Abstract: With an increase in digital technology many individuals suffer from physical eye discomfort, visual fatigue, dry eye after screen use for longer than two hours of a time. The Vision Council refers to this collection of symptoms as digital eye strain. The Vision Council’s 2014 Digital Eye Strain Report suggests that nearly 70 percent of American adults experiences some form of digital eye strain due to prolonged use of electronic devices including desktop and laptop computers, smart phones, e-readers, television and video games. The study found that adults are most likely to experience digital eye strain in between 6 P.M. to 9 P.M. The number of staff subjected to significant amounts of on-screen work with digital eye strain and visual fatigue is currently increasing. Improper use of sense organs, violating the moral code of conduct, and the effect of the time are the three basic causative factors behind all the health problems. No remedial measures for the cure of this pathology prevail in the domain of modern medicine except using ocular surface lubricants and computer glasses. In spite of remarkable progress and advances in the field of modern ophthalmology. On critical analysis of the symptoms of Digital Eye Strain on Tridosha theory of Ayurveda, it seems to be a Vata–Pittaja ocular cum systemic disease. Jeevantyadi Ghrita (orally), Jeevantyadi Ghrita Netra Tarpana (topically) and counseling regarding proper working conditions on computer were tried in 30 patients, suffering with Digital eye strain. In group I, where oral and local treatment was given, significant improvement in all the symptoms of Digital eye strain was observed whereas in groups II and III local treatment and counseling regarding proper working conditions, respectively, were given and showed insignificant results. The study verified the hypothesis that Digital Eye Strain in Ayurvedic perspective is a Vata-Pitta disease affecting mainly eyes and body as a whole and needs a systemic intervention rather than topical ocular medication only.
Introduction:
Prolonged hours in front of a digital screen have led to a new eye disorder, aptly being called “Digital eye strain”. With an increase in digital technology, many individuals suffer from after screen use for longer than two hours at a time. This is defined as physical eye discomfort. As time in front of digital screens increased, so do symptoms like eye strain, blurred vision, burning eyes, headaches and disrupted sleep dry eyes and neck and shoulder pain. The Vision Council refers to this collection of symptoms as digital eye strain. It is reported that nearly two thirds of American adults now experience symptoms of digital eye strain which is also known as computer vision syndrome. It seems that eventually all of us will suffer from digital eye strain if we aren’t already. Findings from The Vision Council’s 2014 Digital Eye Strain Report suggest. Americans are becoming increasingly digitized, with more of our daily tasks moving online. Despite the widespread impact of digital eye strain, most Americans still need education from their OD, as the report reveals that 63 percent of adults do not know that electronics emit high-energy visible or blue light and 41 percent have never tried—do not know how—to reduce their digital eye strain. More than 87 percent of Americans report using digital devices for more than two hours per day, Digital eye strain is becoming a family affair, affecting all age groups.

Computer Vision Syndrome (CVS) is the new nomenclature to the visual, ocular, and systemic symptoms arising due to the long time and improper working on the computer or any visual display and is emerging as a pandemic in the 21st century causing the subjective signs of visual fatigue with on-screen work (burning in eyes, blurred vision, lacrimation, globe heaviness and headaches. But the eyes are still structured according to the old hunting days and are unable to cope up with the demand of computer work, leading to ocular and systemic discomfort coined as Digital Eye Strain.

Words and images on a computer screen are created by combinations of tiny points of light (pixels), which are brightest at the center and diminish in intensity toward their edges. This makes it more difficult for our eyes to maintain focus on them. Instead, our eyes want to drift to a reduced level of focusing called the "resting point of accommodation" or RPA. Our eyes involuntarily move to the RPA and then strain to regain focus on the screen. This continuous flexing of the eyes’ focusing muscles creates the fatigue and eye strain that commonly occur during and after computer use.[2] Results showed that reading under high levels of screen luminance increases visual fatigue, as reflected by a decrease of eye blinks.

No remedial measures for the prevention and cure of this pathology prevail in the domain of modern medicine except using ocular surface lubricants, computer glasses, Increasing text size on devices and counseling for judicious computer use[3]. Though the ailment is a consequence of modern invention, Ayurveda, the ancient science of life can be of great help in dealing the modern occupational ailments by its preventive and therapeutic principles. Considering the Dosha involvement on the basis of
symptoms, Ayurvedic remedies can be used to treat the condition. Therapeutic measures like Kriya Kalpa, Shamana Aushadhis, Chakshushya and Rasayanas, etc. which improve the homeostasis and ocular strength can be practiced.[4] Digital eye strain can be managed by Ayurvedic Chakshushya and Vata-pitta pacifying therapies. Acharya Vagbatta has cooling and rejuvenating therapies for eyes affected by bright light, high-voltage electric spark, and heat exposure.[5]

Based on fundamentals of Ayurveda, it is a Vatapitta pradhana vikara of Netra affecting Pratham and Dwitiya Patalas of Netra i.e., Conjunctiva and Cornea Netra.

