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Review Article

Review of unique ophthalmic formulations in *Vaidya Manorama*: A traditional Kerala *Ayurveda* literature

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ABSTRACT

Vaidya Manorama is a folklore Kerala Ayurveda literature that encompasses time- tested low-budget formulations that can be prepared from easily available resources. Ayurveda Ophthalmology has been described in Chapter twenty-eight of the literature. Many unique formulations like eating firefly (*khadyota*), preparing ghee from fresh-water shellfish (*tadaka-shuktika*), *Kadali phala* (a special type of banana) *bidalaka*, dropping of juice of *palasha* (Butea monosperma) into eyes for various clinical conditions are described. We review the unique ophthalmology formulations in this chapter to bring them to limelight. Few herbo-mineral formulations are also described for which toxicity and safety studies are warranted. All these handy formulations may help clinicians in day-to-day practice or may be a lead for novel research.

1. Background

Vaidya Manorama, also known as '*Chikitsa kramam*', is a renowned traditional *Ayurveda* literature of Kerala. Considering the similarity in literary genre, it is believed to be written by an *Ashtavaidya* descendent [1]. The payoff of Vayaskara.N.S. Mooss's pioneering sterling work in gathering eclectic palm-leaf manuscripts from diverse *Ashtavaidya* families was initially in the form of an article in the magazine 'Vaidya Sarathi'. It was later published as a printed book in two volumes in June 1944 by Vaidya Sarathi Press Pvt. Ltd, Kottayam, Kerala. The revised third conjoint edition of the two volumes was published in August 2020 by Unnimooss foundation, SNA Oushadhashala, Thrissur.

Ayurveda has given exemplary advice on preventive and curative aspects of ophthalmology. Ancient *Ayurveda* literatures like *Bruhat Trayi* (BT), *Laghu Trayi* [2] (LT), *Bhaishajya Ratnavali*, *Yogaratnakara* etc are some of the noteworthy contributors of multitudinous ophthalmic formulations. *Vaidya Manorama*, has a myriad treasure of clinical knowledge from manifold *Ashtavaidya* traditions. Even though the book highlights *Kayachikitsa* (general medicine), *Ayurveda* Ophthalmology has been emphasized in the twenty-eighth chapters '*Netra chikitsa krama*'. These formulations or its modified ones are used as clinically effective treatment leads by many folklore practitioners. We review the unique ophthalmic formulations in the above chapter to bring them to clinical practice and to show light on various research leads.

2. Formulations

Forty-seven formulations are narrated in toto, out of which fourteen formulations are described in aforesaid literatures. The unique formulations for oral and topical use have been described below.

2.1. Oral medications

2.1.1. Eating firefly (*Lampyris noctiluca* L.) [verse 19]

Eating *Khadyota* (firefly) along with food is said to be effective in night blindness (*andhatam aashu santyajya*). The bioluminescence

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of firefly is due to the presence of luciferase enzymes in them. Research shows that injection of luciferin substrates in laboratory animals induce enzymatic reactions to produce light [3]. Hence, consuming fireflies can be hypothesized to have an effect on human retina, which needs to be scientifically and clinically documented. It's possible role in diseases like retinitis pigmentosa [RP] needs to be explored. Such studies may pave way for a paradigm shift in the treatment of RP.

2.1.2. Musta yashtyadi kvatha [verse 43]

Decoction of equal quantities of *Musta* [*Cyperus rotundus* L.], *Yashtimadhu* [*Glycyrrhiza glabra* L.], *Guduci* [*Tinospora cordifolia (Willd.) Miers*], *Vyaghri* [*Solanum xanthocarpum Schrad. & H. Wendl*], *Patola* [*Trichosanthes dioica Roxb.*], *Triphala* [A poly herbal combo] [4] and *Devadaru* [*Cedrus deodara Roxb. ex.G. Don*] is effective in managing all types of *Abhishyanda*. *Abhishyanda* is a general extra ocular or intraocular disease characterized by secretory/oozing/discharge symptomatology [5]. *Musta* has *grahi* property (fluid absorbing property) [6]. *Triphala* and *Tinospora cordifolia (Willd.) Miers* are anti-inflammatory and have ocular-specificity [7]. Hence, they may be beneficial in inflammatory diseases of eyes or adnexa.

