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**CRITICAL REVIEW ON NANO-OPHTHALMOLOGY OF COLLYRIUMS USED IN  
AYURVEDA**

**KADIBAGIL V<sup>1\*</sup> AND SHARMA G<sup>2</sup>**

**1:** Professor & Head, M.D Ph.D. (Ayu), Department of Rasashastra and Bhaishajya Kalpana, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan-573201, Karnataka, India

**2:** Associate Professor, M.D (Ayu), Department of Rasashastra and Bhaishajya Kalpana, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan-573201, Karnataka, India

**\*Corresponding Author: Vinay Kadibagil: E Mail: [drvinaykadibagil@gmail.com](mailto:drvinaykadibagil@gmail.com)**

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**ABSTRACT**

The medicines prepared in rasashastra will contain number of metals and minerals as ingredients. They are used after due shodhana, marana and other such procedures which make them suitable for internal administration. They are prepared or used either singly or in combination with other metal, mineral or herbal ingredients. Most of the cases these medicines will be reduced to nano particle size.

Anjana (collyrium) is a method of administering medication to the eyes in suitable form. Number of anjana (collyrium) contain the minerals and metals as ingredient. This provides a lead to development of nano ophthalmology in Ayurveda. In this work an attempt is made to collect the information of anjana, which contain one or other mineral or metallic ingredient. The study could yield 35 formulations as a result of literature search. It is observed that highest of 16 formulations contain manashila (arsenic disulphide) as ingredient and rasanjana was present in 14 formulations. Among the formulations included in the study 8 each had sasyaka and gairika, 7 had shankha (conch shell), 6 had tamra (copper), 4 each had parada (mercury) and haratala (orpiment), 2 each had abhraka (mica), kankshi, loha, naga, mukta and tankanaas ingredients. Gandhaka, kaseesa, kaparda, vanga, kamsya,

rajavarta, vaidhurya, samudraphena and kukkutandatwak were seen in one formulation each. So, it is imperative to have a thorough safety and efficacy study on these formulations in the wake of hue and cry about toxicity of mineral medicines. This can essentially help to develop nano-ophthalmology in Ayurveda.

**Keywords: Anjana, kriyakalpa, haratala, manashila, collyrium, nano particles**

## INTRODUCTION

Rasashastra, famously known as iatrochemistry of Ayurveda explains different groups of drugs like, maharasa, uparasa, sadharana rasa, dhatu varga, sikatavarga, ratnavarga and other drugs of mineral or metallic origin. Most of these drugs will be used in the form of bhasma after different procedures like shodhana and marana. These bhasma after preparation should qualify few tests of perfectness. These tests are indicative of fineness of particles, lower specific gravity and inertness.

In a study done on swarna bhasma (incinerated gold) it was found that the size of particle is about 56 nm when analysed through various techniques like AFM (Atomic Force Microscope), TEM (transmission Electron Microscope), SEM-EDS (Scanning Electron microscope and Energy Dispersive Spectroscopy). Yet another study on muktashukti bhasma (incinerated pearl), abhraka bhasma (incinerated mica), tamra bhasma (incinerated copper) and loha bhasma (incinerated iron) revealed that these bhasma are in nanometer dimension. These studies have proved that the bhasma used in

Ayurveda are nanomedicines even though the word nano is new derivative [1].

The treatment procedures adopted for treatment eye diseases are termed as kriyakalpa (topical treatment) in Ayurveda. Tarpana, putapaka, seka, aschyotana, anjana, pindi and vidalaka are seven types of procedures described under netrakriyakalpa [2]. Anjana (application of collyrium) is one among them which is application of medicaments to eyelids. In rasashastra also there is an exclusive group of mineral drugs enlisted as anjana. There are five types of anjana that are described in rasashastra which are meant for the treatment of eye disorders. They are souveeranjana, srotonjana, neelanjana, pushpanjana and rasanjana [3]. Apart from these five types of anjana there are many drugs in rasasahstra which are said to have a pharmacological and pharmacotherapeutic property called as netrya. Number of formulations are available for the treatment of eye diseases which are prepared using mineral ingredients and are used as anjana.

