

Review Article

A Comparative Study and Review of Siddha Ophthalmology from the Classical Siddha Literature *Agatthiar Nayana Vidhi-500*

ABSTRACT

Ophthalmology has been practiced and been part of the ancient Tamil civilization since ages; this provides insights to the modern world about the treatment methods followed by Siddhars, the scientific Tamil physicians, who were way ahead compared to their western counterparts in studying the diseases affecting humanity.

The evolution of modern ophthalmology started only after 1851 with the invention of the Ophthalmoscope by Helmholtz. However, well-compiled literature evidences of eye diseases from Siddha palm-leaf manuscripts have been found since the 17th century. A few Tamil palm-leaf manuscripts belonging to the 4th, 7th and 12th centuries have also been found.

In Tamil language, “*Kann*” (the eye) is a word that evolved from the sensory action “*Kaan*” (to see). There are more than 50 words referring to the eye in ancient Tamil literatures. The total number of eye diseases clearly described in Siddha classical literatures is 96. Classical Siddha ophthalmology texts also mention a few sub classifications, thereby taking the overall number of diseases to 125. The Classical Siddha text *Agatthiar Nayana Vidhi* describes 26 types of surgical instruments used to treat 96 types of eye diseases including procedures to perform cataract surgery. These instruments are employed to practice surgical procedures like pricking, cutting, peeling, draining and cauterizing. The present study enumerates the comparison of 96 eye diseases mentioned in Siddha texts with modern science.

Keywords: Tamil language, Tamil civilization, Siddhars, Eye diseases, Siddha surgical instruments, Siddha medicine

1. INTRODUCTION

1.1 Background

Siddha Medicine is one of the major traditional medical systems of India that is widely practiced in Tamil Nadu, Sri Lanka, Malaysia, Indonesia, Cambodia, etc. where Tamil kings had their sway in the ancient period. Siddha palm-leaf manuscripts and classical literatures have been documented only from the fourth century A.D. though the practice of Siddha medicine should have been emerged earlier [20]. The name *siddha* had been coined only in 1923 for administrative purposes to delineate it from other traditional medicines. [1] Previously, it was literally known as *Naattu Marutthuvam* (folk medicine) or *Thennaattu Marutthuvam* (South Indian medicine). [2] Manuscripts and literatures related to Siddha medicine are found exclusively in Tamil language and many of them are yet to be documented. Eye care and treatment has been given much prominence in the Siddha system of medicine from time immemorial. The types of eye diseases, their etiology, general and specific reasons for acquiring those diseases, preventive measures to protect the eye from the diseases, medicines to cure the eye diseases, their dosage and the course are all mentioned in old Siddha texts. [21] The classification of eye diseases and the line of treatment found in classical Siddha texts are exciting. It compels us to admire the wide knowledge of ancient Siddhars who have elaborated different medical and surgical procedures concerning various diseases of the eye.

1.2 Categorization of Siddha ophthalmic treatment

There are clear indications that eye diseases were cured by the application of medicines (both internal and external) as well as surgery. Various surgical methods are described in Siddha literatures [3]. The surgical method is called *asura maruthuvam*. The Siddha medical practitioners of those days had skillfully used such instruments and successfully performed eye surgeries. The surgical approaches are mainly via scarification, operation incision, excision, perforation, cauterization, leeching, and so on. The names of surgical instruments used for the eye surgery, their shapes and sizes, and their uses are clearly mentioned in the manuscripts. [4] [5] The treatment of eye diseases is categorized into three types as follows. [3]

1.2.1 Devamaruthuvam

Siddha internal medicines like *neer* (medicated liquid), *kattu* (condensed mineral drug), *kalangu* (red hot fired and cooled mineral medicine), *urukku* (molten metal medicine), *chunnam* (calcinated lime stone), *karpam* (rejuvenate medicine), *satthu* (extract), and *Guru-kuligai* (bead medicines) with higher potency are used internally to cure eye diseases. Eye diseases like glaucoma, diabetic retinopathy, redness of the eye, and watering of the eyes are dealt using these medications.

1.2.2 Maanidar Maruthuvam

Both internal and external medicines are used. poultice, fomentation, *tharppanam* (continuous dripping of liquid medicine into eye or orbit), *thaarai* (intermittent dripping of liquid medicine into eye or orbit), *kalikkam* (ophthalmic drops), *mai or anjanam* (collyrium), *ennai muzhukku* (application of oil on head followed by hot water bath) etc. are used externally. Herbal decoctions, ghee medicines like *karisalai nei* (a ghee-based medicine prepared from *Eclipta alba*), *ponnankanni nei* (a ghee-based medicine prepared from *Alternanthera sessilis*), *nellikkai ilagam* (a ghee and honey based medicine prepared from *Phyllanthus emblicus*), *injithenn* (a honey-based medicine prepared from fresh *Zingiber officinale* pieces), etc. are used internally to cure eye diseases. Diseases like conjunctivitis, dry eyes and excessive tears in the eyes are dealt under this type.

1.2.3 Asura Maruthuvam

Surgical procedures like pricking, excising, cutting, and peeling are performed to cure certain eye diseases. Surgical instruments like *vilisam*, *pulladi*, *kakkai kaal*, *piruma*, *anjanak koel*, *kariak koel*, etc. are used to resolve various surgical managements. In *Agatthiar Nayana Vithi*, many surgical procedures are described. Pricking with a needle is advocated to release the accumulated liquid in a disease called *Pitthakasam*. The end of cornea is pricked with a copper triangular needle of 3-inch length called *Salagai*. Application of eye drops after the needle pricking, herbal fumigation procedure for alleviating pain in the eye after pricking, etc., have also been explained in Siddha literatures. Even after depleting the accumulated liquid from the eye, if the eyesight is not clear, further pricking is to be carried out the second time with the help of a smaller size needle with the weight of a sesame seed, as described in the manuscripts. [20] Cataract, pterygium, and trichiasis are dealt under this type. Both internal and external medicines are employed in the healing procedure.

1.3 Sources of Siddha drugs

Siddha medicine uses sources from plants, minerals and animal origin. More than 500 raw drugs and fresh herbs are used to prepare eye medicines. The herbs used for the prevention of eye diseases, the need to get permission from the Government to grow plants like *Nandiavattai* (*Ervatamia coronaria*) and *Karisalai* (*Eclipta alba*) in herbal gardens and the tax payable to the Government for growing herbs are recorded in some old palm leaf manuscripts. The tax for cultivating medicinal plants in herbal gardens was called *Kanam*. This shows the significance given even in those days for eye care and treatment of eye diseases. People from villages of Tamil Nadu even today use the latex of *Nandiavattai* (*Ervatamia coronaria*) for eye ailments and *Karisalai* (*Eclipta alba*) juice for the preparation of eye-tex. [21] A few of the Siddha drugs to prepare ophthalmic medicines are given below.

1.3.1 Herbal origin

Kadukkay (Chebulic myrobalan - *Terminalia chebula*), *Thandrikkay* (Belleric myrobalan - *Terminalia bellirica*), *Nellikkay* (Indian Gooseberry - *Phyllanthus emblica*), *Thanneervittankizhangu* (Buttermilk

Comment [JJ1]: Rev_AJRROP_8311 9_Che – 2. In 1.2.1 and 1.2.2,

"medicines like *Neer*, *kattu*, *kalangu*, *urukku*, *chunnam*, *karpam*, *satthu*, and *Guru-kuligai*"

Does the herbs mentioned above have standard Latin or international names?