2.1.3. Chitradi kvatha [verse 50]

A decoction prepared from equal quantities of *Chitra* [roots of *Ricinus communis* (*Roxb. ex. D. Don) G. Don* - White variety], *Glycyrrhiza glabra* L., *Triphala, Trichosanthes dioica Roxb.* and *Yava* [Barley – *Hordeum vulgare* L.] consumed at night along with ghee is said to be highly beneficial in *Timira (timiram cha visheshato hanti)* [visual disturbance/defective vision] [8]. Serum metabolomic and lipidomic changes play an important role in the patho-physiology of refractive errors [9]. *Yava* is specific for normalizing *medas* [lipidomic profile] [10] [*Chapter 01/Verse 22*] and *Triphala* is a highly target specific drug for ocular diseases [11] [*Poorva Khanda/mishra prakarana/Chapter 02/verse 40*] and hence, this combination can be hypothesized to be beneficial in refractive errors and associated asthenopic symptoms of metabolic errors triggered due to faulty lifestyle. In traditional practice, *Yava* is usually added with various formulations to achieve *kapha shodhana* (removal of *kapha*) from *shiras* (head).

2.2. Seka [Closed eye irrigation - (CEI)] formulations

Seka is the procedure by which liquid/decoction is irrigated over closed eyes [12]. Some unique formulations have been mentioned for seka.

CEI or *Aschyotana* (described in section 2.3) is generally administered as the first line of treatment in ocular pathologies, especially of inflammatory/infectious origin [13]. Care has to be taken regarding the temperature of the irrigating liquids. Usually tepid liquids are used, unless contraindicated. The decoctions may be water-based or a milk-based one.

2.2.1. Haridradi stanya dhara [verse 31]

CEI with decoction prepared from equal quantities of *Haridra* [*Curcuma longa* L.], *Triphala*, *Darvi* [*Berberis aristata DC.*] and *Cyperus rotundus* L. macerated in breast milk added with honey is beneficial in traumatic ocular pain. *Berberis aristata DC.* and *Curcuma longa* L. may normalize the post traumatic inflammation by their analgesic and anti-inflammatory properties [14,15].

2.2.2. Talarasadi dhara [verse 32]

CEI performed using juice taken out by warming *Tala* (Petiole of *Borassus flabellifer* L.), *Parpataka* [*Hedyotis corymbosa (*L.*) Lam.*] and a pinch of Camphor [*Cinnamomum camphora (*L.*) J. Presi.]* is beneficial for various eye diseases. In traditional practice, *Borassus flabellifer* L. is also used for increasing the muscle tone. The above formulation is effective as per traditional practice, but invites strenuous efforts for its preparation. Scarcity of *Borassus flabellifer* L. further enhance the toil.

2.2.3. Triphaladi tungatarurdhara [verse 40]

CEI with decoction prepared from *Triphala, Kataka* [*Strychnos potatorum* L.*f.*], *Glycyrrhiza glabra* L., *Cedrus deodara Roxb. ex.G. Don* and *Curcuma longa* L. boiled in coconut water is beneficial for all eye diseases. *Strychnos potatorum* L.*f.* is beneficial in ocular inflammatory diseases and reduces copious watery discharge [16]. Research shows that coconut water increases the number of neurons in the ganglion cell layer, total retinal thickness and thickness of retinal nuclear layer in diabetic rats [17]. Hence, the clinical effect of medicated coconut water on neuro-ophthalmological disorders of retina needs to be explored and documented using Retinal Nerve Fiber Layer Analysis (RNFL) or any other appropriate methods.

