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**SIDDHA DRUGS AND DISCIPLINES FOR THE MANAGEMENT OF COMPUTER VISION SYNDROME (CVS) - A REVIEW**

P. Carolin and S. Sudha Revathy \*

Department of Gunapadam, National Institute of Siddha, Chennai - 600047, Tamil Nadu, India.

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**Correspondence to Author:**

**Dr. S. Sudha Revathy**

Assistant Professor,  
Department of Gunapadam,  
National Institute of Siddha, Chennai -  
600047, Tamil Nadu, India.

**E-mail:** dr.sudharevathy@gmail.com

**ABSTRACT:** In this advanced technological world, the computer has become an indispensable piece of equipment in both office and home. Visual and ocular problems have recently been reported as the most frequently occurring health problem among computer users. Prolonged exposure to radiofrequency radiation affects eyesight and indirectly affects the whole body function. The herbal supplements that improve eye vision are more effective for all age groups and those involved in jobs that cause strain over the eye. Computer Vision Syndrome (CVS) is caused by extensive computer use that reduces eye blinking rate. CVS comprises symptoms like dry eye disease, strain, redness, and irritation. Sight promoters relieve strain, and energize eyes to keep it healthy. They protect and enhance the vision. In Siddha, many herbs and day-to-day disciplines are advised to maintain good vision. This review article discusses the herbs and other disciplines to be followed that will be helpful in the prevention and management of CVS.

**INTRODUCTION:** In our present lifestyle, the majority of our work are done with mobile, laptops, computer *etc.*, as a result, exposure to radio-frequency radiation (RFR) is widespread in society <sup>1, 2</sup>. Approximately more than 45 million workers are directly using computers <sup>3</sup>. Computer helps to increase work efficiency and communication; hence, constant exposure affects our eyesight. Among the human tissues eye lens are more radio-sensitive, and retina is at direct risk to radiation. Prolonged exposure to radiofrequency radiation affects eyesight and indirectly affects the whole body function. The most common radiation disorder is computer vision syndrome (CVS) <sup>4</sup>. Sight promoters are which relieve strain; energize eyes to keep it healthy.

They protect and enhance the vision. The factors promoting eyesight are vitamin C, vitamin E, beta carotene, zinc, zeaxanthin, selenium, lutein, calcium, thiamine, folic acid, omega-3 *etc.*. The herbal supplements that improve eye vision are more effective for all age groups and those involved in jobs that cause eye strain. Siddha medicine is one of the India’s most ancient health care system. The Siddha system of medicine is a distinct science and a unique art of healing found by Siddhars who documented and preached their work in Tamil language.

There were 18 important Siddhars and they developed this system of medicine. As per Siddha, the five-element theory (Panchaboothic theory) creates the universe. Our body is also made of five element theory (nose-earth, skin-air, eyes-fire, mouth-water, ear-space) from which the three humours (vadham, pitham, kabam) develop. The factors that affect this equilibrium cause diseases <sup>5</sup>. According to Siddha, medicine, diet and lifestyle play a major role in health and curing diseases. In Siddha, eye diseases are classified into 96 types by

