Open, controlled, randomized study of systemic use of *shatawari ghrita & shatawari ghrita akshi tarpana in pratham patalgata timir w.s.r. to simple myopia*

A Thesis Submitted to

Tilak Maharashtra Vidyapeeth, Pune

For the Degree of
Doctor of Philosophy (Ph.D.)

In

Shalakya-Tantra

Under the Board of Ayurveda Studies

Submitted By

Dr. Kiran B. Patil

Under the Guidance of

Dr. Madhukar Lahankar

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Form – A

OPEN, CONTROLLED, RANDOMIZED STUDY OF SYSTEMIC USE OF *SHATAWARI GHRITA & SHATAWARI GHRITA AKSHI TARPANA IN PRATHAM PATALGATA TIMIR W.S.R. TO SIMPLE MYOPIA*

A thesis submitted to

Tilak Maharashtra Vidyapeeth, Pune

For the degree of: Vidyavachaspati (Ph.D. - Doctor of Philosophy)

In the

Subject:	**Shalakya-Tantra**
Under the faculty of:	**Ayurveda**
Name of the Candidate:	**Dr. Kiran B. Patil**
Name of the Guide:	**Dr. Madhukar Lahankar**
Name of the Department:	**Ayurveda**
Month and Year:	**July - 2016**

Form - B

I hereby declare that the thesis entitled "**Open, Controlled, Randomized Study of Systemic use of *Shatawari Ghrita & Shatawari Ghrita Akshi Tarpana in Pratham Patalgata Timir w.s.r. to Simple Myopia"*** completed and written by me has not previously formed the basis for the award of any Degree or other similar title upon me of this or any other Vidyapeeth or examining body.

Place: Pune

Date:

Signature of the Research student

From - C

CERTIFICATE

This is to certify that the thesis entitled "**Open, Controlled, Randomized Study of Systemic use of *Shatawari Ghrita* & *Shatawari Ghrita Akshi Tarpana* in *Pratham Patalgata Timir* w.s.r. to Simple Myopia"**

Which is being submitted herewith for the award of Degree of Vidyavachaspati (Ph.D.) in Shalakya-Tantra of Tilak Maharashtra Vidyapeeth, Pune is the result of original research work completed by Dr. Kiran B. Patil under my supervision and guidance. To the best of my knowledge and belief the work incorporated in this thesis has not formed the basis for the award of any Degree or similar title of this or any other University or examining body upon him.

Place: Pune

Date: signature of the Research Guide

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I seek pardon & apologize for any error.

