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A study on impact of technology on vision in children

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Abstract
Purpose: *To raise awareness among people about side effects of technology on vision and how to prevent these problems.*
Methods:*All children 3-18 year old with ocular complains who were using computer, TV, or mobile from December 2017 to November 2019 . All were undergone thorough ocular examination including vision ,tonometry, fundus examination , and slit lamp examination to rule out meibomitis.*
Exclusion criteria were; patients suffering from conjunctivitis ,scleritis,uveitis ,glaucoma any fundus pathology papilleodema,diabetic and hypertensive retinopathy ,optic atrophy ,refractive error .
Results: *Total 196 patients were taken having ocular complaints who were using excessive mobile,TV,and computers . 164 patientshaving only asthenopic symptoms without significant vision loss and28 patients having dry eye with foreign body sensation and mild vision loss. It was noted that long time duration of exposure can lead serious problems like dry eye. Most of children use these gadgets around 5-6 hours in a day. All are advised to minimize using above gadgets and to use lubricating drops.They all got relief clinically.*
Conclusion:*The study shows that improper and excessive use of technology can lead to eye symptoms.But these problems can be prevented by using them in proper way.*
Key Words: *Vision, Technology, Digital vision syndrome*

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I. Introduction

The use of computers and digital electronic devices for both vocational and non-vocational activities including e-mail, internet access and entertainment is almost universal in modern society. A recent estimate of internet usage by continent ranged from 77.4% of the population of North America to 10.9% of Africa, with an estimated 1 966 514 816 users worldwide (or 28.7% of the world's population)

Today's visual requirements may include viewing TV, laptop and tablet computers, electronic book readers, smartphones and other electronic devices like video games, including smart glasses either in the workplace, at home or in the case of portable equipment, in any location. Furthermore, Tv ,computer, laptop, video games, smart phones use is not restricted to adults. A recent investigation of over 2000 American children between 8 and 18 years of age reported that in an average day they spend approximately 7.5 h using Video games, 4.5 h watching TV, 1.5 h on a computer and over an hour playing video games.[1] Some screen sizes may necessitate very small text which the observer frequently positions at a closer viewing distance than had previously been adopted for hard copy printed materials. These increased visual demands may give rise to a variety of symptoms like premature myopia, blurred vision ,dry eye ,asthenopia, headache etc.

Computer vision syndrome (CVS): having the symptoms red eyes, sore/irritated eyes, dry eyes, blurred distant vision, blurred near vision, presence of pain in and around the eyes, headache intermittently or continuously for at least one week during the last twelve months was defined as computer vision syndrome .

Excessive tearing, double vision, twitching of eyelids, and changes in visualizing colors were assessed as symptoms of CVS in this study. The worker who reported one of the above symptoms was considered as positive for CVS [2,3,4,5].

Four specific reasons make children more susceptible to the development of these above problems:
(1) concentrating on an enjoyable task without a significant break;
(2) lacking an ability to recognise and report their visual problems;
(3) using adult-sized computers, desks, keyboards and chairs; and
(4) being exposed to much bright lighting in their TV rooms , computer rooms, video games, laptop, smart phones.

Specifically, whether children lack an ability to report their visual problems is particularly important because
(1) Advancing and disseminating the knowledge of impacts of TV ,smart phones ,video games ,computer use (including the use of electronic handheld games and cell phones) on development of children's vision and cognition is very much needed empirically and theoretically;
(2) Understanding whether children lack an ability to report their visual problems is critical for diagnosis, prevention and intervention of children's; and vision problems.

Asthenopia is a major complaint in subjects using these technology. The results of a 2008 questionnaire returned by over computer operators in India revealed asthenopic symptoms in 46.3% of subjects.Similarly, a survey of 212 bank workers in Italy found asthenopic symptoms in 31.9% of the subjects. A higher prevalence was found in a study of 35 Mexican computer terminal operators where 68.5% of the subjects experienced symptoms[6] . An Australian study of over 1000 computer workers found 63.4% reported symptoms with uncontrolled conditions; this number was reduced to 25.2% when an optimized, ergonomic desk and frequent work breaks were provided.It is unclear whether asthenopia during computer use is associated with age although the prevalence does seem to be higher in females.

Over the past 20 years, there has been a great advancement in the information technology. The use of these gadgets in every workplace has made life easier and increase output tremendously. Computer has become almost an indispensable piece of equipment both at office and at home. The introduction of computer,smart phones,video games,Tv,laptop no doubts has revolutionized and benefited the society; however it does associate with health-related problems. Musculoskeletal related complaints such as tingling and numbness of the fingers, cervical stiffness and backache are well known to be associated with prolonged usage of above gadgets.