The names *Neer*, *kattu*, *kalangu*, *urukku*, *chunnam*, *karpam*, *satthu*, and *Guru-kuligai* are mentioned in Siddha texts which are 1400 years old. They are different types of medicine used in Siddha. They are compound medicines prepared from herbs, minerals and animal products. It is corrected now with international names.

neer (medicated liquid), *kattu* (condensed mineral drug), *kalangu* (red hot fired and cooled mineral medicine), *urukku* (molten metal medicine), *chunnam* (calcinated lime stone), *karpam* (rejuvenate medicine), *satthu* (extract), and *Guru-kuligai* (bead medicines)

Comment [JJ2]: Rev_AJRROP_8311 9_Che – 2. In 1.2.1 and 1.2.2,

"*tharppanam*, *thaarai*, *kalikkam*, *mai or anjanam*, *ennai muzhukku*" "ghee medicines like *karisalai nei*,

ponnankanni nei, *nellikkai ilagam*, *injithenn*".

Does the herbs mentioned above have standard Latin or international names? It is corrected now with international names.

tharppanam (continuous dripping of liquid medicine into eye or orbit), *thaarai* (intermittent dripping of liquid medicine into eye or orbit), *kalikkam* (ophthalmic drops), *mai or anjanam* (collyrium), *ennai muzhukku* (application of oil on head followed by hot water bath) etc. are used externally. Herbal decoctions, ghee medicines like *karisalai nei* (a ghee-based medicine prepared from *Eclipta alba*), *ponnankanni nei* (a ghee-based medicine prepared from *Alternanthera sessilis*), *nellikkai ilagam* (a ghee and honey based medicine prepared from *Phyllanthus emblicus*), etc. are used internally to cure eye diseases. Diseases like conjunctivitis, dry eyes and excessive tears in the eyes are dealt under this type.

Comment [JJ3]: Rev_AJRROP_8311 9_Che – 3. In 1.3.1–1.3.3, please

provide the exact Latin name and sources of these herbs and animals.

Now common English/Latin names are added.

Kadukkay (Chebulic myrobalan - *Terminalia chebula*), *Thandrikkay* (Belleric myrobalan - *Terminalia bellirica*), *Nellikkay* (Indian Gooseberry - *Phyllanthus emblica*), *Thanneervittankizhangu* (Buttermilk root - *Asparagus racemosus*), *Maramanjil* (Tree turmeric - *Berberis aristata*), *Athimathuram* (Liquorice - *Glycyrrhiza glabra*), *Karpuram* (Camphor - *Cinnamomum camphora*), *Kumizham* (White teak - *Gmelina arborea*), *Vellai karisalai* (False daisy - *Eclipta alba*), *Seeragam* (Cuminum - *Cuminum cyminum*), *Aamanakku* (Castor oil - *Ricinus communis*) and *Thenkay* (Coconut oil - *Cocos nucifera*) are the most used herbs.

root - *Asparagus racemosus*), *Maramanjai* (Tree turmeric - *Berberis aristata*), *Athimathuram* (Liquorice - *Glycyrrhiza glabra*), *Karpuram* (Camphor - *Cinnamomum camphora*), *Kumizham* (White teak - *Gmelina arborea*), *Vellai karisalai* (False daisy - *Eclipta alba*), *Seeragam* (Cumin - *Cuminum cyminum*), *Aamanakku* (Castor oil - *Ricinus communis*) and *Thenkay* (Coconut oil - *Cocos nucifera*) are the most used herbs.

1.3.2 Mineral origin

Chembu (Copper), *Neelanjanam* (lead sulphide), *Velli* (silver), *Karuvangam* (lead) and *Ayam* (iron) are the most used minerals.

1.3.3 Animal origin

Gorojanai (Bezoar - ox gall), *mayiliragu* (Pavo cristatus - peacock feather), *Maankombu* (Cervus - deer's horn) and *Ney* (cow's ghee) are the most used animal sources.

2. AIM AND OBJECTIVE

2.1 Aim

The present study is aimed at reviewing the ophthalmic diseases mentioned by various Siddhars, clearly describing the various ailments of the eye so that the scientific community takes note of the advances made by the ancient Tamil community in medical and ophthalmic procedures.

2.2 Objective

The objective of the study is to compare the signs and symptoms of the eye diseases with modern findings and ensure the researchers would find and understand that the classical Siddha texts contain explanations about various eye diseases that are dealt by modern ophthalmic science only in the recent past.

3. METHODOLOGY

3.1 Study design

It is a review of the classification of eye diseases mentioned in relevant Siddha literatures.

3.2 Study period

Specialization in Ophthalmology is a perfect branch in Siddha system of medicine. The data collected for the comparison of ancient & modern science and review of modern medicine references were from January 2020 to December 2021.

3.3 Data Collection

The review of classical Siddha literatures explores many types of eye diseases and the various treatment methods used in Siddha medicine for eye diseases mentioned in various Siddha texts. The classical Siddha literatures taken for collection of data and review are *Agatthiar – Nagamunivar nayanavidhi*, [4] *Agasthiar* 2000 Part-III, [5] *Siddhar Aruvai maruthuvam*, [7] *Agatthiar Nayanavidhi* 500 – *Nagamunivar nayanavidhi* 200, [6] *Nayanaroga Sigitcha Deepam*, [7] *Pararasasekara nayanavidhi*, [9] The present study was carried out based on the references of eye diseases mentioned in *Agatthiar Nayan Vidhi* 500 [4]. Apart from the above History of Siddha Medicine, [2] *Kan Maruthuvam*, [10] *Siddhar Tharum Seeriyai Maruthuvam*, [11] *Aruvai Maruthuvaththil Noyaliyai Parisothikkum Muraimai*, [12] *Sarabenthira vaithiya muraikal*, (*nayana roga sikichai*), [13] *Modern Ophthalmology*, [14] *Ocular Pathology*, [15] *Eye Pathology: An Atlas and Text*, [16] *Parsons' Diseases of the Eye* [17] and various online portals.

3.4 Data Analysis

Comment [JJ4]: Rev_AJRROP_8311 9_Che – 3. In 1.3.1~1.3.3, please provide the exact Latin name and sources of these herbs and animals. Now common English/Latin names are added. *Gorojanai* (Bezoar - ox gall), *mayiliragu* (Pavo cristatus - peacock feather), *Maankombu* (Cervus - deer's horn)

Comment [JJ5]: Rev_AJRROP_8311 9_Bha - Methodology includes only classification of diseases which is incomplete for review Complete reference part as per the journal format

The present study is aimed at reviewing the ophthalmic diseases mentioned by various Siddhars and the objective of the study is to compare the signs and symptoms of the eye diseases with modern findings. 96 diseases along their sub classifications were described in Siddha texts which are lengthy and the classical verses needs English translation. The review is aimed on most appropriate comparison of diseases mentioned in Siddha literatures with recent eye diseases. We hope the current review would certainly bring more papers in future for each diseases i.e 96 eye diseases. The limitation of the study is to explore the mere comparison of ancient Siddha terminology and recent modern terminologies.

We are pleased to state that we will submit separate research papers regarding the complete references of each disease in future. Sorry for the inconveniences.

Comment [JJ6]: Rev_AJRROP_8311 9_Che – 4. Why only literature data from January 2020 to December 2021 were collected? Is the time too short and the data fully collected? Here the data collected are mentioning the signs and symptoms of different types of eye diseases mentioned in modern science. Now the sentence is modified as follows. The data collected for the comparison of ancient & modern science and review of modern medicine references were from January 2020(...

Comment [JJ7]: Rev_AJRROP_8311 9_Che – 5. In 3.3, are the data collection channels authoritative and representative?

The mentioned books are published by Dept. of Indian Medicine, Govt. of Tamil Nādu, Govt. of Sri Lanka and Saraswathi Mahal Library, Thanjavur.

Comment [JJ8]: Rev_AJRROP_8311 9_Sam - Add some more references and data, Reference format not proper. One more reference is added. The reference format is aligned and modified as per journal policy. The same is incorporated in the text.

Collected data were processed, compared and interpreted with *Agatthiar Nayana Vidhi 500* and the types are analysed by a simple statistical method in MS Excel sheet.