Dr. Kiran B. Patil

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LIST OF TABLES

ABBREVIATIONS

A. H. Ni. : Ashtanga Hridaya Nidanasthana

A. H. Su. : Ashtanga Hridaya Sutrasthana

A. H. Ut. : Ashtanga Hridaya Uttarsthana

A. S. Sha. : Ashtanga Sangraha Sharirasthana

A. S. Su. : Ashtanga Sangraha Sutrasthana

A. S. Ut. : Ashtanga Sangraha Uttarsthana

B. P. Ma. : Bhavaprakasha Madhyamakhanda

B. P. Ni. : Bhavaprakasha Nighantu

Bh. Sha. : Bhela Sharirasthana

Bh. Su. : Bhela Sutrasthana

Ch. Chi. : Charaka Chikitsasthana

Ch. Ni. : Charaka Nidanasthana

Ch. Sha. : Charaka Sharirasthana

Ch. Si. : Charaka Siddhisthana

Ch. Su. : Charaka Sutrasthana

Ch. Vi. : Charaka Vimanasthana

Rig. : Rigveda

Sha. Pu. : Sharangadhara Purvakhanda

Sha. Ut. : Sharangadhara Uttarkhanda

Su. Sha. : Sushruta Sharirasthana

Su. Su. : Sushruta Sutrasthana

Su. Ut. : Sushruta Uttartantra

Y.R. : Yoga Ratnakara

S. S. : Sushruta Samhita

अ. हृ. सु.	: अष्टांग हृदय सुत्रस्थान्
अ. हृ. शा.	: अष्टांग हृदय शारिरस्थान
अ .हृ. उ.	: अष्टांग हृदय उत्तरस्थान
अ. सं. सु.	: अष्टांग संग्रह सुत्रस्थान
अ. सं. शा.	: अष्टांग संग्रह शारिरस्थान
अ. सं. उ.	: अष्टांग संग्रह उत्तरस्थान
च. सु.	: चरकसंहिता सुत्रस्थान
च. शा.	: चरकसंहिता शारिरस्थान
च. चि.	: चरकसंहिता चिकित्सास्थान
सु. सु.	: सुश्रुतसंहिता सुत्रस्थान
सु. शा.	: सुश्रुतसंहिता शारिरस्थान
सु. चि.	: सुश्रुतसंहिता चिकित्सास्थान
सु. उ.	: सुश्रुतसंहिता उत्तरस्थान
मा. नि.	: माधव निदान
भा. प्र. नि.	: भावप्रकाश निघन्टू
भा. प्र. पु. ख.	: भावप्रकाश पुर्व खण्ड
शा. उ.	: शारंग्धरसंहिता उत्तरखण्ड

INTRODUCTION

The remarkable strides achieved by man during the days of evolution and his phenomenal growth in unfolding the mysteries of nature relied greatly on his capacity to react to the environment. He succeeded in mastering entire animal world due to his fully evolved senses; among them eye shares a greater role than the rest. To see clearly is poetry, prophecy and religion all in one, says Ruskin, because seeing is believing. As eyes are the gateways of external world, visual defects are equal to the obliteration of the world.

सर्वेन्द्रियानां नयनं प्रधानम् ।।

The eyes are said to be most important than all other *Indriyas*. Eyes are considered as the reflectors of the mind. Eyes are the most precisely developed portions of the brain seen outside the skull. Eye is a unique organ in the body where the course as well as patho-physiology of disease process is visible, effect of therapeutic agents can very well be assessed and if needed documented.

Eyes are involved in 90% of our daily activities. We see, we learn, we enjoy and we proceed in life so eyes are the most important God's gift to human being.

Eye is a part and parcel of the body and it is not a separate entity, so we can call eye as a miniature body. Any derangement in the body is going to be reflected in the eye.

चक्षुरक्षायां सर्वकालं मनुष्यैर्यत्नः कर्तव्यो जीविते यावदिच्छा ।

व्यर्थोलोकेऽयं तुल्यरात्रिन्दिवानां पुंसामन्धानां विद्यमानेऽपि वित्ते ।। (शा.उ. 13/125)

The world is useless for the day is as night for persons who are blind, so every person should try to protect his eyes throughout his life, though they possess plenty of wealth. (18)

The eye is most important of all the sense organs because an eye can adorns the face, it perceives forms, it is a source of direct knowledge, and it is a guide to avoid wrong deeds.

Ayurveda is the ancient and the first Health science existing before the human creation which was memorized and composed by the originator *Brahma* and considered as the branch of *Atharvaveda* and treated as *Panchama Veda*. *Ayurveda* is the science of living healthfully. *Ayurveda* is the most scientific among the ancient systems of medicine. *Ayurveda* has immense potential to tackle almost all health problems. *Ayurveda* is a curative as well as preventive science to overcome today's most disease conditions.

The works of *Acharya Sushruta* are considered as supreme and followed practically. *Acharya Nimi* is considered as the *Acharya* of *Shalakya Tantra,* but the documentations of *Acharya Nimi* are not available. *Acharya Sushruta* himself told that he has followed the tradition of *Nimi*. Among the *Samhitas*, which are available today, *Sushruta Samhita* gives a wide description of the diseases of *Shalakya Tantra* as,

शालाक्यंनामउर्ध्वजत्रुगतानांरोगाणां श्रवणनयनवदनघ्राणादिसंश्रितानां व्याधिनामुपशमनार्थम्

शलाकायन्त्रप्रणिधानार्थं च । (सु.सु. 1/10)

Shalakya Tantra, is one of the 8 branches of *Ayurveda* that deals with the precious organs like Ear, Eyes, Nose, Mouth, Head etc. and the diseases affecting them with their management. (6)