On critical analysis of the symptoms of Digital Eye Stress on Tridosha theory indicated of Ayurveda, as per the road map given by Acharya Charaka, it seems to be a Vata–Pitta ocular cum systemic disease which needs systemic as well as topical treatment approach[6]. Jeevantyadi Ghrita Orally, Jeevantyadi Ghrita in the form of Netra Tarpana (topically), and counseling regarding proper working conditions on computer has been studied in 30 patients of digital eye strain.

Aims and objectives -

- To study the digital eye strain and visual fatigue in Ayurvedic perspective.
- To evaluate the efficacy of Jeevantyadi Ghrita administered in two different routes namely oral and topically in the form of Tarpana.
- To know the effects of changing the working style and standards in the management of digital eye strain and visual fatigue.

Materials and Methods

Selection of patients

Patients were selected from the Shalakya Tantra (eye unit) OPD at Mahatma Gandhi Ayurved college & hospital, Salod, Wardha. A total of 30 patients of Digital Eye Strain & Visual Fatigue were selected irrespective of age, sex, caste, and religion.

Inclusion criteria

Patients with more than 5 signs and symptoms of digital eye strain and visual fatigue aged between 18 to 40 yrs and with no history of previous disorders and current illness were taken for study.

All patients using exposed to any kind of digital visual display like computer, L.E.D. & smart phone, at least 3 hrs/day presenting with following clinical features of Digital Eye Strain & Visual Fatigue were included in this study:

- Trouble focusing
- Slow refocusing
- Increased sensitivity to light
- Dry eye - Changed color perception
- Watery eyes
- Sore eyes with Redness
- Burning sensation
- Excessive fatigue (neck/shoulder/back pain)
- Double vision
- Eye strain - Blurred vision
- Dizziness/nausea – Headache

Materials and Methods

Selection of patients

- Jeevantyadi Ghrita Orally
- Jeevantyadi Ghrita in the form of Netra Tarpana
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- Dizziness/nausea – Headache
Exclusion criteria

- Patients suffering from any systemic or metabolic disorders.
- Patients suffering with acute, chronic, infective ocular ailments like conjunctivitis, any specific eyelid disorders, corneal ulcers, dacryocystitis, and Lagophthalmous.

Method of study

30 Patients were selected by random sampling technique, which fulfilled the inclusion criteria, and were subjected to the following three groups:

- Group I - In this group, Jeevantyadi Ghrita was given orally and in the form of Netra Tarpana.
- Group II - In this group Tarpana Karma with Jeevantyadi Ghrita was given.
- Group III - Counseling for changing the working style and standards on computer was given.

Drug schedule

**Group I**

Jeevantyadi Ghrita was given orally in a dose of 15 ml twice daily with lukewarm water in empty stomach one month and Tarpana Karma with Jeevantyadi Ghrita was given 7 days in a week, followed by a gap for 7 days, and then the same was repeated again for 3 consecutive cycles.

**Group II**

Tarpana Karma with Jeevantyadi Ghrita 7 days in a week, then a gap for 7 days, and then the same is repeated again for 3 cycles

**Group III**

- Use of computer glasses and use of antiglare screen.
- Increasing text size on devices.
- Advice regarding the location of computer screen - computer screen should be at 15 to 20 degrees below eye level (about 4 or 5 inches)
- **Counseling regarding Frequent Blinking** as blinking keeps the front surface of eyes moist.
- Counseling regarding proper posture and sitting of the patient in front of any digital devices.
- Low illumination of the monitor screen of the computer.

The trial of therapy was carried out up to 3 month for all groups.

Follow-up

Follow-up was done fortnightly to assess the effect of therapy for next three months. Patients were followed up for the next six months for withdrawal effects or recurrence.

Criteria of assessment

Grading and scoring system was adopted for assessing each clinical feature before the clinical trial and after the completion of trial.

Results and Observations

Demographic data have been presented for 30 patients. Patients who completed
the clinical trial and similarly the results were analyzed and are presented in [Table 1], [Table 2] and [Table 3].