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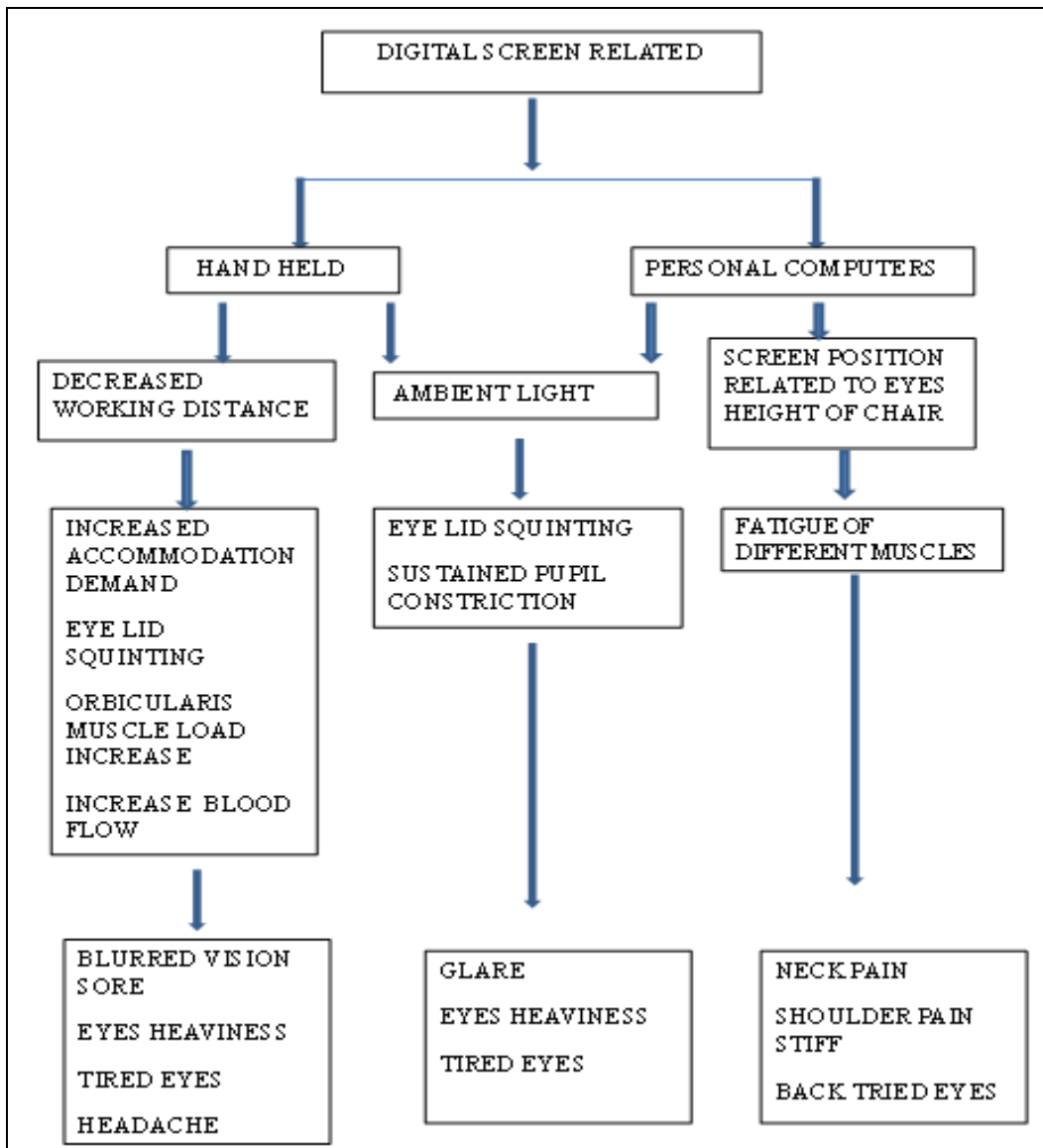
the Siddhar Agasthiyar and Nagamuni <sup>6</sup>. The present article discusses various Siddha drugs that can be helpful in ameliorating the symptoms of CVS and promoting healthy vision.

population of computer workers experience discomfort due to CVS <sup>8</sup>. CVS is a mixture of visual ocular and extraocular manifestations that affects digital screen users.

**Computer Vision Syndrome:** The American optometric association (AOA) has defined computer vision syndrome as a complex of eye and vision problems related to near work experienced during computer use <sup>7</sup>. Around 60 million

Ocular symptoms include dry eye disease, strain, redness, and irritation. Extraocular symptoms include headache, neck, shoulder, and back pain, and trigger thumb or wrist tendonitis or arthritis

**Pathology of CVS <sup>9</sup>:**



**Siddha Disciplines for Ameliorating the Symptoms of CVS:**

**Oral Hygiene:** As per the Siddha system of medicine, specific disciples have been mentioned in the classical texts for keeping the sense organs healthy (Aimporigal) <sup>10</sup>. For the maintenance of

healthy vision specific procedure of brushing the teeth is advised. Sticks of *Aal (Ficus benghalensis)*, *Erukku (Calotropis gigantea)*, *Vel (Acacia nilotica)*, *Maruthu (Terminalia arjuna)*, *Pula (Bombax ceiba)* have been advocated for brushing. The posture advised is kukkudasanam (Cock or Rooster Pose)

<sup>11</sup>. The stems should be healthy, soft, without leaves or knots and taken from a healthy tree. Chewing on these stems is to cause attrition and leveling of biting surfaces, which facilitates salivary secretion and helps in plaque control, while some stem have an anti-bacterial action <sup>12</sup>. These sticks prevent tooth infections and thereby prevent eye infections. After brushing, rinsing the mouth at least 12 times is advised <sup>11</sup>. According to Bishop Harman theory, there is a causal relationship between the deciduous teeth, cornea and conjunctiva by trigeminal nerve pathway. According to Back, diseased teeth harbor the virus of herpes which spreads along the trigeminal to the cornea <sup>13</sup>.