4. REVIEW OF LITERATURES

The following references have been found mentioning the anatomy, physiology, diseases, treatment and medicines for many eye diseases and it is critical and complex to ascertain the period of writing and when they were first published. [19]

Uyarntiṭum nayanamtanṇil uṇpala viyāṭikkellām
mayāṅkiṭa iruḷālurru varuntiri tōṣattālum
viyaṅṭiṭa mēviniṛkum viraviya maruntutāṇum
tayaṅkiṭak kiriyaiceyyum taṇmaiyaik kūḷalurrēṇa

Many texts have been found in the name of Agatthiar or authored by Agatthiar or worshiped in the name of Agatthiar are published 50-100 years ago. *Agatthiar – Nagamunivar nayanavidhi*, *Agasthiar 2000*, *Siddhar Aruvai marutthuvam*, *Agatthiar Nayanavidhi 500 – Nagamunivar nayanavidhi 200*, *Nayanaroga Sigitcha Deepam* and *Pararasasekara nayanavidhi* as shown in Fig.1 to Fig. 6. They have contributed a lot of procedures to Siddha ophthalmology with different types of eye diseases and many treatment methods.

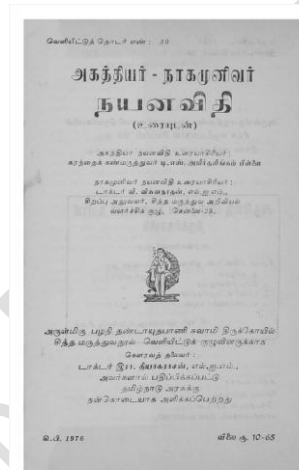


Fig. 1. Front cover of *Agatthiar – Nagamunivar nayanavidhi* text, 1923

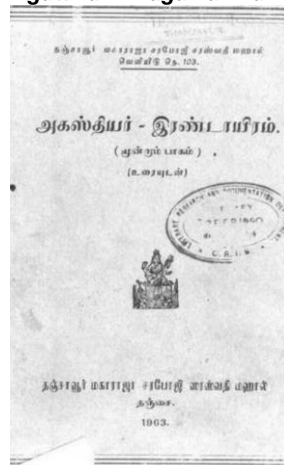


Fig. 2. Front cover of *Agasthiar 2000 Part-III* text, 1963



Fig. 3. Front cover of *Siddhar Aruvai marutthuvam* text, 1968



Fig. 4. Front cover of *Agatthiar Nayanavidhi 500 – Nagamunivar nayanavidhi 200* text, 1923

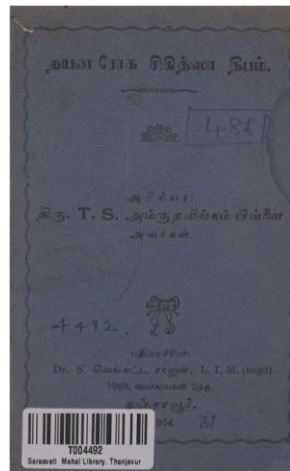


Fig. 5. Front cover of *Nayanaroga Sigitcha Deepam* text, 1954



Fig. 6. Front cover of *Pararasasekara nayanavidhi* text, 2012

Literature evidence for Siddha Ophthalmology for more references which are mentioned in classical Siddha texts are given below. *Agatthiar Nethira Vagadam*, *Agatthiar Sanjeevi*, *Nayana Vaithiya Vidhi*, *Kan Vaitthiyam*, *Nayana Satthiram*, *Nayanav Vidhi Vagadam*, *Agatthiar Sutthiram*, *Agatthiar Vagadam*, *Agatthiar Kuzhambu*, *Agatthiar Sanjeevi*, *Anubava Vaitthiam*, *Anubava Vaithiya Vasanam*, *Anubava Vaithiya Rathina Surukkam*, *Dhanvanthiri Vaitthiyam*, *Thirumoolar Vaitthiyam*, *Therayar Vaitthiyam*, *Bogar Vaitthiyam*, *Karuvloorar Vaitthiyam*, *Ramadevar Vaitthiyam*, *Pulippani Vaitthiyam*, *Yugimuni Vaitthiyam*, paper and palm manuscripts found in Government *Keezthisai Suvadigal Noolagam* and *Sarasvathy Mahal Noolagam* in the district of Thanjavur, Tamil Nadu. The Kerala University Noolagam, Thiruvananthapuram, Kerala has 24 types of palm leaf manuscripts and paper manuscripts. [20]

5. MENTION OF EYE DISEASES IN AGATTHIAR TEXT

Agasthiar 2000, a book on Siddha medicines, contains a chapter on *Nayana Vidhi* - the rules for eye treatment. This gives the names, description, manufacturing techniques and uses of instruments for eye surgery. [1] The classical Siddha text *Agatthiar Nayana Vidhi-500* mentions in detail the types of eye diseases according to the parts of the eye and vitiated humour. It also describes both internal and external treatment methods to cure many eye diseases. It also deals curable and incurable conditions of eye diseases. According to *Agatthiar Nayana Vidhi 500*, the following descriptions are given in detail.

5.1. Quality of healthy eyes

vellaiyil civappurātu viḷaṅkunaṟ paṭikampōṇṟu
oḷḷiya cōtitaṇṇil oḷḷinīra vaṇṇamākil
uḷḷoḷi poruntavaṅkē uṇṇukam viḷaṅkattōṇṇil
oḷḷiya nayaṇamākum uṇṇamaiṟ taṟintitāyē

- verse 6

According to *Agatthiar Nayana Vidhi 500*, the sclera is the white part and iris and pupil are the black parts of the eye. A healthy eye should have pure crystal-like white part without any reddish tint and a dark black pupil in the black part. The eye should reflect the face of a person standing before him/her.

5.2 Anatomy of the eye

Paṅkamil viḷiyiṇṇam pakartaru makalantaṇṇō
tiṅkata nāḷanī tāṇ iyalpuṭa nuraikkakkēḷāy
aṅkula miraṇṇiṇōṭē yaraikumōṇṇumeṇalākum

ceṅkayaḷ viḷiyiṇmātē cettuḷōrk kaṇintukoḷḷē

- verse 7

According to *Agatthiar Nayana Vidhi 500*, the eye is two inches in length, half inch in breadth and one inch in depth.

Nayaṇattil mūṇṇattoṇṇu nakaikaru viḷiyēyeṇṇa
payaṇottu nilavumāru pakuttiṭu mēḷiloṇṇu
viyaṇotta cōṭiyēṇṇa mēṭiṇṭaṇḷil vāḷmakkaṭ
kayaṇottup paṭaitṭaṇkaṇṭāy yaṇṇameṇa ṇaṭaiyaṇaṅkē

- verse 8

The black part occupies one third of the eye. The pupil occupies one seventh of the black part.

5.3 Sequence of occurrence of eye diseases in human life span

Teḷivatu oḷiyāṇiṅkum tiṅkillai muppattaintil
oḷiyatu pukaintu caṇṇē otuṅkiṭum nāṇṇaṇṇil
veḷiyuṇṇappukaintukāṭṭum mēviya aimpattēḷil
aḷiyuṇṇa viruḷuṅkaṇṭāy āṇṇatu nūṇṇatāmē

- verse 10

According to *Agatthiar Nayana Vidhi 500*, human beings tend to have normal vision until the age of 35 years. Then, mild blurring occurs when they see nearby objects and this condition becomes normal after 45 years. They develop mild blurring when seeing distant objects 45 years onwards until 57 years. At last, the vision slowly becomes dull year after year and complete loss of vision occurs by 100 years of age.