Again, it is imperative to note that these drugs of mineral origin when

intended to be used for treatment, have to be converted in to bhasma. The size of the particles in these bhasma will be in range of 1-1000 nanometer ( $1 \text{ nm} = 10^{-9} \text{ m}$ ) which in other term will be in a size of a nanomaterial. With advancement in the technology a scientific branch called nanomedicine was evolved using nanotechnology for the diagnosis and the treatment of different diseases [4].

The application of this to develop more effective, less destructive therapies for ocular diseases have added a chapter called nano-ophthalmology. This includes biopharmaceuticals, (e.g., drug delivery systems such as nano micelles, liposomes, and dendrimers) drug discovery, implantable materials such as tissue regeneration scaffolds, implantable devices such as intraocular pressure monitors, bioresorbable and biodegradable materials, glaucoma drainage valves, and diagnostic tools such as imaging and genetic testing [5].

When the ophthalmic preparations used in Ayurveda contain five types of anjana (collyrium) or other mineral drugs there is every possibility that they will fit into this category of nano ophthalmology. Hence in this work an attempt was made to collect the information of mineral drugs used as anjana (collyrium) in eye disorders.

#### Formulations used as Anjana:

##### 1. Gandhakadhruthi (anjana) [6]

Gandhakacurna (sulphur powder), tutthacurna (powder of copper sulphate), abhrakabhasma (incinerated mica) and tamrabhasma (incinerated copper) 10 nishka (30 g) are taken and bhavana (trituration) is given with ardrakaswarasa (juice of *Zingiber officinale* Rosc.). This mass or paste is kept in an earthen crucible and heated with agni (fire). When all the moisture evaporated, add 1 karsha (12 g) gandhakacurna (sulphur powder) mix and swedana (fomentation) is done kanduka yantra (Specifically designed apparatus). Then add 1 karsha (12g) each tuttha (copper sulphate), shilajatu (Asphaltum) and bhavana (trituration) is given with 1 prastha (768 ml) jala (water). Remove the clear water from the mixture and kept for drying.

This formulation is effective for all types of netraroga (eye disease) specially vrana (wound), kustha (skin diseases), pilla (variety of eye disease), kacha (senile immature cataract) and kukunaka (*ophthalmia neonatorum*). It is applied with ghrita (ghee), madhu (honey) or streedugdha (women's milk)

##### 2. Garudanjana [7]

6 g each of parada (mercury), mritacurna (mud powder), grihadhuma (soot) are taken and bhavana is given with dattura (*Datura stramonium* L.) swarasa (juice). Then add 100 g of spatika (*Potassium alum*), 400 g each of jaipala (*Croton tiglium* L.), maricha

(*Piper nigrum* L.), erandabeeja (*Ricinus communis* L.) 60 gnaga (lead). Then it is bhavana is given with *jambeeranim buswarasa* (juice of *Citrus medica* L.) and made into pills.

Application as anjana (collyrium), cures graha (Infections?), sarpavisha (snake poison). teevrasheetajwara (fever with chills), ajeerna (indigestion).

### 3. Garudanjana [8]

Kathakabeeja (seed of *Strychno spotatorum* L.), saindavalavana (rock salt), shuddhatuttha (processed copper sulphate). Rasanjana (extract of *Berberis vulgaris* L.), shunti (*Zingiber officinale* Rosc.). pippali (*Piper longum* L.), maricha (*Piper nigrum* L.), spatika (Potassium alum), musta (*Cyperus rotundus* L.), kaparda bhasma (incinerated *cypra eamoneta* Linn), three types of lavana (saindavalavana (rock salt), kala lavana (black salt), sambaralavana (sea salt)), tamra bhasma (incinerated copper), loha bhasma (incinerated iron), karpura (camphor), mamsarohini (*Soymida febrifuga* Roxb.), samidrafena (*Sepia officinalis*), vacha (*Acorus calamus* L.), manushyakapalasthi (flat bone), naga bhasma (incinerated lead), parada (mercury), haritaki (*Terminalia chebula* Retz.), bhhibitaki (*Terminalia bellirica* Roxb.), amalaki (*Phyllanthus emblica* L.), yastimadhu (*Glycyrrhiza glabra*) – all are powdered and bhavana is given with

karanjaswarasa (juice of *Pongamia pinnata* L.).