2.2.4. Trividha darvi dhara [versus 45, 46]

Three different combinations of *Berberis aristata DC.* have been mentioned.

a) CEI with decoction of *Berberis aristata DC.* and *Triphala* added with ghee is beneficial in reducing eye pain.
b) CEI with *kshira kvatha kvātha* (milk-based decoction) made from *Berberis aristata DC.* is beneficial in all *Abhishyanda.*
c) CEI with decoction of *Berberis aristata DC.* (Boiled and reduced to one-eighth amount) added with honey is effective in eye diseases due to *sarva dosha prakopa* [vitiation of multiple *dosha*]. Care has to be taken not to triturate/mix honey with hot decoction. Heating honey increases hydroxymethyl furfuraldehyde (HMF) content to cause deleterious effects on health [18].

2.3. Eye drops [Aschyotana]

Eye drops serve as the first choice of treatment in ocular pain, redness, watering and burning sensation. Special herbal juice, latex and even butter preparation are advised as eye drops.

2.3.1. Nandyarvarta pushpa svarasa aschyotana [verse 15]

Nandyarvarta pushpa svarasa [Juice of crushed flowers of *Tabernaemontana divaricata* (Linn.) R.Br. ex Roem & Schult.] with honey is said to be effective in reducing corneal opacity [*shuklahara*]. *Tabernaemontana divaricata* (Linn.) R.Br. ex Roem & Schult. is said to be effective in various ocular diseases [19]. This simple and easy to prepare formulation may be helpful in managing the corneal ulcers/opacities in day-to-day practice in a cost-effective manner. Evidence based research data on this is warranted. In Traditional practice, water is filled in a brass vessel and sufficient quantity of fresh undamaged flowers are sprinkled over it, so as to cover the entire water surface. These flowers are kept as such for 4 hours. The water is filtered without squeezing or damaging the flowers and then used for eye-wash which is an excellent eye cooler.

2.3.2. Palasha rudhira aschyotana [verse 33]

This is a formulation which is unique in having a time-phased drug collection pattern. Red coloured droppings of sap of *palasha tree* [*Butea monosperma (Lam.) Taub.*], termed as Bengal Kino, collected during dusk is beneficial in night blindness [20]. Previous studies have shown that methanolic extract of *Butea monosperma (Lam.) Taub.* is helpful in reducing various serum enzymes like serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT), superoxide dismutase (SOD),

catalase (CAT), and glutathione peroxidase (GPx) [21]. These enzymes, since are conversion factors, may be compared to *agni/pitta.* Hence, it may be inferred that the extract may help in its correction. Since, eye is the abode of *alochaka pitta*, it can be even hypothesized that *Butea monosperma (Lam.) Taub.* may correct it for getting better night vision.

Clinical validation of this formulation may be useful in delayed dark adaptation spectrum disorders. A Phyto-molecular study in the direction of time-phased variation in chemical constituents of sap of Bengal kino may provide deeper insights into scientific reason for selection of dawn for its collection.

2.3.3. Tamboola patradi aschyotana [verse 54]

Apply *Tila taila* [Sesame oil] and common salt on *Tamboola patra* [leaves of *Piper betel Blanco]*. The leaves are then warmed and squeezed with fingers to extract the juice. This is effective in eye diseases of recent onset [*hanti navakshi rogan*]. Considering the *Ayurveda* pharmacodynamics of betel leaves, it may be considered to be beneficial in eye diseases of *Kapha* origin. Betel leaves are beneficial for eyes according to a short scientific report [22]. Biochemical studies on this combination is required to unveil its scientific modes of action. Further, toxicological studies are also needed to document the safety profile of using betel leaf juice and sesame oil as ocular therapeutic agents. Studies have shown that extract of betel leaves significantly inhibits the growth of staphylococcus aureus in bacterial conjunctivitis [23].