5.4 Causes of eye diseases

kerppattilcicuvāḷpōtu kirumikaḷ cērntiṭṭāḷum
kappiya paciyyuṇṇāḷuṅ kalakkaṅkoḷ tikiḷnēṇṇāḷum
ceppumāṇ kaṇikāyemetta tēṭiyē pucittiṭṭāḷum
oppaṇu makaviṇkaṇṇil viyāṭivan taṇukuctāṇē

- verse 11

According to *Agatthiar Nayana Vidhi 500*, the factors that cause diseases in the eyes are as follows. During pregnancy, if the uterus has any infections, if the mother does excessive fasting, if the mother is frightened, if the mother is eating excess raw mango and mango fruits, eye diseases affect the foetus.

Naṭukiya veyiliṇāḷum kaṇattati cuṭukaiyāḷum
taṭiyaṭi paṭukaiyāḷum talaiyatu cumaiyiṇāḷum
muṭukavē eṇṇeyvārttu mūḷkippiṇ paṭukkaiyāḷum
paṭippinṇiṇ kūṇmaiyaḷum paṭarntiṭuṅ kaṇṇiṇōyē

- verse 12

Working in a hot place, blisters in the foot due to heavy sun exposure, being beaten by a bamboo stick, lifting heavy goods on the head, day sleeping after oil bath, reading with eye strain, etc. may affect the eyes.

Uṭṭaṇa matikattāḷum utittiṭu mantattāḷum
uṭṭaṇa poruḷkaṭam'mai yukantutāṇ mutaralāḷum
uṭṭaṇa veyiliṇāḷu muḷaṇṇuṇiṇ rāṭalāḷum
uṭṭaṇa matikamṭiṇ utittiṭuṅ kaṇṇiṇōyē

- verse 13

Suffering from excess body heat, indigestion, using drugs like *Gorochanai*, Camphor, *Navacharam* and smelling the scented flower *shenbagam*, bathing immediately after wandering in the sunlight, etc. may affect the eyes and cause eye diseases.

Nittiraiyilātātālūm nīlveyilōlukal taṇṇāl
nittirai camayantaṇṇil nimirtalai kavīṭtal taṇṇāl
pattiyāṅkāṭi koḷḷal parukunīratikaṅ koḷḷal
mattiya matikakkārrāl vantaṭuṅ kaṇṇiṇōyē

- verse 14

Sleeplessness, wandering for a long time in the summer season, avoidance of night sleep, using vinegar while taking *Patthiyam* medicine, drinking excess toddy, exposing body to open air, etc. may affect the eyes.

Maṇamiṭai kuṇṇiṇālūm mātartam'mācaiyālūm
kaṇamac cērkkaiyālūm viṇṭiṭu pārvaṇiyālūm
taṇamikak keṭukaiyālūm taṇivilā naṭaiyīṇālūm
ciṇamikak koḷḷālūm cērntiṭum naṇayanōyē

- verse 15

Excessive grief, excessive indulgence in sex, chronic constipation, working for a long time with the head tilted down (like in case of cell phone viewing), loss of wealth, walking for long distances without rest, excess anger, etc. may cause eye diseases.

Kaṇṇatu aḷaṇṇeri;tta kāraṇamēṭō venṇil
naṇṇiya vapputaṇṇai nalamikap parukaṇiyālūm
tiṇṇiya vaṇṇaiyālūm cērntēṇṇey pōkātālūm
viṇṇeḷu miṇṇalōṭu viḷaṅkuṭiṭ pārppatāluma

- verse 16

Drinking excess water, excess dryness, not cleaning the hair properly while taking oil bath, seeing lightening, and seeing a burning flame may cause eye diseases.

Taṭiyāṭi paṭukaṇiyālūm talaiyaṭiṭ cumaiyīṇālūm
kaṭivirai naṭaiyīṇālūm kavīṇṭiṭum pārivāyālūm
neṭuviral nakattiṇālūm neruṅku nittiraiyīṇālūm
paṭiyēḷu kūрмаiyālūm pāvaiyir paṭarunōyē

- verse 17

Bamboo stick injury, lifting heavy goods on the head, brisk walking, working for long hours by tilting the head downwards, growing long nails, excess sleep, straining the eyes, etc. induce eye diseases.

Uṇṭiṭu macaṇantaṇṇi lukantukal kaṭikkaiyālūm
koṇṭakal mayiriṇālūṅ koṭumalac cērkkaiyālūm
paṇṭuvenṇilayum pākkum pakkarai yaṭakkaiyālūm
kaṇṭanēṭ tirantaṇakkuk karutiya nōykkuttāyām

- verse 18

Biting and ingesting small stones in prepared food, swallowing hair along with food, chronic constipation, chewing betel nut for a prolonged time, etc. may cause eye diseases.

5.5 Aetiology of Eye diseases

According to Siddha literatures, there are 96 types of eye diseases. The aetiology is classified based on the imbalances in the three humours, *Vatham*, *Pittham* and *Kabham* and the affected parts such as the white part, black part or inner part of the eye.

5.6 Classification of eye diseases by *Agatthiar*

According to Siddha medicine, the diseases of the eyes are classified into 96 types. Classical Siddha text *Agatthiar Nayana Vidhi-500* mentions in detail the types of eye diseases according to the parts of the eye affected and vitiated humour. The text also describes both internal and external treatment methods to cure eye diseases.

Jōtiyi lirupattēlu tolkaru viljiyilpattu
tītupaṇ mūṇṇāmveḷḷai ciṇantiṭu cantiloṇpāṇ
kōtaikēḷ mūvēṭṭākum kuvaḷaiyi ṇimaiyiṇuḷḷē
ēTamil nayaṇameṇkum eḷuntanōy patiṇmūṇṇāmē

- verse 19

Agatthiar Nayana Vidhi-500 classifies eye diseases that occur in various parts of the eye. They are mentioned in Table 1 and Fig. 7.

Table 1: Classification of eye diseases according to the affected parts

S.No.	Part	Number
1.	Diseases of lens and pupil	27
2.	Diseases of black of the eye	10
3.	Diseases of white of the eye	13
4.	Diseases of binding unions	9
5.	Diseases of upper and lower eyelids	24
6.	Diseases of the eye ball	13

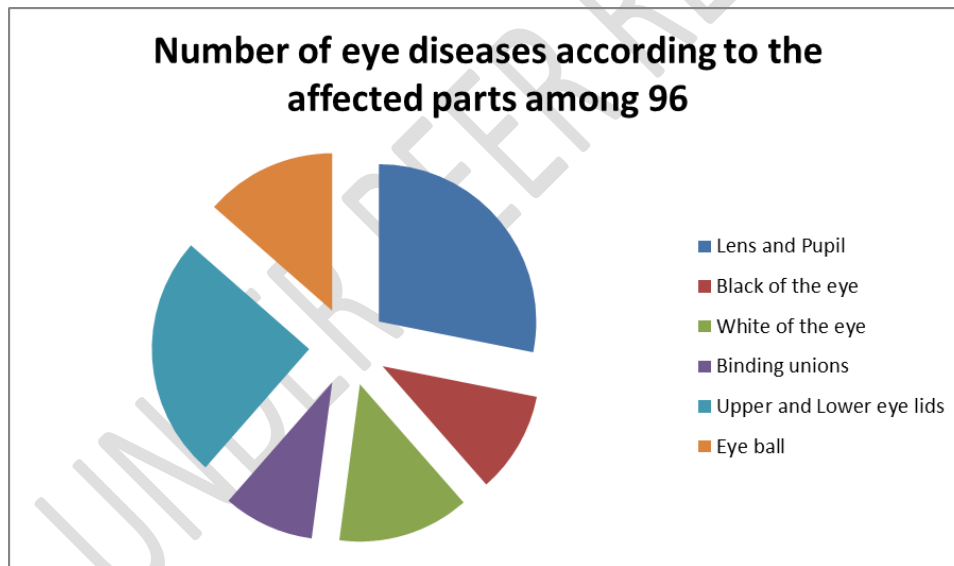


Fig. 7. Number of eye diseases according to the affected part

Cēravē toṇṇūrrārum tīrantīra mākanīrkum
maṇṇu nārpaṭṭaṇcum mākapam irupateṇka
cīriya pitṭiṇōṭu ciṇantavai muppatṇṇu
pēṇṇu naṇayarōkam pēṇimuṇ piṇakkumvārē

- verse 20

Abnormalities of the three humours - *vatham*, *pitham* and *kabham* affect the eyes and cause eye diseases. *Agatthiar Nayana Vidhi-500* also classifies the 96 eye diseases according to the vitiating humours. They are mentioned in Table 2 and Fig. 8.