Usage of this in form of anjana (collyrium) make eyes like garuda (eagle).

### 4. Gutikanjana [9]

Shunti (*Zingiber officinale* Rosc.), maricha (*Piper nigrum* L.), pippali (*Piper longum* L.), palandu (*Allium cepa* Linn), yastimadhu (*Glycyrrhiza glabra*), saindavalavana (rock salt), laksha (*Lacciferlacca*), gairika (red ochre)- all are taken equal quantity and rubbed with water and prepare vati (pill). It is indicated in kukunaka (*ophthalmia neonatorum*).

### 5. Gutikanjana [10]

1part gairika (red ochre), 2part saindavalavana (rock salt), 4part pippali(*Piper longum* L.), 8part tagara (*Valerianawallichii* DC.) curna (powder) are rubbed with water and prepare gutika (pill). It will cure netrabhishandhya (conjunctivitis).

### 6. Guhamula dhyanjana [11]

Shaliparni (*Desmodium gangeticum* DC) or prishnaparni (*Urariapicta*) mula (root), saindavalavana (rock salt), kala maricha (*Piper nigrum* L.) are rubbed with kanji in tamra patra (copper flakes) and it will cure pillanetraroga (variety of eye disease).

### 7. Manjistanjana [12]

Manjista (*Rubia cordifolia* L.), madhuka (*Madhuca indica* J. F. Gmel.), kamala (*Nelumbo nucifera* Gaertn.), samudrafena (samandrachaga) (cuttle fish bone), twak

(*Cinnamomum zeylanicum* J. Presl.), khasa (Poppy seeds), gorochana (Bostarus/Oxgall) (stone or bezoar found in cattle), jatamansi (*Nardostachys jatamansi* DC.), raktachandana (*Pterocarpus santalinus* L.), shankha (conch shell), tejapatra (*Cinnamomum tamala*), gairika (red ochre), shuddhaharatala (processed orpiment), and pushpanjana (Zinc oxide).

Indications- kleda (moisture), raktajashula (pain), arma (pterygium), shukra (inflammation of cornea).

#### • 8. Manashilanjana [13]

Manashila (realgar) is rubbed with turangalala (horse dung) and applied to eye. Indication- sannipatajajwara (Fever due to vitiation of tridosha)

#### 9. Manashilanjana [14]

Manashila (realgar), saindavalavana (rock salt), pippali (*Piper longum* L.)

Indication- vishamajwara (fever)

#### 10. Manashilanjana [15]

Manashila (realgar), rasanjana (extract of *Berberis vulgaris* L.), shakrutaparavat (pigeon fecal)

Indication- apasmara (Epilepsy), unmada (hysteria)

#### 11. Manashilanjana [16]

Shuddhamanashila (processed realgar), shuddhatuttha (processed copper sulphate), Kasturi (musk deer), jatamansi (*Nardostachys jatamansi* DC), sembalakimusali (*Chlorophytum tuberosum*

Roxb), shunti (*Zingiber officinale* Rosc.), shankha (conch shell), and karpoora (camphor)

Indications- 6 types of timiraroga (immature cataract)

#### 12. Manashilanjana [17]

Shuddhamanashila (processed realgar), saindavalavana (rock salt), shuddhakaseesa (processed Ferrous Sulphate), shankha (conch shell), trikatu (shunti, maricha and pippali), rasanjana (extract of *Berberis vulgaris* L.)