2.3.4. Nava-Navaneeta aschyotana [verse 30]

Freshly prepared butter is kept in a brass vessel and is macerated with powder of root of Tagara [*Valeriana wallichi DC.*]. Dropping it into eyes is effective in reducing foreign body sensation and watering of eyes. This is an exclusive formulation, where butter is advised to be applied inside the palpebral aperture. The butyric acid in butter along with valeric acid in *Valeriana wallichi DC.*, may have a sedative action on the somato-sensory neurons of eyes to soothe the foreign-body sensation and resultant watering of the eyes [24].

2.3.5. Megharavasya mula stanya aschyotana [verse 48]

Dropping breast milk macerated with the roots of *Megharava,* also called *Megha naada* (*Amaranthus graecizans* L.), into the eyes, is said to be best for eye diseases. Application of breast milk into eyes warrants a cautious usage as there are chances of getting complication [25]. The β-carotenes and luteins of *Amaranthus* species are generally beneficial for ocular development.

2.3.6. Talavrunta-madhvaschyotana [verse 14]

Eye drops from juice of petioles of *Borassus flabellifer* L. added with honey as adjunct is best in clearing off corneal opacity (*shuklanut param*). Evidence based data is required to be generated on this folklore formulation, as it may help in framing guidelines for conservative management in cases of corneal opacity.

2.4. Bidalaka [medicated ocular poultice]

This procedure involves applying medicated paste directly or as a poultice over closed eyelids [26]. Some special formulations are described below.

2.4.1. Chincha patra bidalaka [verse 29]

Juice of *Chincha patra* (Leaves of *Tamarindus indica* L.) is mixed with cow's milk and is kept in a brass vessel. When they get curdled, the resultant paste is applied over the eyes. It is beneficial in erythema, watering of eyes, pain and *netra samrambha* [sore eyes]. This is a very unique medicine as an acidic drug (tamarind leaf juice) is mixed with milk and a basic drug (brass) to curdle milk, which is then applied as *Bidalaka*. Traditionally, mild fomentation over eye-lids with an *Amalaki* (*Emblica officinalis* Gaertn.) sized small *potali* (herbal bundle) of mashed leaves of *Tamarindus indica* L. and *Curcuma longa* L is clinically found to be effective in blepharitis and acute stages of stye.

2.4.2. Kadali phala bidalaka [verse 48]

Overripe (*atyanta pakva*) *Kadali phala* (ripe fruit of *Musa paradisiaca* L.; small fruits used for ritual purpose) is macerated and kept over eyes. It is beneficial in relieving burning sensation, redness and watering of eyes. The pH of ripe banana is around 6.5, which is almost similar to normal physiological ocular pH of 7.11 ± 1.5 [27]. This may reduce the burning sensation and other associated symptoms. Traditionally, it is used for blepharitis induced redness of eyes.

2.4.3. Ikshumuladi Lepana [verse 42]

Equal quantities of *Ikshumula* [roots of *Saccharum officinarum* L.], *Glycyrrhiza glabra* L.], *Tinospora cordifolia (Willd.) Miers, Solanum xanthocarpum Schrad. & H. Wendl, Trichosanthes dioica Roxb.,- Triphala, Cedrus deodara Roxb. ex.G. Don* are macerated in cow's milk and applied as *Bidalaka*. It is beneficial in all eye diseases.

2.5. Collyrium formulations (Anjana)

2.5.1. Chandraprabha varti [verse 8–9]

There are some special ingredients in this formulation, which is makes it quite different from other synonymous formulations. 80 numbers of *Tila-pushpa* [flowers of *Sesamum indicum* L.], 60 numbers of *Pippali* [*Piper longum* L.], 50 numbers of *Jati pushpa* [*Jasminum grandiflorum* L], 16 numbers of *Marica* [*Piper nigrum* L] is macerated in plain water. It is effective in defective vision, itchy eyes, sticky discharge from eyes and *Kacha* [Lenticular opacity]. Flower buds of *Jati pushpa* (~also termed as *malati pushpa*) is a highly oculo-specific drug [10]. [*Chapter 05/verse 139*].