Table 1: Effect of therapy in trial group I

| Cardinal feature             | No of Patient | Mean BT AT | D    | % of Relief | ±SD  | ±SE  | “t” | P      |
|------------------------------|---------------|------------|------|-------------|------|------|------|--------|
| Eye strain                   | 08            | 2.00 0.21  | 2.00 | 89.09       | 0.5  | 0.156| 11   | <0.001 |
| Blurred vision               | 08            | 2.00 0.22  | 1.66 | 87.88       | 0.79 | 0.26 | 6.38 | <0.001 |
| Dizziness/nausea             | 06            | 1.55 1.11  | 1.00 | 82.6        | 0.69 | 0.32 | 4.21 | <0.01  |
| Headache                     | 09            | 2.22 0.21  | 1.56 | 87.03       | 0.33 | 0.11 | 4.30 | <0.01  |
| Redness                      | 05            | 1.2 0.11   | 1.31 | 85.6        | 0.76 | 0.28 | 3.56 | <0.05  |
| Burning sensation            | 07            | 2.00 0.14  | 0.11 | 86.5        | 0.71 | 0.21 | 3.41 | <0.01  |
| Dry eye                      | 01            | 0.11 0.00  | 0.11 | 100         | 0.41 | 0.11 | 1.0  | >0.05  |
| Change in color perception   | 05            | 1.20 2.21  | 0.00 | 89.20       | 0.73 | 0.25 | 4.01 | <0.05  |
| Slow refocusing              | 07            | 2.21 0.21  | 2.00 | 86.40       | 0.66 | 0.23 | 5.01 | <0.001 |

Table 2: Effect of therapy in trial group II

| Cardinal feature             | No of Patient | Mean BT AT | D    | % of Relief | ±SD  | ±SE  | “t” | P      |
|------------------------------|---------------|------------|------|-------------|------|------|------|--------|
| Eye strain                   | 07            | 1.99 0.364 | 1.69 | 81.01       | 0.43 | 0.15 | 9.97 | <0.001 |
| Blurred vision               | 06            | 1.50 0.26  | 1.23 | 82.01       | 1.03 | 0.35 | 3.12 | <0.05  |
| Dizziness/nausea             | 01            | 0.123 0.11 | 0.00 | 00          | 0.0  | 0.0  | 0.0  | >0.05  |
| Headache                     | 05            | 0.75 0.42  | 0.69 | 67.08       | 0.69 | 0.24 | 2.99 | <0.05  |
| Redness                      | 04            | 0.69 0.39  | 0.62 | 82.01       | 0.74 | 0.26 | 2.34 | >0.05  |
| Burning sensation            | 04            | 0.78 0.25  | 0.63 | 69.23       | 0.68 | 0.24 | 2.41 | >0.05  |
| Dry eye                      | 01            | 0.24 0.00  | 0.25 | 100         | 0.70 | 0.24 | 1.00 | >0.05  |
| Change in color perception   | 03            | 0.63 0.24  | 0.62 | 70.32       | 0.90 | 0.31 | 1.02 | >0.05  |
| Slow refocusing              | 04            | 0.79 0.25  | 1.00 | 60.01       | 0.56 | 0.18 | 0.92 | <0.01  |
| Excessive fatigue (neck or shoulder or back pain) | 06 | 1.32 0.362 | 0.875 | 69 | 0.31 | 0.34 | 2.391 | <0.05 |
Table 3: Effect of therapy in trial group III

| Cardinal feature                  | No of Patient | Mean BT | AT | D | % of Relief | ±SD | ±SE | “t” | P  |
|----------------------------------|---------------|---------|----|---|-------------|-----|-----|-----|----|
| Eye strain                       | 3             | 1.3     | 1  | 0.3| 27.62       | 0.52| 0.23| 1.59| >0.05|
| Blurred vision                   | 4             | 1.3     | 1  | 0.3| 27.01       | 0.53| 0.24| 1.58| >0.05|
| Dizziness/nausea                 | 0             | 0.0     | 0.0| 0  | 0.0         | 0.0 | 0   | 0   | >0.05|
| Headache                         | 3             | 1.3     | 0.7| 0.4| 32.01       | 0.49| 0.23| 1.59| >0.05|
| Redness                          | 3             | 1.2     | 0.7| 0.0| 0.0         | 0.0 | 0.20| 0.0 | >0.05|
| Burning sensation                | 3             | 1.3     | 1.0| 0.4| 29.32       | 0.23| 0.20| 1.59| >0.05|
| Dry eye                          | 1             | 0.4     | 0.2| 0.2| 52.22       | 0.21| 0.21| 1.0 | >0.05|
| Change in color perception       | 3             | 0.7     | 0.6| 0.2| 24.11       | 0.20| 0.20| 1.0 | >0.05|
| Slow refocusing                  | 4             | 1.7     | 1.2| 0.5| 32.21       | 0.49| 0.49| 1.11| >0.05|
| Excessive fatigue (neck or shoulder or back pain) | 3 | 1.0 | 0.7 | 0.2 | 20.21 | 0.21 | 0.2 | 1.0 | >0.05 |