Indication-kacha (senile immature cataract), shukra (inflammation of cornea), arma (pterygium), timiraroga (immature cataract)

#### 13. Manashiladhya varti [18]

Shuddhamanashila (processed realgar), shankhanabhi (conch shell), pippali (*Piper longum* L.), rasanjana (extract of *Berberis vulgaris* L.)

Indications-all types of netraroga (eye disease).

#### 14. Marichadhyanjana [19]

Shuddhamanashila (realgar), maricha (*Piper nigrum* L.)

Indications- netrasrava (Chronic dacrocystitis/epiphora)

#### 15. Mukta dimahanjana [20]

Mukta (Pearl Calcium), karpura (camphor), kacha (senile immature cataract), agaru (*Aquilaria Malaccensis*), maricha (*Piper nigrum* L.), pippali (*Piper longum* L.), saindavalavana (rock salt), elavaluka

(*Prunus avium* L.), shunti (*Zingiber officinale* Rosc.), kankola (*Piper cubeba*), kamshya bhasma (incinerated bronze), vangabhasma (incinerated tin), haridra (*Curcuma longa*), manashila (realgar), shankhanabhi (conch shell), abraka bhasma (incinerated mica), tuttha bhasma (incinerated copper sulphate), kukkutan-datwak (Eggshell Calcium), haritaki (*Terminalia chebula* Retz.), keshara (*Mesuaferrea* L.), haritaki (*Terminalia chebula* Retz), madhuka (*Madhuca indica* J.F.Gmel.), rajavartha (Lapiz lazuli), jatipushpa (*Jasminum grandiflorum* L), tulasi (*Ocimum sanctum*) pushpa (flower), tulasi (*Ocimum sanctum*) beeja (seed), karanja (*Pongamia pinnata* L.)beeja (seed), nimbabeeja (seed of *Azadirachta indica* A. Juss)), neelanjana (lead sulfide), musta (*Cyperus rotundus*), tamra bhasma (incinerated copper), rasanjana (extract of *Berberis vulgaris* L.)

Indications- all netravikara(eye diseases)

#### 16. Meshashrin gadhyanjana [21]

Meshashringapushpa (flower of *Gymnemasyl vestre* Retz), shirishapushpa (flower of *Albizia lebbeck* L.), dhatakipushpa (flower of *Woodfordia fruticosa* L.), jatipushpa (*Jasminum grandiflorum* L), mukta (Pearl Calcium), vaidurya (Chrysoberyl Cat's eye) all are taken in equal quantity triturated in tamra (copper) khalwa yantra (mortar and pestle) with ajaksheera (goat's milk).

Indications- it will clean the eyes

#### 17. Meshashrin gadhyanjana [22]

Meshashringa (*Gymnema sylvestre* Retz), rasanjana (extract of *Berberis vulgaris* L.), shankha (conch shell), neelanjana (lead sulfide).

Indications- kacha (senile immature cataract) and netramala(eyedirtiness)

#### 18. Raktanjana [23]

5 tola raktachandana (*Pterocarpus santalinus* L.) is triturated with bringarajswarasa (juice of *Eclipta prostrata* L.) for 100 times in tamra (copper) khalwa (mortar pestle).

Indications- timiraroga (immature cataract)

#### 19. Rasakeshwara varti [24]

Rasaka (zinc ore), saindavalavana (rock salt), tuttha (copper sulphate), tankana (borax), katukatraya, triturated with nimbuswarasa (juice of Citrus limon) and prepare varti (wick).

Indications- netrarukshata (eye dryness), arbuda (tumor), phula (Cataract), timiraroga (immature cataract), arjuna (Disease of sclera), patala (Disorders of layers of eye), kacha (senile immature cataract), netrasrava (watering in eyes).