Table 2. Classification of eye diseases according to the affected humours

S.No.	Humour	Number
1.	Vitiated <i>vatham</i>	45
2.	Vitiated <i>pitham</i>	31
3.	Vitiated <i>kabham</i>	20

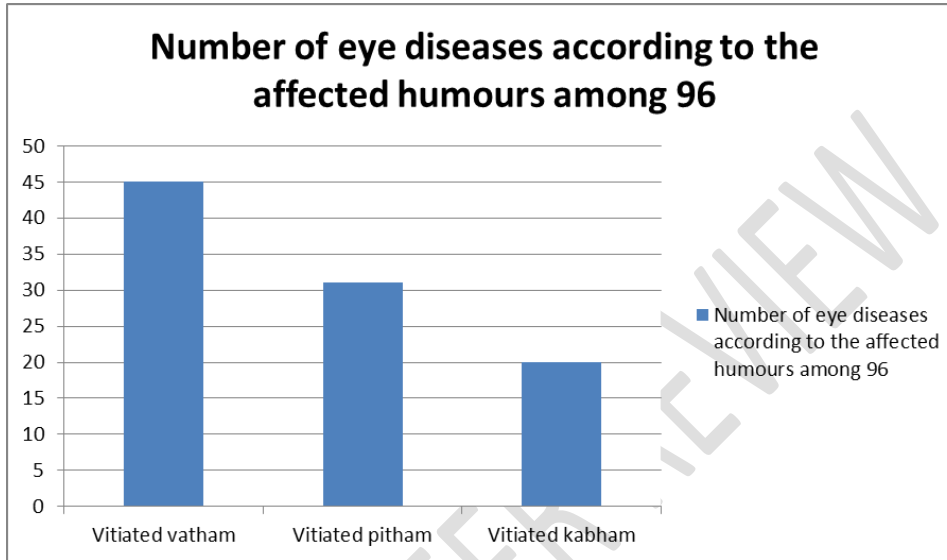


Fig. 8. Number of eye diseases according to the affected humour

According to *Agatthiar nayana vidhi*, 96 diseases are named according to the affected part, category, signs and symptoms. They are mentioned in Table 3 and Fig. 9.

Table 3. Classification of eye diseases according to *Agatthiar Nayana Vidhi* 500

S.No	Category	Number	Name
1.	Kaasam	17	Neelakasam
2.			Pitthakasam
3.			Vathakasam
4.			Valakasam
5.			Mantharakasam
6.			Silettumakasam
7.			Valiyunkasam
8.			Udaithezhu kasam
9.			Maalaikasam
10.			Uurukasam
11.			Manineelakasam
12.			Neerezhukaasam
13.			Thunnukasam
14.			Thutthidukasam
15.			Vaarezhukasam
16.			Kuvalai kasam
17.			Anthirakasam
18.	Padalam	5	Nagapadalam
19.			Vellaipadalam
20.			Panchuneerpadalam
21.			Ratthapadalam

22.			Neerpadalam
23.	Sukkiram	1	Sukkiram
24.	Thimiram	1	Thimiram
25.	Ezhucchi	2	Ezhucchi
26.			Undai ezhucchi
27.	Pillam	3	Pillam
28.			Soozhnthidum pillam
29.			Neer pillam
30.	Thadippu	2	Imai thadippu
31.			Kumbikai thaditthal
32.	Mayir	1	Mudamayir
33.	Parpam	1	Parparogam
34.	Puzhuvettu	2	Kodumpuzhuvettu
35.			Mayirpuzhuvettu
36.	Vippuruthi	1	Kuvalai vippuruthi
37.	Nokkadu	2	Kannovu
38.			Vennokkadu
39.	Akkiram	1	Akkira rogam
40.	Viranam	3	Avikaya viranam
41.			Sothigaviranam
42.			Kan viranam
43.	Ukkiram	1	Ukkira rogam
44.	Saikan	1	Saikan kurudu
45.	Thinavu	1	Kan thinavu
46.	Thooya kan	1	Thooya kan kurudu
47.	Vanderithal	1	Suzhal vanderithal
48.	Kobam	1	Anna kobam
49.	Sivappu	1	Maruvu kansivappu
50.	Erivizhi	1	Erivizhimuzhunguthal
51.	Mandham	1	Athimantham
52.	Kuvalai	1	Kuvalai neritthal
53.	Azhikan	1	Azhikan piritthal
54.	Kuntham	1	Padikuntham
55.	Mantharam	4	Mathanamantharam
56.			Athimantharam
57.			Vithanamantharam
58.			Mathanamantharam
59.	Paicchal	1	Neerpaicchal
60.	Aroobam	1	Aroobam
61.	Kurudu	2	Kankurudu
62.			Piravikurudu
63.	Adai	1	Adaithezhunthidal
64.	Mulai	1	Parumulai
65.	Mamisan	2	Thurmamisan
66.			Sudarathy mamisan
67.	Niram	1	Vellezhutthu
68.	Pudaippu	2	Uruvizhipudaitthal
69.			Uyarnthukanpudaitthal
70.	Poo	1	Paravaipoo
71.	Amaram	1	Amaram
72.	Pugaicchal	2	Pugaicchal
73.			Thunnu ven pugaicchal
74.	Neritthal	2	Sothineri
75.			Kuvalai neritthal
76.	Ver	1	Sever
77.	Urukkal	1	Kasamurugi
78.	Pozhuthu	1	Malaikkan
79.	Suzhalvizh	1	Suzhalvizhi eritthal
80.	Akkaram	1	Akkaram
81.	Piritthal	1	Azhitthidum piritthal

82.	Thudippu	1	Sorakkan thudippu
83.	Valarchi	1	Valarnthezhurogam
84.	Sudar	1	Sudarpalathondral
85.	Veekkam	1	Veengivizhitthal
86.	Paduvan	3	Natthaipaduvan
87.			Kuvalaipaduvan
88.			Pakkapaduvan
89.	Azhitthal	1	Putthiazhitthal
90.	Pongal	1	Pongiyavithanam
91.	Chandiran	1	Chandirarogam
92.	Suriyan	1	Ezhugnayiru
93.	Kootcham	1	Koosivizhitthal
94.	Azhalarchi	1	Azhartri
95.	Sala rogam	1	Varunsalarogam
96.	Urutthal	1	Imaiodurutthal