2.5.2. Likucha phalastha marica anjana [verse 10]

Piper nigrum L. is kept in a ripe *Likucha phala* [fruits of *Artocarpus lacucha Buch. Ham.*] and is sun dried. It is later macerated to a semisolid state of *Anjana*. It is beneficial in *timira*, *kacha* and night-blindness [28]. Ripe *Artocarpus lacucha Buch. Ham.* is specifically mentioned, as unripe ones may deteriorate eye health. Ripe fruits reduce *pitta* (thereby balancing the *pitta* increasing property of *Piper nigrum* L.), improves *agni* (bio-metabolic energy) and is *vrushya* (Imparts potency) [11]. [*Poorva Khanda/mishra prakarana/ Chapter 07/verse 2*6]. Hence, this may help in potentiating the retinal photoreceptor cells which needs to be scientifically validated.

2.5.3. Tamradi gulika [verse 11–13]

16 parts of *Tamra rajas* (In practice, *Tamra bhasma (*ash of burnt copper is taken*)*), 14

parts of *Glycyrrhiza glabra* L., 12 parts of *Kushta* (*Saussurea lappa (Decne.) Sch. Bip*), 06 parts of *Piper longum* L.] are well-powdered and macerated with sufficient quantity of goat's milk. It is then applied over a copper vessel and is allowed to dry. This procedure is repeated for seven days. This formulation applied as collyrium is effective in *Abhishyanda, Adhimantha* [complication of *Abhishyanda*] [29], *Vranashukra* [Inflammatory/infective diseases of cornea] [30], *Kukoonaka* [Ophthalmia neonatorum like illness] [31], *timira* and *Kacha*. *Tamra* is oculo-specific in expelling *pitta* and *kapha* from eyes and has *lekhana* (scarifying), *ropana* (Wound-healing) properties. [32] [*Sutrasthana/Chapter 46/Verse* 327–8]. Copper has a potent biocidal property and also helps in synthesis

and stabilization of proteins along with angiogenesis; thus, may help in wound healing [33].

2.5.4. Karpoora anjanadi gulika [verse 22]

*Cinnamomum camphora (*L.*) J. Presi.*, *Sauveeranjana* [Stibnite - Sb_2S_3], purified lead and mercury, *Piper longum* L., *Piper nigrum* L. is macerated in juice of flowers of *Tabernaemontana divaricata* (Linn.) R.Br. ex Roem & Schult. and is then allowed to dry. This procedure is repeated several times. Finally it is mixed with honey and is preserved in a vessel made of *Sphatika* (glass bottle). Applying this collyrium is effective in corneal opacity, *Arma* [Pterygium] [34], *timira* and *kacha*. Even though it has been scientifically validated that Ayurvedic preparations like *Rasa sindhoora*, prepared in accordance with classical literature do not challenge health [35], toxicity studies of this formulation is warranted for getting statistical data on its human safety. Purified mercury helps in improving eye health [11]. [*Poorva Khandam/mishra prakaranam/Chapter 08/verse* 80]. Purified lead is having specific action on curing *prameha* (~diabetes) [11]. [*Poorva Khanda/mishra prakarana/Chapter 08/verse* 33]. This compound can be thus hypothesized to have beneficial effects on neutralizing diabetic retinopathy (DR) patho-physiology. Hence scientific clinical studies are warranted to explore its effectiveness in diseases like DR. Theoretically, *srothoanjana*, which is oculo-specific has to be used, but traditional practitioners in Kerala use *sauveeranjana*, which has similar properties with the former [11]. [*Poorva Khanda/mishra prakarana/Chapter 08/verse* 125].

2.5.5. Palasha taru shonita prayoga [verse 16]

One part of *Chandana* [*Santalum album* L.], two parts of *Saindhava* [Rock salt], three parts of *Terminalia chebula Retz.*, four parts of red juice of *Butea monosperma (Lam.) Taub.* are well macerated dried, powdered and applied as collyrium with suitable adjunct. It is beneficial in corneal opacity. Scientific documentation of its extent of effectiveness on which type of corneal opacity needs to be explored.