#### 20. Rasanjana dhyanjana [25]

Rasanjana (extract of *Berberis vulgaris* L.), talisapatra (*Abies webbiana* Lindl.), swranagairika (red ochre), triturated with ghrita (ghee), madhu (honey) and gomaya rasa (cow dung)

Indication- pitta vidagdadrushti (vision related diseases).

### 21. Rasanjana dhyanjana [26]

Rasanjana (extract of *Berberis vulgaris* L.), manashila (realgar), devadharu (*Cedrus deodara*), jatipatraswarasa (juice of *Jasminum grandiflorum* L) and madhu (honey).

Indications- naktandhya (Night blindness)

### 22. Rasanjana dhyanjana [27]

Rasanjana (extract of *Berberis vulgaris* L.), sarjarasa (*shorearobusta gaertn.f.*), jatipushpa (*Jasminum grandiflorum* L), manashila (realgar), samudrafena (cuttle fish bone), saindavalavana (rock salt), gairika (red ochre), maricha (*Piper nigrum* L.)

Indications- netrakleda (discharge in eye), kandu (Itching in eyes)

### 23. Rasanjana dhyanjana [28]

Rasanjana (extract of *Berberis vulgaris* L.), katapala (Myricanagi), haritaki (*Terminalia chebula* Retz.), manashila (realgar)

Indications- netrapatala (Disorders of layers of eye)

### 24. Rasanjana dhyanjana [29]

Rasanjana (extract of *Berberis vulgaris* L.), sarjarasa (resin of *Vateria indica* Linn), pusphanjana (zinc oxide), manashila (realgar), samudrafena (cuttle fish bone), saindavalavana (rock salt), gairika (red ochre), maricha (*Piper nigrum* L.) all are triturated with madhu (honey).

Indications- netrakleda (discharge in eye), kandu (Itching in eyes)

### 25. Rasadi varti [30]

Parada (mercury), tankana (Borax), saindavalavana (rock salt), trikatu (shunti, maricha and pippali), karpara (Zinc ore), tuttha (copper sulphate), amlavetasa (*Garcinia pedunculata* Roxb.), triturated with madhu (honey).

Indications- all netraroga (eye disease)

### 26. Rasa dyanjana [31]

Rasna (Pluchealanceolate DC.), manashila (realgar), ela (*Elettaria cardamomum* L)

Indication-sannipata (disease due to vitiation of Tridosha)

### 27. Rodranjana [32]

Lodhra (*Symplocos racemosus* Roxb.), rasanjana (extract of *Berberis vulgaris* L.), amalaki (*Phyllanthus emblica* L.), gairika (red ochre) triturated with madhu (honey)

Indications- netraroga (eyedisease) of bala (children)

### 28. Rohinyadi vati [33]

Katuki (*Picrorhiza kurroa* Royle ex Benth), tuttha (copper sulphate), kumuda (*Nymphaea stellata* Willd), neelotpala (*Nymphaea nouchali* Burm.f.), keshara (*Crocus sativus*) triturated with daruharidrakwatha (decoction of *Berberis vulgaris* L.).

Indications- pittajaarma (pterygium), netravrana (eye wound)

**29. Lohabhasmanjana [34]**

Loha curna (iron powder), swethalodra (*Symplocos racemosa*), rasanjana (extract of *Berberis vulgaris* L.), maricha (*Piper nigrum* L.), gorochana (Bostarus/Oxgall)

Indication- tandra of sannipata (disease due to vitiation of tridosha)

**30. Vidanganjana [35]**

Vidanga (*Embelia ribes* Burm.f.), haratala (orpiment), manashila (realgar), daruharidra (*Berberis vulgaris* L.), laksha (*Lacciferlacca*), gairika (red ochre) triturated with kanji (fermented preparation of mashadhanya (*phaseolsu mungo*) and raktasali (*oryza sativum*))

Indications- kukunaka (*Ophthalmia neonatorum*), potakinetraroga (Trachoma) of balaka (children).