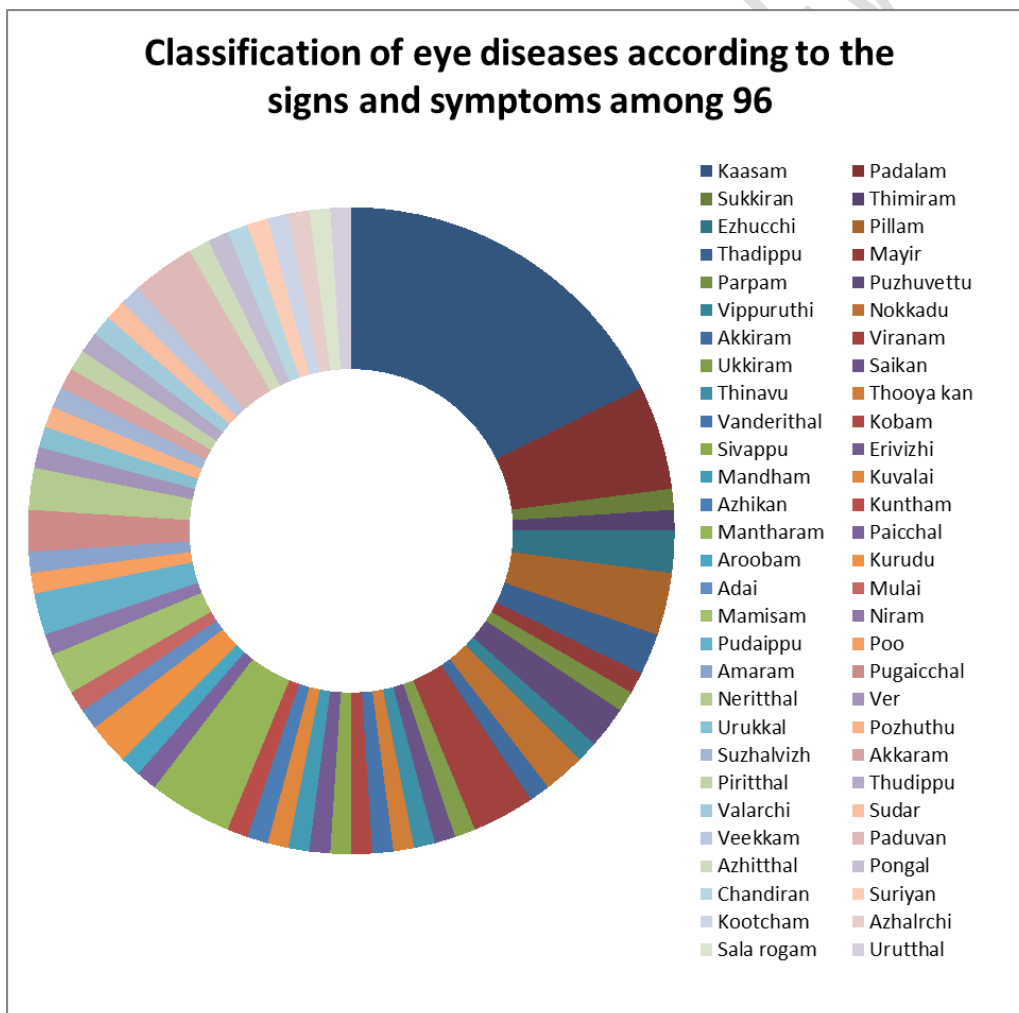


Fig. 9. Number of eye diseases according to the signs and symptoms

According to *Agatthiar Nayana Vidhi*, the 96 diseases are compared with the modern names of eye diseases and it is carried out in Table 4. The text also clearly mentions the prognosis for each disease.

Table 4. A Comparison of 96 eye diseases according to Siddha and Modern science

Sl. No.	Review of Siddha science			Review of modern science
	Siddha name	Prognosis	Signs and symptoms	Appropriate modern name of the disease
1.	<i>Akkira rogam</i>	Curable	Exudate of inflamed mucous membrane and catarrhal secretion	Catarrhal ophthalmia
2.	<i>Avikaya viranam</i>	Curable	Redness and a gritty sensation in your eye, along with itching	Corneal Tubercles
3.	<i>Ukkira rogam</i>	Curable	Circular growth of flesh	Pinguecula
4.	<i>Udaithezhu kasam</i>	Incurable	Mucopurulent discharge	Conjunctival Hyperaemia
5.	<i>Saikan kurudu</i>	Curable	Blindness	Strabismus
6.	<i>Imai thadippu</i>	Curable	Morbid thickening of the eyelids	Blepharoptosis
7.	<i>Kan thinavu</i>	Curable	Eye pain	Ophthalmia
8.	<i>Thooya kan kurudu</i>	Curable	Darkening of vision	Amaurosis
9.	<i>Sukkiram</i>	Curable	Inflammation of the sclerotic coat	Phlyctenular ophthalmia
10.	<i>Maalaikasam</i>	Incurable	Evening vision weakness	Retinitis pigmentosa
11.	<i>Suzhal vanderithal</i>	Curable	Extreme sensitivity to light	Photophobia
12.	<i>Anna kobam</i>	Curable	Marked inflammation in the eye	Ophthalmia
13.	<i>Maruvu kansivappu</i>	Curable	Redness and watering of the eye	Epiphora
14.	<i>Uurukasam</i>	Incurable	Swelling and adhesion of eyelids	Ankyloblepharon
15.	<i>Erivizhimuzhunguthal</i>	Curable	Heaviness and congestion of the eyes	Phthisis cornea
16.	<i>Parparogam</i>	Curable	Glaring of vision	Tarsomalacia
17.	<i>Athimantham</i>	Curable	Eye pain with one sided headache	Traumatic amblyopia
18.	<i>Kuvalai neriththal</i>	Curable	Ulceration of the eyelids	Mycosis fungoides
19.	<i>Azhikan piriththal</i>	Curable	Mucopurulent discharge with swelling and excessive pain	Purulent ophthalmia
20.	<i>Sothigaviranam</i>	Curable	Ulceration of the cornea	Macula lutea
21.	<i>Manineelakasam</i>	Incurable	Increased eye pain with sensitive to blue colour	Blue Glaucoma
22.	<i>Padikuntham</i>	Curable	Objects appear small than their original size	Micropsia
23.	<i>Mathanamantharam</i>	Curable	Blurred indistinct vision	Blurred Vision
24.	<i>Nagapadalam</i>	Curable	Vascularised thickening of the conjunctiva, triangular in shape	Vascularized limbal keratitis
25.	<i>Imai neerpaicchal</i>	Curable	Ophthalmic catarrh	Ophthalmic Catarrh
26.	<i>Aroobam</i>	Curable	Swelling of the ocular conjunctiva	Chemosis
27.	<i>Vellaipadalam</i>	Curable	Flesh growth in the sclera	Clear pinguecula
28.	<i>Kan viranam</i>	Curable	Ulceration in and around the eyes and eyelids	Periorbital cellulitis
29.	<i>Neerezhukaasam</i>	Incurable	Pain with flashes before the eyes and discharge of tears	Retinal Cataract
30.	<i>Neelakasam</i>	Curable	Blue colour around lens	Blue opaque cataract
31.	<i>Valiyunkasam</i>	Incurable	Bluish white colour around lens	Chronic cataract
32.	<i>Vathakasam</i>	Incurable	The contraction of the black part	Phthisis corneae
33.	<i>Mudamayir</i>	Curable	Loss of hairs in eyelids	Blepharolosis
34.	<i>Kankurudu</i>	Curable	Partial blindness of the eye	Vision impairment
35.	<i>Adaithezhunthidal</i>	Curable	Itching sensation in the eyes followed by water running	Watery itchy eyes