Risk factors-

Many studies have shown that the prevalence of visual symptoms was higher among individuals who spend more than four hours working on video display terminals (Rossignol et al., 1987)

The distance of the Video Display terminals(VDT) from the eyes has been shown to be an important risk factor because the closer the VDT to the eyes the more difficult the eyes have to work to accommodate with it. The physiological explanation for the challenge to accommodate is that close distance causes an excess accommodation which result in overworking of the ciliary muscles of the eye which is manifested as eye fatigue and headache.

when viewing near objects miosis,accommodation convergence take place. Prolonged work at computer terminals has been associated with changes in both relative accommodation & vergence.[7]

It has been suggested that an inaccurate accommodative response (AR) during working at the computer terminal or a failure to relax the AR at completion of the near task is at the heart of the asthenopia experienced by the users. Blurred vision at near and difficulty to shift to distant gaze is a common complaint in CVS and accommodative problem was the most common oculomotor anomaly reported.[8,9] .

Similarly, concentration VDT tend to reduce the rate of blinking which exposes the eyes to free dry air that causes redness, dryness and eyestrain. Researchers have recommended a viewing distance between 30and 70 cm as measure to reduce visual symptom (Bhandenietal., 2008; Chiemeke et al., 2007; Taptagaporn et al., 1995).[10,11]

Other risk factors include the height and the inclination of the monitor. Studies have demonstrated an association between CVS symptoms and the risk factors where increased odds ratios (eye strain) for certain eye symptoms were observed when the computer operators kept the computer monitor at about the eye level instead of below the eye level (Bergqvist and Knave, 1994; Jaschinski et al., 1998). It has been recommended that in order to reduce the discomfort, the Video Display Terminals should be at least 5 to 6 inches below the straight line of the user's vision. Such measures have been shown to reduce not only dry eye, but also the severity of the spasm and neck muscles (Rechichi and Scullica, 1990).

Glare and reflections on VDT have been reported to cause visual symptoms including eye strain. In order to minimize glare, it has been recommended to use antiglare cover over the screen and use of flat screens is also recommended. Conditions of high illumination and sensitivity to the glare due to computer use have been shown to increase the reading time and decrease attention to the task (Office Ergonomics Handbook, 2008).

Aims and Objectives:-

1. To study the effect of various gadgets on vision, mental ability and development of child.
2. To raise the awareness among people about side effect of technology on vision and how to prevent these problems.
3. To study the pattern, usage, type, duration of various gadgets according to age, socioeconomic status, education level of the child from 3yr to 18yr.
4. To study the role of these gadgets in progression of refractive error.
5. To study the role of these gadgets in developing any eye disease.

II. Materials And Methods

The present clinical study entitled "Impact of technology on vision in children with various gadgets will be conducted in the Upgraded Department of Ophthalmology, JLN Medical college & Hospital, AJMER.
All children (3-18years) attending eye OPD with ocular problems (Using gadgets:Tv , Mobile phones, Computers , Video games, Laptop) from December 2017 to December 2019 will be included in the study.

196 cases with eye problems having history of using technology gadgets which fulfils the inclusion and exclusion criteria will be taken randomly from the period of DECEMBER 2017 to November 2019 as a time bound study.

Inclusion criteria

1.Patients between 3-18 years of age.

2. using gadgets like computer , smart phones ,video games ,laptop users complaining of eye strain, dry eyes, blurred vision, redness, burning eyes, excessive tears, double vision, headache, glare sensitivity, fatigue, neck, shoulder and back pain.

3.Minimum 4 hour exposure to these mentioned gadgets like Tv, desktop, laptop, mobile phones, computers, video games etc.

Exclusion criteria

1.Patients of age below 3 years or above 18 years.

2.Those having symptoms due to direct physiological effects of substance (e.g., drug abuse, medication) or a general medical condition (e.g., hypothyroidism).

3.Patients suffering from infectious conditions of the eye like conjunctivitis, scleritis, uveitis, glaucoma, stye, blepharitis, etc.

4.Patients having any fundus pathology like optic atrophy, diabetic retinopathy, hypertensive retinopathy, papilledema, etc.

5.Patients suffering with any eye problems but not using above mentioned gadgets.

III. Methodology

After taking informed consent, all the subjects will be asked a detailed ocular and systemic history and they will undergo a thorough ophthalmic examination.

1.Preliminary eye examination will include visual acuity
[Distant And Near vision] .
Intraocular pressure will be recorded using schiotz tonometer.

2.Fundus examination will be done by using Direct ophthalmoscope, Indirect ophthalmoscope and 90 D Slit Lamp Bio microscopy.