2.5.6. Karpasa bhasma anjana [verse 34]

Karpasa bhasma [Ash of *Gossypium arboreum* L.] mixed with sufficient quantity of breast milk is placed in a brass vessel and is macerated with copper pestle. It is then applied to eyes as collyrium. It is beneficial in *pilla roga.* [Chronic inflammatory diseases of eye] [36]. Application of ash to eyes is generally not a routine practice. Hence, scientific documentation of this simple formulation may help in tackling chronic eye diseases through *Ayurveda*.

2.5.7. Rasanjana prayoga [verse 35]

Collyrium prepared from *Rasanjana*, *Tuttha* [Copper sulphate], *Glycyrrhiza glabra* L., Stibnite is effective in *Jalasrava* [Epiphora of non-inflammatory origin]. *Rasanjana* is a semisolid end product of heating homogenized milk-based decoction of *Berberis aristata DC.* It is highly beneficial drug in ocular diseases. (*netrayoh paramam hitam*) [11]. [*Poorva Khanda/mishra prakarana/Chapter 02/verse* 179].

2.5.8. Darvi valkadi rasakriya Anjana [verse 36]

Equal quantities of *Berberis aristata DC, Saindhava, Stibnite*, *Piper longum* L., *Tuttha, Samudraphena* [Common cuttlefish bone (*Sepia officinalis* L.)], *Piper nigrum* L., *Glycerrhiza glabra* L. and purified copper [usually compound of purified copper triturated with lemon juice (for increasing its w/w concentration) is used] is macerated with sufficient quantity of honey and made into a *rasakriya* (semisolid) form. Applying it as collyrium is beneficial in *pilla* rogas like diseases of eyelids, *vartma kshobha* [blepharospasm], eye discharge, night blindness, corneal opacity and *timira*.

2.5.9. Madhu-Saindhava anjanam [verse 51]

Equal quantities of honey and *Saindhava* mixed together shall help in fast relief from *pilla roga*, is the best combination for treating corneal opacities and *kukoonaka*.

2.5.10. Panchangi Gulika [verse 52]

Santalum album L., *Glycyrrhiza glabra* L., *Sringam* [Horn of Indian spotted deer (*Axis axis Erxleben*, 1777)], *Mridveeka* [*Vitis vinifera* L.], *Badarasthi* [Seed-rind of *Ziziphus jujuba Mill.*] is macerated in plain water, dried and made to a tablet form. This when applied as collyrium with suitable adjunct is effective in reducing corneal opacities.

2.5.11. Karpoora Saindhavadyanjana [verse 21]

Equal quantities of *Cinnamomum camphora (*L.*) J. Presi., Saindhava, Piper longum* L., *Emblica officinalis Gaertn., Piper nigrum* L., *Ficus macrocarpa* L.*f. and Katurohini (Picrorhiza kurroa Royle. ex Benth.)* are mixed with old ghee along with honey and is applied as collyrium. It is beneficial in diseases affecting all parts of the eyes [*sarvakshi pakshma vikruti prashamaya martyah*].

2.6. Ghrita [ghee based] formulations

Medicated *Ghrita* formulations can be used in multiple ways; either orally or locally in the form of *Tarpana krama.* [Therapeutic retainment of Ghee over eyes] or as *aschyotana*.

2.6.1. Chandana darvadi ghrita [verse 18]

Ghee prepared from paste of equal quantities of *Santalum album* L., *Berberis aristata DC., Glycyrrhiza glabra* L., *Ksheeridruma* (*Nalpamara* - combination of four Ficus: *Ficus racemosa* L., *Ficus microcarpa* L.*f.*., *Ficus religiosa* L., *Ficus benghalensis* L.), fruits of *Udakanta* (*Trapa natans* L.) and juice (*svarasa*) of *Hedyotis corymbosa (*L.*) Lam.* is beneficial in various eye diseases especially in *pitta* dominant ones.

