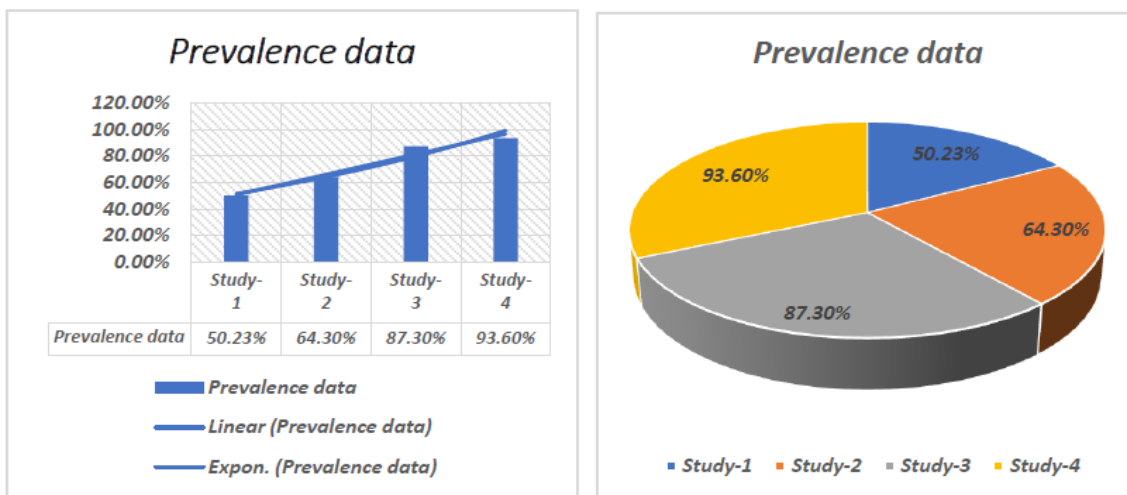


Fig: 4 & 5: "Prevalence data of DES"

Initially we had searched/identified a total of 415 citations. After scanning titles of the citations, 210 were accepted for further screening and complete abstracts of these studies were reviewed. Of these, 104 citations were identified as potentially meeting the inclusion criteria. After examination of full-text articles, 15 studies were included in the review.

Digital eye strain (DES) prevalence scores were recorded pre and post of the lockdown period for comparative analysis. Mean duration of digital tasks used during lockdown was 3.9 ± 1.9 h which is more than pre-lockdown period (1.9 ± 1.1 h, $P < 0.0001$). 36.9% ($n = 80$) were using digital tasks >5 h in lockdown as compared to 1.8% ($n = 4$) before lockdown in case of

study-1 i.e. Prevalence of DES was 50.23%, while in study-2, typically, 93.6% of respondents reported an increase in their screen time since the lockdown was declared. Average increase in a digital device usage was calculated at about 4.8 ± 2.8 h per day. The total usage per day was found to be 8.65 ± 3.74 hours. Study-3 encompasses the mean hours of VDT use at work was 6.5 ± 1.3 hours/day. The prevalence of DES was 64.3% in pre-

lockdown periods, while in case of study-4 among the 150 participants studied, the overall prevalence of DES (at least 1 symptom present) is 87.3%.

Their knowledge of relief symptoms was also assessed in which there was significant change in closing eyes momentarily, washing them, use of antiglare screen, optimum brightness mode and consultation to an ophthalmologist/Optometrists in case of study-4.

Comparison of prevalence data-

Table1: Pre-lockdown comparative data

Pant K et al. ⁵⁰	Arshad S et al. ⁵¹
1. Cross-sectional survey based study; (March-May 2019), UP.	1. Longitudinal educational interventional study; (August-October 2018), MP.
2. 126 subjects with 64% of DES prevalence.	2. 131 subjects with 87.3% of DES prevalence.
3. Most common symptoms: Headache	3. The prevalence of various asthenopic symptoms varied from 85.3% (eye fatigue) to 18.7% (blurring of vision).
4. (64%) while least common was dry eyes (16%).	4. The data was entered in MS excel and analysis was done using Epi-info 7 software.
5. Data analysis was performed using SPSS version 21 & Chi-square test.	5. A 'p' value of < 0.05 was considered as significant.
6. A 'p' value of < 0.05 was considered as significant.	

Table 2: Post-lockdown comparative data,

Mohan A et al. ⁵²	Bakhir FA et al. ⁵³
1. Cross-sectional survey based study; (July- August 2020), MP.	1. Observational survey based study; (July 2020), Tamilnadu.
2. 109 subjects with 50.27% of DES prevalence.	2. 381 subjects with 93.6% of DES prevalence.
3. Most common symptoms were itching and headache (n = 117, 53.9%)	3. Typically, 95.8% of respondents had experienced at least one symptom related to digital device usage.
4. Data analysis was performed using the IBM SPSS statistics software and Chi-square or Fisher's exact test was used to investigate the associations between the qualitative variables.	4. Data analysis was performed using the IBM SPSS version 13 and Chi-square test was applied on categorical variables.
5. A 'p' value of < 0.05 was considered as significant.	5. A 'p' value of < 0.05 was considered as significant.

A meta-analysis by Holden et al.⁵⁴ predicts a twofold increase in myopia prevalence and a sevenfold increase in the visual loss by myopia by 2050. These predictions may be hastened by the current pandemic if immediate actions are not taken.

CONCLUSION

Time passes on being digital. We were experiencing, though never knew it'll be ever like the present scenario.

The outbreak of pandemic COVID-19 had made us lock inside the home & now the home is the centre for working, learning, entertaining & socializing from a distance. Children are learning through home-schooling. Students were getting their sessions via online delivered classrooms. Companies had been started "Work from

Home" & thus more employees were working & having meetings online. People were locked but relaxing through watching movies, playing screen games, enjoying parties with friends through online. Majority of the people maximum time connected to the world being online only.

The main points of this review study was that who people will be used a laptop, tablet, cell phone, iPad, etc. for a prolonged period continuously, definitely they will suffer from the DES.

So that secure yourself from that types of issues by follow each and every guideline/instructions of preventive measures for DES given by many researchers and consult with an Optometrist/eye care providers regularly.

It was also found that maintaining ideal distance as well as body posture and

follow digital guidelines rule like as 20-20-20 rule, various eye exercises and other modalities showing in this review study.

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