3.The refractive error is measured with an auto refractor ; and in very young or uncooperative children refractive error was determined by performing retinoscopy with a retinoscope and lenses according to standard protocols.

4.Patients having dry eye undergo for all tests of dry eye to see meibomian gland dysfunction.

IV. Management

Patients diagnosed as having computer vision syndrome, and problems associated due to use of technology gadgets. All patients were advised to use artificial tear drops , and stop using above gadgets, decrease time duration of using gadgets , prescribed spectacles if needed .They were told proper way of using these gadgets. Dry eye patients were treated with antibiotic and artificial tear drops.

To prevent these symptoms patients were advised-

1.Place the screen between 20 to 28 inches away from child's eyes. Align the top of screen at eye level so that children look down at the screen while they work.

2. Use low watt bulbs in lighting fixtures to reduce glare from windows .

3. Choose a comfortable ,supportive chair poisoned so that child's feet flat on the floor.

4.Encourage children to move around and change positions while working .

5. Suggest that they limit screen time to 2 hours or less a day. This include watching T.V. , playing video games and using mobile phones.

6. Teach kids to rest there eyes. Every 20 minutes , tell them to look up at least 20 feet away for 20 seconds also remind children to blink regularly to prevent dry , irritated eyes.

7. Glasses may be needed for some people with computer vision syndrome , a single or bifocal lens or tinted lens material may help increase contrast perception and filter out glare and reflective light to reduce symptoms eye strain.

8. Massaging the muscles around your eyes can help combat fatigue and strain.

Follow up done at 1 month and 2 month .In our study all patients got relief .only in 1 patient we had to prescribe spectacle.

V. Results

Table 1: Age distribution of patients in study

Age	No.	%
16-18 year	94	48%
8-15 year	68	34.69%
4-7 year	34	17.34%

Around half of study subjects between age group 16-18 year.(n-94,48%),more then one fourth between 8-15 year .

Table 2: Frequency of symptoms in study patients

Common presenting complaints	No.	%
Headache	107	54.6
Blurring of vision	85	43.4
Heaviness of eyes	46	23.5

Most common symptom was headache in 107 subjects ,then blurring of vision in 85 subjects ,heaviness of eyes in 46 subjects ,other symptoms were also noted but in less frequency.

Table 3: Vision status of study patients

Vision	No.	%
6/6 BE	114	58.2
6/9 BE	75	38.3
6/12 or less	7	31.1

Most of study subjects having vision 6/6 in BE(n-114,58.2%),only 75 patients affects vision up to 6/9,only 7 patients up to 6/12.

Table 4: Final outcome

Follow up finding	No	%
Complete relief	160	81.6%
Partially relief	36	18.4%

Most of patients (n-160) got complete relief .

VI. Discussion

In our study the subjects were presented with complaining of blurred vision ,headache ,diminution of vision, eye ache ,heaviness ,foreign body sensation, watering and burning of eyes ,shoulder pain ,muscle stiffness.The majority of patients presented with headache(54.6%) ,followed by blurring of vision (43.3%),heaviness (23.5%) ,eye pain ,shoulder pain ,foreign body sensation ,muscle stiffness, diminution of vision ,burning eyes ,tiredness near vision problems in decreasing order. So we noted main symptoms was asthenopia. In a study Mocci et el. reported the prevalence of asthenopia as 31.9% performed on 385 bank workers of Italy ,while Sanchez -Roman et al. found this prevalence to be high as 68.5% in their study in Spain.

In our study more then half of the subjects (n =106,54.1%)using these gadgets around 5-7hours in a day, some subjects 27 (13.8%) using around 8-10 hours, most of children spend their time on using these gadgets . It was also noted in our study that duration of using these gadgets is directly related to eye symptoms. Duration of using is directly related to severity of symptoms. Hanne et.al. found a significant difference in asthenopia and daily hours of VDT work between workers working less then 6 hour daily and those working more then 6 hours daily. Similarly a review by kanitkaret al. showed thatduration ofcomputer work is directly related to eye symptoms ,and longer duration tend to result in long lasting complaints.

A study was conducted by Karin lindgren Griffith et al , that was on impact of computerized work environment on professional occupational groups and behavioral and physiological risk factors for musculoskeletal symptoms. work at hectic workplace resulting in heightened muscle tension and forces, with inadequate work breaks .These factors were identified in this review as risk factors for work related musculoskeletal symptoms. In our study some patients presented with shoulder pain and muscle stiffness of hands also.

VII. Conclusion

The study shows improper and excessive use of technology can lead health problems.It can cause eye problem also. But these health related problems can be prevented by using the gadgets in proper way.

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