**31. Vishamajwarantakanjana [36]**

Haratala (orpiment) triturated with nimbataila (oil of *Azadirachta indica* A. Juss)

Indications- jwara (fever)

**32. Vaidehi varti [37]**

Kathaka (*Strychnos potatorum* L.), chandana (*Santalum album* L.), laksha (*Lacciferlacca*), maricha (*Piper nigrum* L.), madhuka (*Madhuca indica* J.F.Gmel.), neelotpala (*Nymphaea nouchali* Burm.f.), tuttha (copper sulphate), bhibitakibeeja (*Terminalia bellirica* Roxb. seed), amalakibeeja (seed of *Phyllanthus emblica* L.), manashila (realgar), javitri (*Myristica dactyloides* Gaertn.), sita (sugar), vidanga

(*Embelia ribes* Burm.f.), samudrafena (cuttle fish bone), ela (*Elettaria cardamomum* L.), shankhanabhi (conch shell), rasanjana (extract of *Berberis vulgaris* L.).

Indications- patala (Disorders of layers of eye), timiraroga (immature cataract), shuskakshipaka (dry eye syndrome), toda (Pain), arma (pterygium), tridosajanetraroga (eyedisease)

**33. Vyoshadhyanjana [38]**

Trikatu (shunti, maricha and pippali), bringaraj (*Eclipta prostrata* L.), manashila (realgar), haratala (orpiment), karanjabeeja (seed of *Millettia pinnata* L.).

Indications- vartmaroga (disease of eye lids) of balaka (children)

**34. Amruthanjanana [39]**

Application of shuddhaparada (processed mercury), naga (lead) equal parts, 2 parts of neelanjana (lead sulfide), and little quantity of karpura (camphor) will cure timiraroga (immature cataract).

**35. Krishnandanjana [40]**

If pippali (*Piper longum* L.), manashila (realgar) and haratala (orpiment) rubbed and applied as anjana (collyrium) cures tandrikasanniapata (disease due to vitiation of Tridosha).

**DISCUSSION**

Anjana (collyrium) is a popular method of application of medicine inside the eye. It is the best option among kriyakalpa because of easy administration,

availability and affordable price especially when a long-term therapy is needed. Besides its benefits in curing ailments related to the eye, is mentioned as a daily routine in order to protect the eye from various eye disorders and to maintain the equilibrium of dosha inside the eye. Though there are indications of anjana (collyrium) everywhere in different contexts of netraroga (eyedisease), acharya explore vast varieties of anjana (collyrium) for the management of drishtigataroga (diseases of eye sight). It may be due to the fact that it can be advised for long period and drishtigatarogain cases which needs prolonged therapy either in terms of care, prevention or for treatment.

In the present work it is observed that 16 anjana (collyrium) contain manashila (Arsenic disulphide) and 14 contain rasanjana. Arsenic and antimony compounds have higher molecular size. They can't cross blood aqueous barrier when they are administered orally/systemically. anjana (collyrium) form increases the bio availability of drug by increasing the tissue contact time. Topical application of medicaments in the form of anjana (collyrium) can help to overcome this issue. This indicates that the ancient scholars of Ayurveda had knowledge about absorption or bioavailability or may be about barriers.

In present scenario there is hue and cry about toxicity of mineral drugs. Number of publications have raised concern over safety issues of rasoushadha (metallo mineral formulation). It is pertinent to note that the concern is about the drugs when used orally. But it is astonishing to note that there are more than 35 formulations used as anjana (collyrium) which contain one or the other mineral ingredient. Hence there is a need of considering the possible toxicological effects of Nanoparticles (NP). Newly-synthesized NP should be characterized sufficiently before preclinical or clinical studies with those NP are performed. Some of these parameters are the chemical composition, dose of administration, size, presence of coating, surface characteristics, degree of aggregation, zeta potential, and water solubility. NP can pass through BRB or other barriers in the eye, and prolonged bioavailability of NP in the eye is suitable to reduce the duration of treatment. however, prolonged residence time can also add to the potential toxicity of NP in local tissues. All in all, further studies will enrich the future of nanomedicine, and nanomaterials have a very good application prospect in the field of ophthalmology that may revolutionize the routine drug delivery systems and clinical treatments.