**Anjanam (Kajal):** Mai (collyrium) must be applied once in 3 days in the eyes to promote good sight. Some of the Anjanam mentioned in Siddha literature are Nilajanamai for Kan poo (cataract), kaasam. Ponnakanni mai for kan oli (sight), kirampu pakava vennai for theera kan noi (chronic eye disease), narikelanjana mai for presbyopia <sup>6</sup>. As *anjanam* works as a foreign body on the ocular surface, cornea, conjunctiva of the eye produce reflex secretion. It enhances the ocular absorption through cornea and conjunctiva <sup>14</sup>. Applying kajal should be avoided during rainy seasons, after sunset, during the menstrual cycle and after taking oil bath <sup>6</sup>.

**Application of Ghee in Feet:** In Siddha aspect, before going to bed, application of ghee in feet over which bran is applied and closed with white cloth. It should be washed with water and sandal powder by the next morning. This reduces *azhal* (heat) and promotes healthy vision <sup>10</sup>. Applying ghee to feet generally acts on vascular, nervous, and lymphatic systems. It normalizes the neurotransmitters serotonin and norepinephrine, which regulates the neuropsychological process and sleep, positively affecting the eye <sup>15</sup>. Application of ghee over feet enhances better sleep and visual acuity <sup>16</sup>. Cow's ghee benefits eyes since it is cold in potency, reducing *pitham* <sup>17</sup>. Application of ghee on feet stimulates the naadi, which regulates healthy vision <sup>18</sup>.

**Medicated Oil Bath:** An oil bath is one of the ways to maintain healthy vision. In Siddha, taking an oil bath twice a week is advised, especially on

Wednesday and Saturday for males and Tuesday and Friday for females <sup>10</sup>. Oil bath improves vision, removes dust particles, and reduces redness in eyes. The oils contain antioxidant and polyunsaturated fatty acid and vitamin E, which act as antimicrobial and anti-inflammatory agent <sup>19</sup>. Some medicated oils include arkasirathi thylam, seeraga thylam for eye diseases. Notchi thylam, Santhana thylam and milagu thylam are specifically mentioned for people with vatham, pitham and kabham body constitutions, respectively <sup>20</sup>. The optic nerve which ends in the retina is the direct extension of brain stem. So daily application of oil, selected according to the person's body constitution, helps prevent eye diseases and nourishes all sense organs.

**Medicated Water for Eye Wash:** Based on Siddha literature, herbal eye wash includes the leaves of Nellikai (*Phyllanthus emblica*), Thanrikai (*Terminalia bellarica*), Kadukkai (*Terminalia chebula*). The leaves are soaked in water and little camphor is added and mixed well. Washing with this water daily in the morning relieves eye irritation <sup>10</sup>. One previous study revealed that an average of 55% were relieved of symptoms after doing eye exercise and Triphala eyewash when compared to the group treated with eye exercise and distilled water eyewash for computer vision syndrome. Eye exercise and Triphala eyewash had a significant effect than eye exercise and instillation of distilled water <sup>21</sup>. Add Padigaram (Alum) 130mg with 28ml of water, rinse well and use as eye wash for eye disease as it has antimicrobial activity <sup>22</sup>.

**Exposure to Moon Light:** This procedure is mentioned as *Palakani paarthal* in Siddha literature. It is said that a small triangle is made with the help of fingers and moonlight is watched in the gap after dinner. Before this, the eyes should be washed with clear water. This practice enhances healthy vision.