			through the nose	
36.	<i>Parumulai</i>	Curable	Growth inside the eye	Chalazion
37.	<i>Ezhucchi</i>	Curable	Intolerance to light	Staphyloma
38.	<i>Thurmamisam</i>	Curable	Redness and growth in the eyes	Episcleritis
39.	<i>Vellezhutthu</i>	Curable	Loss of ability to focus nearby objects	Presbyopia
40.	<i>Uruvizhipudaitthal</i>	Curable	Spared eye injury	Sympathetic ophthalmia
41.	<i>Paravaipoo</i>	Curable	Face looks dark and inability to look straight	Opaque crystal cataract
42.	<i>Panchuneerpadalam</i>	Curable	Spreading growth of flesh	Corneal leukoma
43.	<i>Amaram</i>	Curable	chronic progressive exacerbations and remissions	Granular conjunctivitis
44.	<i>Pugaicchal</i>	Curable	Dimness of vision	Post marital amblyopia
45.	<i>Athimantharam</i>	Curable	Scar in the cornea	Interstitial keratitis
46.	<i>Thimiram</i>	Curable	Lack of blood flow	Amaurosis fugax
47.	<i>Sothineri</i>	Curable	Redness in the pupil	Pupil Conjunctivitis
48.	<i>Sever</i>	Curable	Red streaks of the eye	Red sclerotic streaks
49.	<i>Silettumakasam</i>	Incurable	Opaque vesicular growth of the pupil	White cataract
50.	<i>Kuvalai theritthal</i>	Curable	Foul smelling discharge from eyelids	Odour conjunctivitis
51.	<i>Kasamurugi</i>	Curable	Morbid growths on the white of the eye and irritation of the lower lid.	Optic neuritis
52.	<i>Maalaikkan</i>	Curable	Night blindness	Nyctalopia
53.	<i>Thunnukasam</i>	Incurable	Growth of flesh in black of the eye	Eye web
54.	<i>Suzhalvizhi eritthal</i>	Curable	Seeing floating objects inside the eye	Vitreous opacities
55.	<i>Pakkapaduvan</i>	Curable	Pin prick pain on the white of the eye and ulcerous growth of flesh	Corneal growth
56.	<i>Akkaram</i>	Curable	Itching and ulceration in the eyes	Corneal ulcer
57.	<i>Pillam</i>	Curable	Eyelid diseases caused by phlegmatic and bilious disorders	Mucus fishing syndrome
58.	<i>Azhitthidum piritthal</i>	Curable	Mucopurulent discharge of the whole eye	Scleral anomalies
59.	<i>Pitthakasam</i>	Curable	Yellow or brownish colour of the lens	Yellow cataract
60.	<i>Thutthidukasam</i>	Incurable	Spreading of a white membrane all over the eye	White pterygium
61.	<i>Thunnu ven pugaicchal</i>	Curable	White colour on the black of the eye	Horner-Trantas dots
62.	<i>Sorakkan thudippu</i>	Curable	Irritation in the lens, boring pain, swelling, thickening of the eyelids.	Posterior scleritis
63.	<i>Vennokkadu</i>	Curable	Inability to see even the moon light	Nyctalopia
64.	<i>Soozhnthidum pillam</i>	Curable	Flesh growth on the eyelids and eyes	Xanthelasma
65.	<i>Mayirpuzhuvettu</i>	Curable	Loss of hair and ulceration in the eyes	Tinea ciliorum
66.	<i>Vithanamantharam</i>	Curable	Pulling pain in the upper lid	Upper orbital cellulitis
67.	<i>Valarthezhurogam</i>	Curable	Ulcerated fleshy growth in the corner of the eye and white coat	Corneal abrasion
68.	<i>Sudarpalathondral</i>	Curable	The objects around appear bluish flame	Aerial perspective
69.	<i>Veengivizhitthal</i>	Curable	Growth in the angle of the eye	Neo vascular glaucoma

70.	<i>Mathanamantharam</i>	Curable	Vision is blurred or indistinct, eye colour changes as like chameleon	Idiopathic rapid eye
71.	<i>Sudarathy mamsam</i>	Curable	Fleshy growth and hazy vision	Surfer's eye
72.	<i>Undai ezhucchi</i>	Curable	Pricking pain in the corner of the eyes, watery discharge	Granular Conjunctivitis
73.	<i>Vaarezhukasam</i>	Incurable	Pain, red eyes, sensitivity to light	Red and bloodshot eyes
74.	<i>Valakasam</i>	Incurable	Dim vision becomes clear after sometime	Halo optical phenomena
75.	<i>Uyarnthukanpudaitthal</i>	Curable	The eyes have fleshy growth	Keratomycosis
76.	<i>Neer pillam</i>	Curable	Severe scarring of the inside of the eyelid followed by watering	Chlamydia trachomatis
77.	<i>Mantharakasam</i>	Curable	Smoky vision due to cooling substances	Glare vision
78.	<i>Kuvalai vippuruthi</i>	Curable	Abscess in the eye	Dacryocystitis
79.	<i>Kumbikai thaditthal</i>	Curable	Excess mucopurulent discharge, heaviness in the eyelids	Croupous Conjunctivitis
80.	<i>Kuvalai kasam</i>	Incurable	Swelling of the angle of the eye and blue tint in the lens	Chronic Open-Angle Glaucoma
81.	<i>Natthaipaduvan</i>	Curable	Boil of an eruption like an oyster shell in the eye ball	Ocular Herpes
82.	<i>Kuvalaipaduvan</i>	Curable	A tubular growth in the lower eyelid	Blepharitis ulcerosa
83.	<i>Putthiazhitthal</i>	Curable	Confusion of the mind, cloudy vision, objects appear differently	Confused blurry vision
84.	<i>Pongiyavithanam</i>	Curable	Swelling in the eye, dull vision, mucopurulent discharge	Mucopurulent ophthalmia
85.	<i>Kannovu</i>	Curable	Pain in the eyes more in windy season	Winter Woes eyes
86.	<i>Chandirarogam</i>	Curable	Moonlight blindness and could not see in moon light	Equine recurrent uveitis
87.	<i>Ezhugnayiru</i>	Curable	Headache beginning with the rising sun	Ocular migraines
88.	<i>Koosivizhitthal</i>	Curable	Seeing objects with half-closed eyes	Pressure phosphenes
89.	<i>Ratthapadalam</i>	Curable	Red colour and congestion in the pupil	Pannus
90.	<i>Neerpadalam</i>	Curable	Accumulation of morbid fluid, purulent discharge	Allergic Conjunctivitis
91.	<i>Azhartri</i>	Curable	Mucopurulent inflammation of the conjunctiva	Bacterial Conjunctivitis
92.	<i>Piravikurudu</i>	Curable	Congenital vision impairment	Leber congenital amaurosis
93.	<i>Salarogam</i>	Curable	Pain and watering of eyes, narrowing of eye opening	Closed-Angle or Narrow-Angle Glaucoma
94.	<i>Kodumpuzhuvettu</i>	Curable	Burning sensation on the eyes followed by removal of hairs in eyelids, itching sensation in the eyes	Seborrheic Dermatitis of eyes
95.	<i>Imaiodurutthal</i>	Curable	Thickening of the upper eyelid	Posterior blepharitis
96.	<i>Anthirakasam</i>	Incurable	Day blindness	Hemeralopia

6. RESULTS AND DISCUSSION

The text describes 96 types of eye diseases in verses written in Tamil. The description of verses for each eye disease is concised in Table 4 with a mere comparison of modern diseases. The modern findings of eye diseases are more are less similar with ancient findings which are mentioned in

Comment [JJ9]: Rev_AJRROP_8311 9_Bha - Elaborate discussion part as it discussing only classification of diseases and is not justifying the objectives of study?

The objective of the study is to compare the signs and symptoms of the eye diseases with modern findings and ensure the researchers would find and understand that the classical Siddha texts contain explanations about various eye diseases that are dealt by modern ophthalmic science only in the recent past.

Comment [JJ10]: Rev_AJRROP_83 119_Che – 6. More Discussion should be allow in this review.