[inflammatory ocular pathologies].

2.6.2. Ghana naada shiphadi ghrita [verse 23]

Ghee prepared from equal quantities of paste of *Ghananaada shipha* [terminal buds of *Amaranthus gracilis Desf.*], *Glycyrrhiza glabra* L., lotus stem [*Nelumbo nucifera* Gaertn.], *ulpala* [tuberous roots of *Nymphaea pubescens Willd.*], *Santalum album* L. and sugar boiled in milk (taken four times the quantity of *kalka*) and ghee is effective in *Abhishyanda, Adhimantha and Akshipaka* [Sub-acute/Chronic ocular inflammatory conditions].

2.6.3. Tadaka-shuktika-saradi ghrita [verse 24–26]

Ghee prepared from 192 g of fresh-water *Tadaka Shuktika Mamsa Rasa* [Freshwater based Shellfish meat soup], *Shigru-patra Svarasa* [Juice of leaves of *Moringa oleifera* Lam.], juices of flowers of *Tabernaemontana divaricata* (Linn.) R.Br. ex Roem & Schult, juice of petioles of *Borassus flabellifer* L. and milk; and 36 g each of *Berberis aristata DC., Santalum album* L., *Glycyrrhiza glabra* L. as herbal paste (*kalka*), is beneficial in *Vranashukra* [Corneal ulcer], *Arma* and *Abhishyanda.* Traditionally, shellfish meat soup is prepared by breaking the shell fish in a special manner and keeping them over petioles of *Borassus flabellifer* L. It is used for wound healing in fresh deep corneal ulcers or surgical incisions.

2.6.4. Anantaadi Aja-Ghrita [verse 37–39]

Equal quantities of roots of *Ananta* [*Tragia involucrata* L.], *Santalum album* L, Sugar, *Glycyrrhiza glabra* L., tuberous roots of *Nymphaea pubescens Willd.*, Lotus stem, *Vidari* [*Pueraria tuberosa (Willd.) DC.*], *Kasheruka* [*Cyperus scariosus R.Br*] is macerated in goat's milk and then cooked in ghee made from goat's milk. It is beneficial in *Timira*, *Kacha*, *Netrashula* [ocular pain], *Abhishyanda, Adhimantha*