**Food as Medicine:** The Siddha system of medicines advocates healthy food habits for good eyesight and act as sight promoters. Greens namely *Pannai keerai* (*Celosia argentea*), *Siru keerai* (*Amaranthus campestris*), *Ponnankanni keerai* (*Alternanthera sessilis*) should be taken for lunch, ghee must be used twice a day, and milk for dinner. These food practices help keep the vision healthy,

preventing dry eyes and eye strain. *A. sessilis* leaves are rich in Vitamins A ( $956.02 \pm 3.92 \mu\text{g}$ ) and  $\beta$  carotene ( $1090 \pm 8.95 \mu\text{g}$ )<sup>23</sup>. Vitamin A is the first molecule in the process of transforming photons of light to electrical signal<sup>24</sup>. *Amaranth* contains high amount of Carotenoids (100 IU), Calcium (267 mg), Potassium (411 mg), Ascorbic acid (80 mg), Phosphorus (455 mg), Magnesium (266 mg) and Iron (17.4 mg)<sup>25</sup>. *C. argentea* is rich in vitamin A, C and E, calcium, magnesium and potassium<sup>26</sup>. A dynamic equilibrium between influx regulates calcium in the outer segments of rods and cones *via* the transduction of cGMP-gated channels and extrusion *via* rod- and cone-specific  $\text{Na}^+/\text{Ca}^{2+}$ ,  $\text{K}^+$  exchangers<sup>27</sup> and function in neuron, act in the process of light adaptation<sup>28</sup>. Magnesium regulates cellular and molecular functions of ocular tissue such as cornea, conjunctiva, lens, and retina and prevents dry eye disease and infection<sup>29</sup>. Ascorbic acid (Vitamin C) acts as a physiological sunscreen to protect the lens from UV light-induced oxidative damage and regenerate Vitamin

E & glutathione, which increase antioxidant capacity<sup>30</sup>. These minerals and vitamins are sight promoters and prevent the symptoms of CVS.

Preventive therapies to maintain healthy vision and balance of three humour are achieved by the following measures below<sup>6</sup>.

**Vali:** 4 months once *kazhichal maruthuvam (Viresanam)*-Purgation therapy.

**Azhal:** 6 months once *vanthi seivithal (Vamanam)*-Emesis.

**Iyam:** 1 month once nasiyam –Nasal drops.

**Herbal Drugs in Siddha Medicine for the Management of CVS:** Siddha system of medicine has indicated the use of many herbal drugs to manage eye disease. **Table 1** enlists the herbs that can be used to manage the symptoms of CVS. The scientific basis and the herb's mode of use are enlisted in **Table 1**.

**TABLE 1: HERBAL DRUGS IN THE MANAGEMENT OF CVS**

Sl. no.	Tamil name	Botanical name	Part used	Protective effects for CVS	Mode of administration <sup>48</sup>
1	<i>Athimarutham</i>	<i>Glycyrrhiza glabra</i> – Fabaceae	Root	It has an effect in acute conjunctivitis by its presence of a corticosteroid-like substance and it probably improves conjunctival resistance by its tonic nature. Glycyrrhizin bind to high mobility group box I protein (HMGB1), which inhibits cytokine activity and potentially improve dry eye disease <sup>31</sup>	Root is gring with breast milk  Athimathura chooranam-Powder form of the root.
2.	<i>Ponnakani</i>	<i>Alternanthera sessilis</i> - Amaranthaceae	Leaf	<i>A.sessilis</i> leaf extracted Ag nanoparticles act as antibiotics like Gatifloxacin and Tobramycin and showed maximum zone of inhibition against ocular pathogens such as <i>S.aureus</i> and <i>P.aereginosa</i> <sup>32</sup> . <i>A.sessilis</i> leaf and stem has maximum and lower zone of inhibition of ocular pathogen ( <i>Bacillus subtilis</i> , <i>Staphylococcus aureus</i> , and <i>Streptococcus mutans</i> ) <sup>33</sup>	Leaf is roasted with ghee and taken for 40 days, for healthy vision (Internal).  Oil bath – External.
3.	Jathikai	<i>Myristica fragrans</i> - Myristicaceae	Nutmeg	The beneficial components include dietary fiber, manganese, thiamine, VitaminB6, folate, magnesium and copper <sup>34</sup> . Vitamin B6 may play a role in preventing eye diseases, especially macular degeneration. Copper deficiency is associated with optic neuropathy, but retinal function is maintained <sup>35</sup> . Mg has been shown to improve blood flow by modifying endothelial function via endothelin-1 (ET-1) and endothelial nitric oxide	Nutmeg is ground to a fine powder and externally applied around the eyes externally (patru).