**Demographic profile**

The far vision of those exposed to screen irradiation was significantly worse than in those who were not exposed. The people from the exposed group had vision correction significantly more often. The probable relation between progressive myopia and on-screen work is not excluded, but further investigation is needed. The proposed measures were effective for preventing visual fatigue. However, 49.5% of the study group had persistent visual symptoms, probably because of not following the recommendations, not having an ergonomic correction, or because modifications of blinking, tear film, and the ocular surface were not taken into account.

It revealed that the incidence of Digital eye strain and visual fatigue was higher, i.e., 73.33%, in the age group of 18-40 years, and was 56.66% in males and 97.30% in Hindus., 56.55%, were full-time computer workers and 48.06% of them belonged to middle socio-economic status. Most of the patients, i.e., 56.66%, were using computer for 8-10 h/day; 83.33% of patients were on mixed diet. The incidence was more, i.e., 60%, in patients with *Vata-Pitta* Prakriti. Maximum number of patients, i.e., 53.33%, was addicted to tea or coffee, 36.66% of patients were having regular bowel habits, and 60.66% of patients were having sound sleep. Most of the patients, i.e., 66.33%, were having graduate qualification, and 63.33% of patients were unmarried. Maximum number of patients, i.e., 63.66%, belonged to rural area, and 88 % of patients were emetrope.

**Clinical profile**

Maximum number of patients, i.e., 93.33%, was having eye strain, while 83.33% patients had excessive fatigue.
(neck or shoulder or back pain). 80% patients had blurred vision and burning sensation, while 76.66% patients had headache and slow refocusing. 56.66% patients had change in color perception, while 66.66% had redness. 30% patients had dizziness or nausea and 14.66% patients had dry eye.

**Discussion**

**Probable mode of action:**

In Digital Eye Strain and Visual Fatigue there is Atiyoga of Chakshurendriya, which leads to Vata Pitta vitiation i.e. Vata Pitta vradhi. They ultimately lead to Dhatu Kshaya. Therefore Jeevantyadi Ghrita which is mainly Vata Pitta shamka, pacifies the vitiated Vata Pitta and Rasayana property perform the function of Dhatuvardhan. Thus we can say that Jeevantyadi Ghrita with Madhu and Ghrita anupana acts by improving the overall general health by pacifying the vitiated Vata and Pitta.

The formulation Jeevantyadi Ghrita to be an excellent choice in the treatment of digital eye strain. Aacharya Vagbhata has advocated Jeevantyadi Ghrita in the form of Tarpana Kriyakalpa and systemic santarpana (anabolic nutritional supplement) for the enhancement of Drishti due to its nourishing effect to eyes[7].

Jeevantyadi Ghrita possess Rasayana, Chakshushya, Vata-pitta shamaka properties which is helpful in strengthening the first Patala (cornea & conjunctiva), reconstructing the Ashru (tear film) which decreases the dryness of eyes as well as enhance tear film stability. Moreover due to its lipid nature it lubricates the eyes surface and enhance the lipid layer of the tear film. It also work on Dvitya patala(second) to nourish and strengthen ciliary muscle which improves accommodation of the eyes. Jeevantyadi Ghrita checks out the ocular manifestations by increasing the functional integrity of the visual apparatus. Jeevantyadi Ghrita with Madhu and Ghrita anupana acts by improving the overall general health by pacifying the vitiated Vata and Pitta Doshas.

**Demographic profile**

Majority of the patients were in the age group 18 to 40 years because this age group used computer more than the other age groups. Maximum number of patients was Hindus because this area (where the trial was conducted) is a Hindu dominated area. Most of the patients were full-time computer workers and using computer for 8-10 h/day, which shows that prevalence of digital eye strain is more in long time computer users because they have no time for rest (break). Most of the patients belonged to middle socioeconomic status, and their over stress of responsibility (which demands over work) as well as not meeting the required nutritional demand adds into the precipitation of Digital Eye Strain. Maximum number of patients was of Vata-Pitta Prakriti, again suggestive of digital eye strain, a Vata dominating Pitta disorder. Maximum number of
patients belonged to rural area because this study was done in a rural area.