Few more sentences are added in the discussion part as follows. The text describes 96 types of eye diseases in verses written in Tamil. The description of verses for each eye disease is concised in Table 4 with a mere comparison of modern diseases. The modern findings of eye diseases are more are less similar with ancient findings which are mentioned in *Agattiari Nayana Vidhi*. The description of various symptoms of *Suzhal Vanderithal* (vitreous opacities), *Mayir puznuvettu* (Tinea ciliarum), *Amaram* (Granular conjunctivitis), *Kuvalaipuruthi* (dacryocystitis), *Vellelluthu* (presbyopia), *thurmamsam* (episcleritis), and *Mudamayir* (trichiasis) are very much similar to that in modern medicine diagnosis. It is surprising to learn how in those days they have explained these diseases in clear terms. [1] From the above-mentioned evidences, we can get a clear view about the knowledge and resources of the ancient Siddha classical literatures, possess with respect to Ophthalmology. In these traditional Siddha texts, the Siddhars have clearly described the qualities of a healthy eye (para 5.1), the anatomy of the eye (para 5.2), progress of eye diseases and age (para 5.3), causes of eye diseases (para 5.4), aetiology of ophthalmic diseases (para 5.5), the treatment methodology of various ophthalmic diseases, sources of drugs of herbal origin, drugs of mineral origin and drugs of animal origin, classification of eye diseases according to the parts of the eye, classification of eye diseases according to the vitiated humours (para 5.6), clinically manifesting signs and symptoms of 96 eye diseases, and comparison of Siddha classification with the ophthalmic diseases described in modern science (Table 4). The treatment methods for each disease along the prognosis of treatment were well explained in the texts, but here not mentioned due to the limitation of the study. The data available for the treatment of few challenging diseases may be utilized in future by some researchers wherever and whenever applicable.

Agaththiar Nayana Vidhi. The description of various symptoms of *Suzhal Vanderithal* (vitreous opacities), *Mayir puznuvettu* (Tinea ciliarum), *Amaram* (Granular conjunctivitis), *Kuvalaivipuruthi* (dacryocystitis), *Vellelluthu* (presbyopia), *thurmamisam* (episcleritis), and *Mudamayir* (trichiasis) are very much similar to that in modern medicine diagnosis. It is surprising to learn how in those days they have explained these diseases in clear terms. [1] From the above-mentioned evidences, we can get a clear view about the knowledge and resources of the ancient Siddha classical literatures, possess with respect to Ophthalmology. In these traditional Siddha texts, the Siddhars have clearly described the qualities of a healthy eye (para 5.1), the anatomy of the eye (para 5.2), progress of eye diseases and age (para 5.3), causes of eye diseases (para 5.4), aetiology of ophthalmic diseases (para 5.5), the treatment methodology of various ophthalmic diseases, sources of drugs of herbal origin, drugs of mineral origin and drugs of animal origin, classification of eye diseases according to the parts of the eye, classification of eye diseases according to the vitiated humours (para 5.6), clinically manifesting signs and symptoms of 96 eye diseases, and comparison of Siddha classification with the ophthalmic diseases described in modern science (Table 4). The treatment methods for each disease along the prognosis of treatment were well explained in the texts, but here not mentioned due to the limitation of the study. The data available for the treatment of few challenging diseases may be utilized in future by some researchers wherever and whenever applicable.

7. CONCLUSION

Various kinds of eye diseases and their descriptions described in the Siddha manuscripts like *Siddhar Aruvai Maruthuvam* and *Agaththiar Nayana Vidhi* are similar and comparable to that in modern medicine. These literature evidences prove the fact that Siddha medicine was a highly advanced medical science which had immense treasures not only in the classification of eye diseases but also in complex medical and surgical procedures for ophthalmic diseases. But, in due course, these treasures were relegated to the back seat and slowly forgotten even by the Siddha medical community. The study highlights the efficacy of "Herbal and Herbo mineral drugs" which is an ancient tradition, Siddha medicine used in some parts of India. This ancient concept should be carefully evaluated in the light of modern medical science and can be utilized partially if found suitable. The researchers have published this paper to revitalise these procedures and develop a rational approach to use the traditional knowledge about ophthalmic diseases mentioned in classical Siddha texts to reduce the suffering of humanity.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

REFERENCES

- [1] Esakkimuthu, S., Sylvester Darvin, S., Mutheeswaran, S. *et al.* A study on food-medicine continuum among the non-institutionally trained *siddha* practitioners of Tiruvallur district, Tamil Nadu, India. *J Ethnobiology Ethnomedicine* 14, 45 (2018). <https://doi.org/10.1186/s13002-018-0240-9>
- [2] N. Kandhasamy Pillai, History of Siddha Medicine, published by the Government of Tamilnadu, 1979
- [3] K.S. Uthamarayan (Ed.), *Siddhar Aruvai Maruthuvam* (2nd ed.), Tamil Nadu stationery printing industrialists, 1967
- [4] Agaththiar – Nagamunivar nayanavidhi, published by Arulmigu palani Thandayuthapani Thirukoil Siddha maruthuva veliyeettu kuzhu, Office of Director of Indian Medicine, Chennai 600029, 1 Ed. 1923, 2 Ed. 1976, 76
- [5] Agastthiar 2000 Part-III, published by Thanjavur Maharaja Saraswathy Mahal, Thanjavur, 1963
- [6] Vaidyar V.R.Sundaram, *Agaththiar Nayanavidhi* 500 – Nagamunivar nayanavidhi 200, published by Sri Gowry Ayurveda vaidya manthiram, Chennai 1923

Comment [JJ11]: Rev_AJRROP_831 19_Che – 1. Please highlight the significance of this review.

The significance of the review is added as follows.

The study highlights the efficacy of "Herbal and Herbo mineral drugs" which is an ancient tradition, Siddha medicine used in some parts of India. This ancient concept should be carefully evaluated in the light of modern medical science and can be utilized partially if found suitable.

Comment [JJ12]: Rev_AJRROP_831 19_Sam - Add some more references and data, Reference format not proper

The format is modified as per journal policy. One reference is added [8] now. The error in numbering is corrected now. The numbers are now checked and corrected in respective text.

- [7] T.S.Amruthalingam Pillai, Nayanaroga Sigitcha Deepam, published by Dr.S.Venkatarajan, Saganayagan street, Thanjavur, 1954
- [8] Dr.J.Jeyavenkatesh, Dr.S.Sridhar, Dr.S.Roja Ramani, Principles and Practice of Siddha Surgery, Published by Shanlax Publications, Madurai, 2021
- [9] Dr.S.Sivashanmuga Raja, Pararasasekara nayanavidhi, published by Sivararjanam overeser printers, Palalai, Kondavil, 2012
- [10] V. R. Madhavan, Kan Maruthuvam, International Institute of Tamil Studies, Chennai, 1982
- [11] Siddhar Tharum Seeriyar Maruthuvam, MSS Asaan, Tarzon Pathippagam, 81, Balmour Road, Nagerkoil - 629001, November 1990
- [12] Dr.K.S.Uthamarayan, Aruvai Maruthuvaththil Noyaliyai Parisothikkum Muraimai, Tamil Nadu stationery printing industrialists, 1981
- [13] Sarabenthira vaithiya muraikal, (nayana roga sikichai) published by Thanjavurmaharaja sarapojiyin sarasvati mahal noolagam, Thanjavur.
- [14] Dutta L.C, Modern Ophthalmology, Jaypee Brothers Medical Publishers III Ed. 2005
- [15] Myron Yanoff, Joseph W. Sassani, Ocular Pathology, Elsevier, 2019
- [16] Ralph C. Eagle, Jr, Eye Pathology: An Atlas and Text, Lippincott Williams and Wilkins; 2nd edition, 2011
- [17] Sihota, Radhika Tandon, Parsons' Diseases of the Eye, Ed. 23, Elsevier India, 2019
- [18] Mohammed Iqbal, Siddha maruthuvathil kan maruthuvam published by Thamarai noolagam, Chennai. 2012
- [19] K.G. Sreelekha, Traditional Medicine, System in India, National Mission for Manuscripts, Dev Publishers & Distributors, 2014
- [20] <https://www.britannica.com/science/Siddha-medicine>
- [21] https://www.nhp.gov.in/eye-care-in-siddha_mtl
- [22] <http://en.wikipedia.org>
- [23] <http://www.thefreedictionary.com>
- [24] <http://www.tknSiddha.com>