				(NO) pathways. Mg also exhibits a neuroprotective role by blocking N-methyl-D-aspartate (NMDA) receptor-related calcium influx and by inhibiting the release of glutamate, and hence protects the cell against oxidative stress and apoptosis <sup>36</sup>	
4.	Neichatti	Vernonia cinerea - Asteraceae	Whole plant	V.cinerea has the therapeutic potential of the lens against selenite-induced cataracts. V.cinerea might be useful against lens damage caused by ROS generation under oxidative stress <sup>37</sup>	Flower extract is taken as eye drops to reduce redness and promote eyesight
5.	Venthamarai	Nelumbo nucifera - Nelumbonaceae	Rhizome, flower	Different extracts of rhizome showed significant antibacterial effects against <i>Staphylococcus aureus</i> , <i>Escherichia coli</i> , <i>Bacillus subtilis</i> , <i>B. pumilis</i> and <i>Pseudomonas aeruginosa</i> <sup>38, 39</sup> . The most common form of infection caused by <i>Pseudomonas aeruginosa</i> is corneal ulcer, which spreads with frightening rapidity to panophthalmitis <sup>40</sup>	Honey from the flower is used to treat eye diseases
6.	Iruvachi	Jasminum sambac – Oleaceae	Flower, root	<i>Jasminum sambac</i> has <i>In-vitro</i> antimicrobial and antioxidant activities which could support the use of the plant by Siddha system to treat various infective eye diseases <sup>41</sup>	Flower oil is used in head bath and as eye drops
7.	Chittramutti	Sida cordifolia- Malvaceae	Root	<i>S.cordifolia</i> -mediated iron oxide nanoparticles serves as potent antibacterial agents in an eco-friendly way by securing natural microbiome as nanoparticles usually acts through targeted delivery. $\alpha$ -Fe <sub>2</sub> O <sub>3</sub> NPs are more efficient in inhibiting the growth of <i>B. subtilis</i> <sup>42</sup> <i>Bacillus spp.</i> are ubiquitous, Gram-positive organisms that can infect ocular and adnexal tissues leading to dacryo cystitis, conjunctivitis, keratitis and iridocyclitis <sup>43</sup>	The root oil is used in head bath to prevent eye diseases
8.	Manjal Karisalankanni	Eclipta alba- Asteraceae	Whole plant, leaf	Wedelolactone reduces host immune responses. It attenuates neutrophil recruitment and interleukin 1 beta (IL-1 $\beta$ ) maturation as aspergillus fumigates keratitis and decreases MPO level (Myeloperoxidase) <sup>44</sup>	Oil prepared with the plant is used in head baths for healthy vision
9.	Ellu	Sesamum indicum- Pedaliaceae	Seed Oil	Sesame oil is rich in linoleic and linolenic acids and has high amounts of biologically active substances such as lignans, natural vitamin E, and phytosterols <sup>45</sup> . Vitamin E is a powerful antioxidant that is important in maintaining healthy eyes. Vitamin E deactivates harmful free radicals, which are atoms of oxygen that can damage cells within the body (oxidative damage)	Two drops of sesame oil are applied to the eyes, and the same is applied to the whole body; this reduces irritation in the eyes and improves vision
10.	Vengaipisin	Pterocarpus marsupium- Fabaceae	Gum	<i>Pterocarpus marsupium</i> exerted anti-cataract effect evident from decreased opacity index <sup>46</sup>	Gum is roasted with ghee, ½ -2 grams to be taken internally

11.	<i>Thandrikkai</i>	<i>Terminalia bellerica</i> - Combretaceae	Dried fruit	<i>Terminalia bellerica</i> is one of the ingredients in <i>Thiripala</i> . Overall, it has been observed that treatment with <i>Triphala</i> eye drop gives a statistically significant difference at 1% level over placebo treatment, $P < 0.001$ . <i>Triphala</i> eye drops relieve the eye strain and strengthen the visual function <sup>47</sup>	4 grams of dried fruit powder, white sugar is taken with honey internally
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**Metal, Minerals and Animal Products for Computer Vision Syndrome<sup>49</sup>:**

**Sembu (Copper):** In the Siddha system of medicine, copper is used to prepare the surgical instruments for eye diseases and in medicated collyrium and cures 96 types of eye diseases<sup>6</sup>. Copper sticks are used for applying collyrium. Copper and zinc are necessary for the visual cycle and photoreceptor survival. Copper and zinc also stimulate protective cellular stress signaling pathways and stabilize proteins, making them less vulnerable to oxidation. Copper deficiency leads to morphological changes in retinal structures<sup>51</sup>. Copper deficiency cause optic neuropathy and also vision loss.