**Clinical profile -**

**Effect of therapy in group I**

In dry eye which was the only subjective feature, because objectively (i.e., Schirmer-I test and T-BUT - Tear Film Break Up Time) they had no findings, the percentage of relief was 100%, which was statistically insignificant \((P > 0.05)\) owing to the reason that 'n' was 1, i.e., <6.

### Effect of therapy in group II

| Cardinal feature                          | % of Relief |
|-------------------------------------------|-------------|
| Eye strain                                | 90.09%      |
| Blurred vision                            | 88.88%      |
| Burning sensation                         | 86.61%      |
| Slow refocusing                           | 90.43%      |
| Dizziness/nausea                          | 83.70%      |
| Excessive fatigue (neck or shoulder or back pain) | 87.50%      |
| Headache                                  | 79.06%      |
| Change in color perception                 | 81.96%      |
| Redness                                   | 88.38%      |

### Effect of therapy in group III

| Cardinal feature                          | % of Relief |
|-------------------------------------------|-------------|
| Eye strain                                | 31.57%      |
| Blurred vision                            | 30.57%      |
| Dizziness/nausea                          | 0%          |
| Headache                                  | 33.33%      |
| Redness                                   | 0%          |
| Burning sensation                         | 28.57%      |
| Dry eye                                   | 54%         |
| Change in color perception                 | 27%         |
| Slow refocusing                           | 36.33%      |
| Excessive fatigue (neck or shoulder or back pain) | 27%         |

**Conclusion:**

The discussion on ocular and non-ocular symptoms of Digital Eye Strain & Visual Fatigue in the perspectives of Ayurveda is clearly suggestive of Vata dominating Pittaja vitiation in eye and body as a whole. These pathological factors give rise to Vata-Pitta ocular surface symptoms like Vataja, Pittaja, Rakta, Abhishyanda, as well as Shushkakshipaka (dry eye syndrome).

Drug, Jeevantyadi Ghrita has been proved very effective in the management of Digital Eye Strain & Visual Fatigue.

Tarpana Kriyakalpa alone was less effective in relieving the different features, especially ocular features of digital eye strain.

- In Group I Jeevantyadi Ghrita with Madhu Anupana orally along with Tarpana Karma has found more effective in relieving the different ocular as well as non-ocular symptoms of Digital Eye Strain & Visual Fatigue.
In Group II where *Netra Tarpana* with *Jeevantyadi Ghrita* was carried out, improvements were gradual and slow.

In Group III where changing the lifestyle by preventive measures and counseling regarding VDT, is least effective.

This formulation, *Jeevantyadi Ghrita* proved to be very beneficial in improving vision and overcoming dryness of eyes as it worked efficiently in alleviating vata and pitta doshas.

It also works wonders in releasing the strain to intra and extra ocular group of muscles, headache due to spasm of temporal muscles, improving vitality of eye, and reversing the degenerative changes due to irradiation. It can be concluded Digital Eye Strain & Visual Fatigue is Vata-Pitta vitiation pathology and needs to be managed by Snigdha and Rasayana measures, both locally and systemically.

To achieve the maximum benefits of the formulation and complete cure as well as to sustain the results for nullifying recurrence *Netra Tarpana* followed with oral administration is recommended as peer of this study.

Thus it can be concluded that the Ayurvedic formulation, *Jeevantyadi Ghrita Netra Tarpana* (topically) & *Jeevantyadi Ghrita* (orally) is more effective in comparison to only topical medication or computer work related counseling.

**References:**

1. www.thevisioncouncil.org/content/digital-eye-strain.
2. www.allaboutvision.com/cvs/faqs.htm
3. Wikipedia; Computer vision syndrome, Therapy; [Last access and modified on 2011 Feb 09]
4. Sushruta, Sushruta Samhita with Nibandhsamgraha Commentary of Dalhan. Uttar Tantra, 18/17-18. Chaukhamba Surbharti Publication, Varanasi; 2008. p. 634.
5. Vagbhata, Asthang Samgrah with Sashilekha Commentary of Indu. Uttar Tantra, 16/28. Chaukhamba Sanskrita Series, Varanasi; 2006. p. 712.
6. Agnivesha, Charak, Dridhabala, Charak Samhita with Ayurveda Dipika Commentary of Chakrapani, Sutra Sthana, 18/44 - 47. Rashtriya Sanskrit Samstan Publication; 2006. p. 108.
7. Vagbhata, Asthang Samgrah, Uttarsthana translated by Prof. K.R. Shrikant Murthy, Vol-III 16/4. Chaukhamba Sanskrita Series, Varanasi; 2009. p. 137.