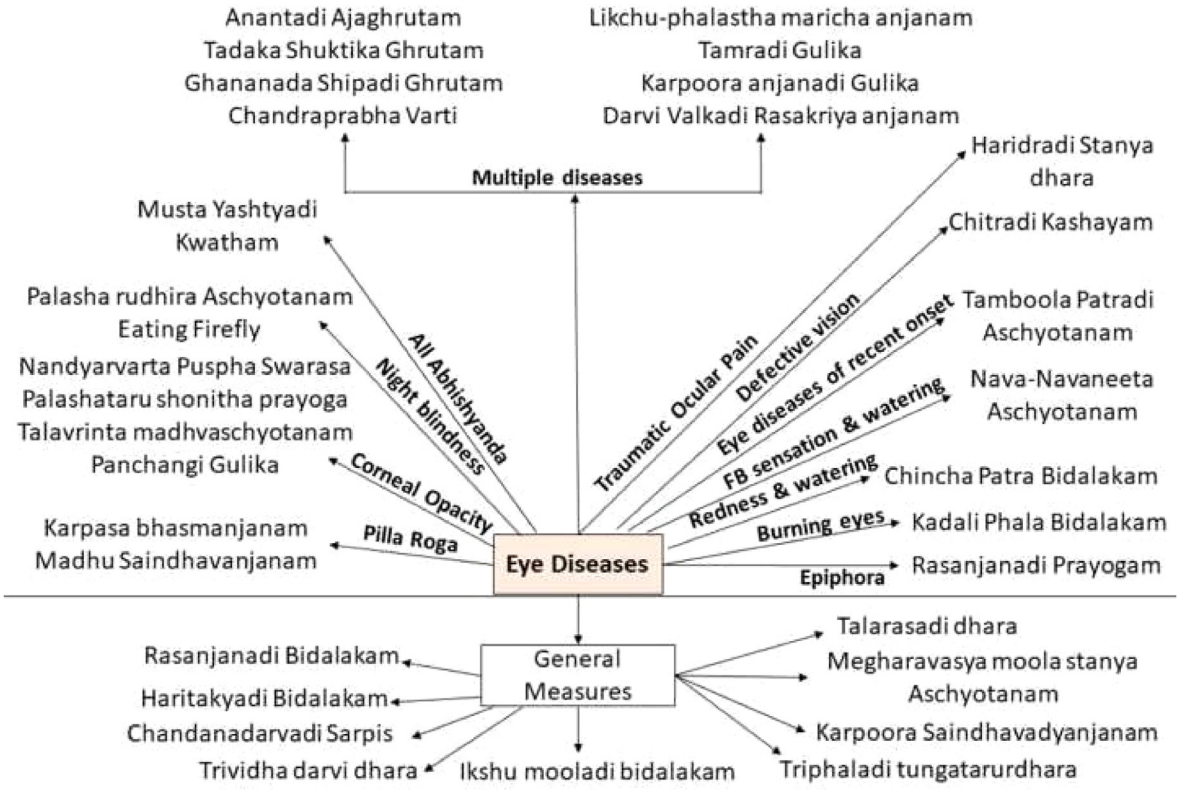

Fig. 1. Showing Bird's eye view of the clinical utility of formulations in Vaidya Manorama.

and corneal opacification. Goat Milk may be hypothesized to be very specific for eye on account of its 47% higher Vitamin A content, 13% more calcium, presence of medium chain triglycerides, smaller fat globules and its capability to neutralize the acids and toxins [37].

3. Discussion

Fig. 1 provides bird's eye view of the unique herbal, herbo-mineral and animal product-based formulations described in the book '*Vaidya Manorama*'.

It can be summarized that folklore Kerala *Ayurveda* Ophthalmology treatments has a fair usage of *Jangama dravya* (animal products) along with *Sthavara dravya* (herbal products) and *Parthiva dravya* (mineral products). It can be found that existence of oculo-specific drugs (*netrya*) was ensured in each formulation for target-oriented action. Certain specific parts of the plants were traditionally used like flowers of *Sesamum indicum* L. or petioles of *Borassus flabellifer* L. which has great affinity for eyes. Similarly, certain combinations that induce specific chemical reactions, like application of salt and sesame oil on betel leaves or tamarind leaf juice along with milk in a brass vessel, are unique to Kerala folklore practice. The scientific rationale for such combinations needs to be explored. These formulations with relatively simple and easily procurable drugs may give a clinician or a researcher added advantage of cost-effectiveness. Eventhough these medicines are anticipated to be clinically safe and effective, some of them especially with herbo-mineral drugs should undergo strict toxicological studies. It is recommended to conduct clinical studies of the given formulations for generating evidence and concreting the theoretically highlighted efficacy. Standardization of the drugs and formulations should also be taken up according to the principles laid down in Ayurvedic Pharmacopoeia of India (API) and Ayurvedic Formulary of India (AFI) respectively.

4. Conclusion

Ophthalmic formulations in *Vaidya Manorama* projects light on many clinically tested folklore Kerala-style medicinal preparations. These unique formulations are made from fewer ingredients that are easily available and cost effective. This may help in day-to-day clinical practice. Even though they are time-tested folklore clinically effective formulations, evidence-based research data is highly warranted.

Author contributions

Praveen Balakrishnan: Conceptualization, Methodology, Writing Original Draft; **Ajayan S**: Validation, Resources; **Sreejith Mukkudakkat**: Resources; **Kavya Nechiyil**: Validation, Resources; **Narayanan Nambi**: Resources.

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Conflict of interest

The authors declare that there is no conflict of interest.

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Appendix A. Supplementary data

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