**Nandukkal (Fossil Stone Crab):** Fossil stone crab contains calcium as a major component<sup>52</sup>. Calcium ion ( $Ca^{2+}$ ) contributes to detecting, transduction and synaptic transfer of light stimuli in rod and cone photoreceptors. Calcium is intricately involved in controlling the functional properties of photoreceptors<sup>53</sup>. Calcium also represents a substantial fraction of their current. In rods, 15% of the dark current is carried by calcium, whereas in cones this fraction can be as high as 30%<sup>54</sup>. In Siddha medicine, Nandukkal is ground with nanthiya vattam juice (*Tabernaemontana divaricata*) and applied as collyrium for 8 days, the size of sesame seed. This medication cures all 96 types of eye diseases. *Tabernaemontana divaricata* is especially used for eye irritation and redness<sup>48</sup>.

**Honey (Putru then):** Honey reduces inflammation, inhibits bacterial growth, enhances the healing process, and alleviates dry eye symptoms. On the other hand, propolis has anti-angiogenic properties, lowers intraocular pressure, and inhibits inflammatory responses in addition to neuroprotective effects<sup>55</sup>. In Siddha, honey is used both internally and externally for eye diseases. Honey is a powerful hyperosmotic medium due to its high concentration of sugars and low moisture

content. When applied undiluted to the ocular surface in edematous corneas, honey can rapidly (within 10 to 15 minutes) reduce the inflammation of corneal epithelium and anterior stroma and resolve microcystic edema and collapsed epithelial bullae. Therefore, using honey elevates tear osmolarity and induces ocular surface epithelial osmotic stress<sup>56</sup>. A drop of honey can effectively reduce the redness of limbal papillae and improve vernal keratoconjunctivitis. Honey reduces dry eyes and keratoconjunctivitis and maintains osmotic stress in eye<sup>57</sup>.

**Cow’s Ghee:** Cow’s ghee is applied in foot and also taken internally for enhancing good vision. It contains 98% glycerides. It has lubricating properties which is the mainstay of computer vision syndrome treatment. It contains vitamin A 3500/100gm. It also contains Beta-carotene and Vit E<sup>58</sup>. The human lens is made of phospholipids, especially dihyrosphigomyelin, which helps to keep the lens transparent<sup>59</sup>. Ghee is also used in head bath. Ghee has fat-soluble vitamins (A, D, E, K) and essential fatty acids (linolenic acid and arachidonic acid), besides having rich and pleasant sensory properties. Ghee is believed to be a coolant, capable of increasing mental power, and physical appearance, and cures ulcers and eye diseases<sup>62</sup>.

**Buffalo Milk:** Buffalo milk is high in calcium (1.5-fold higher than cow’s milk). It has higher calcium than phosphorus content. Milk from buffalo contains more tocopherols, vitamin A and enhances good eye sight<sup>60</sup>. In Siddha, buffalo curd is used as an eye coolant.

**Cow’s Milk /Butter:** Milk is a good source of retinoid, containing 280µg/l<sup>61</sup>. Vitamin A is important for the maintenance of vision. Vitamin A contributes with other molecules to form Rhodopsin, which is primitive pathway important for absorption of light.

**Kaya Karpam:** The *kaya karpam* is a stream of rejuvenation medicine that acts as an antioxidant. They prevent from ageing, skin wrinkling, greying, senile changes and other diseases for promotes longevity. Siddhar's like *Thirumoolar*, *Bogar*, *Agathiyar*, *Therayar* have mentioned kayakarpam herbs in their literature. The *kaya karpam* herbs indicated for preventing eye diseases and promoting good sight are enlisted in **Table 2** with the mode of administration.

**TABLE 2: LIST OF KAYA KARPAM HERBS**

S. no.	Plant name	Mode of use
1	Inji ( <i>Zingiber officinale</i> )	Vadagam <sup>50</sup> Made as pills
2	Thuthuvalai ( <i>Solanum trilobatum</i> )	Vathral, uurukai <sup>50</sup> Dried and as pickle.
3	Ponnankani ( <i>Alternanthera sessilis</i> )	Taken with ghee and pepper, salt <sup>47</sup>
4	Pitharohini ( <i>Coptis teeta</i> )	Used as paste for external therapy <sup>47</sup>

**CONCLUSION:** The various Siddha disciplines and the use of herbs, minerals, and animal products have been well discussed in this review article. Hence by limiting exposure to the gadgets and by following the Siddha disciplines Computer vision syndrome (CVS) can be prevented and well managed.

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