It can be noted that among 35 formulations included in the study 8 each

had sasyaka and gairika, 7 had shankha (conch shell), 6 had tamra (copper), 4 each had parada (mercury) and haratala (orpiment), 2 each had abhraka (mica), kankshi (potash alum), loha (iron), naga (Lead), mukta (pearl) and Tankana (borax) as ingredients. Gandhaka (sulphur), kaseesa (ferrous sulphate), kaparda (cowry), vanga (tin), kamsya (bronze), rajavarta (lapis lazuli), vaidhurya (cat's eye), samudraphena (cuttle fish bone) and kukkutandatwak (egg shell) were seen in one formulation each. When carefully analysed inclusion is not solely based on netrya (Good for eyes) property. For instance, kaseesa (ferrous sulphate) is a mineral considered as ateevanetrya (more beneficial for eye), but among the anjanadiscussed here it is seen as an ingredient only once. So, it is better to consider the elements present in those minerals their role in relation with eye. The essential trace metals iron, zinc, and copper play important roles both in retinal physiology and disease. They are involved in various retinal functions such as phototransduction, the visual cycle, and the process of neurotransmission, being tightly bound to proteins and other molecules to regulate their structure and/or function or as unbound free metal ions. Elevated levels of free or loosely bound metal ions can exert toxic effects, and in order to maintain homeostatic levels to protect retinal cells

from their toxicity, appropriate mechanisms exist such as metal transporters, chaperones, and the presence of certain storage molecules that tightly bind metals to form nontoxic products. The pathways to maintain homeostatic levels of metals are closely interlinked, with various metabolic pathways directly and/or indirectly affecting their concentrations, compartmentalization, and oxidation/reduction states. Retinal deficiency or excess of these metals can result from systemic depletion and/or overload or from mutations in genes involved in maintaining retinal metal homeostasis, and this is associated with retinal dysfunction and pathology. Iron accumulation in the retina, a characteristic of aging, may be involved in the pathogenesis of retinal diseases such as age-related macular degeneration (AMD)<sup>41,42</sup>. Zinc deficiency is associated with poor dark adaptation. Zinc levels in the human retina and RPE decrease with age in AMD. Copper deficiency is associated with optic neuropathy, but retinal function is maintained. The changes in iron and zinc homeostasis in AMD have led to the speculation that iron chelation and/or zinc supplements may help in its treatment [43].

As a conclusive consideration, the search for recent patents in the field of ocular drug delivery, and in particular of nanotechnological applications, has given a

relatively high number of inventions, of both academic and industrial origin. However, it is our impression that, differently than for other areas of DDS technology, such as anticancer and antibacterial therapies, the distance between the proposed approaches and their true value in clinics is still considerable. The actual nanomedicine possibilities can exert a marginal, although positive influence on the efficacy, duration and selectivity of action of drugs, especially for those meant to treat the posterior segment of the eye. But the great, true hindrances that conventional medicines encounter to ensure an efficient therapy of ocular pathologies still remain largely unresolved by the nanotechnology and controlled/targeted delivery solutions presently proposed [44].

## CONCLUSION

Metallo mineral medicines are manufactured in such a way that the particles will be reduced to nano size. Nano particles will be better and easily absorbed in to the system because of this tiny particle size. When the medicaments applied to eye disorders in the form of anjana (collyrium), the presence of nano particles will help to cross blood aqueous barrier. So probably ancient scholars of Ayurveda have advocated number of anjana (collyrium) which contain one or other mineral content. However, owing to hue and cry over

toxicity of metallo mineral medicines there is a need of detailed safety and efficacy-based studies on these formulations. This can essentially help to develop nano-ophthalmology in Ayurveda.

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