The *Uttar Tantra* of *Sushruta Samhita* starts from eye diseases. Out of 26 chapters of *Shalakya Tantra*, 20 chapters are devoted to eye diseases. *Netravigyana* is having utmost importance because eye is the organ of sight, if vision is lost merely everything is lost. The human being, though very rich cannot enjoy this beautiful world without Eyes. (7)

The anatomy, physiology and the principles of *Ayurveda* are the same from that period to till date. These are to be reviewed in context of modern life style. We are four thousand years away from the time when *Ayurveda* was practiced uniquely. We have to prove *Ayurvedic* principles from modern point of view. Science is changing continuously as constant change is a basic principle of science. Maintenance of the health and treatment of the disease is the main objective.

The loss of vision completely disables the patient so the diseases of the eye are very important than any other physical disability. The most disastrous result of ocular disease is blindness. Of all the eye diseases, *Timir* is considered to be the important one, causing difficulty in vision. A good care is required with proper diagnosis and treatment.

According to the site of lesion, the diseases of eye are classified by *Acharya Sushruta*. '*Drishtigata Rogas'* are responsible for visual impairment, both partial and complete. *Timir* is one of them. According to *Sushruta Timir*, *Kacha* and *Linganasha* as the progressive clinical stages of the disease *Linganasha*. *Vagbhatta* enumerates six types of *Timir* as separate entities. (8)

The clinical features of *Timir* can be considered as errors of refraction. Out of the six *Netra Patala*s, described by *Sushruta*, the last four *Patalas* are related with eyeball antero-posteriorly, in which *Timir Roga* is said to be produced. According to *Vagbhata*, this occurs in the first two layers of the eyeball. (6)

A detailed conceptual and clinical study is the need of time to explore the pathophysiology and symptomatology of the disease *Timir* in *Ayurveda*, in accordance with modern parameters. The anatomical considerations of the *Patalas* and symptoms of the vitiated *Doshas* situated in these *Patalas* reveals that the word *'Timir'* which is described as an ocular pathology in *Ayurveda,* is nothing but errors of refraction.

Nature always doing better for all living being; but life of today's man is away from the nature. There has been a drastic change in his day by day activities like Life style, Food habits, Meditation, Environmental Pollution, and Occupational hazards. It has been seen that the simple or developmental myopia will occur in such population.

Human body is affected by many diseases but any disease which starts in the form of simple symptom but ends in complete loss of natural physiological phenomenon invites special consideration.

The progression of pathogenesis of *Drishtigata Rogas* is explained in terms of involvement of successive *Patalas*. Vitiated *Doshas* produces various clinical features, when they are situated in different *Patalas*. Involvement of successive *Patala* means the pathology progresses to deeper tissues and the prognosis worsens accordingly.

Timir is included under *Drishtigata Rogas* by all *Acharyas.* Clinical features of *Timir* differs according to various *patals* i.e. first to fourth *patal.*

प्रथमे पटले दोषो यस्य दृष्टौ व्यवस्थितः ।

अव्यक्तानि स रूपाणि सर्वाण्येव प्रपश्यति ।। सु.उ ७अ

सिरानुसारिणि मले प्रथमं पटल श्रिते ।

अव्यक्तमीक्षते रूपं व्यक्तमप्यनिमित्ततः।। (अ.हृ.उ.१२/)

Clinical features related to visual disturbances are seen only in *Drishtigata rogas*. So all types of visual disturbances can be considered under the broad heading of *Timir – Kacha - Linganasha* complex. The part of

clinical feature of *Timir* (First & Second *Patala*) can be correlated with most important refractive error i.e. Myopia. [9,12]

When the vitiated *Doshas* invade first *Patala*, the patient complains of difficulty in seeing objects distinctly. This is the common complaint of myopia, hypermetropia, astigmatism. So the *Timir* of first *Patala* can be correlated to refractive errors viz myopia easily.

Myopia (shortsightedness) is the most common disease in the world with substantial social, educational, and economical impact.

Myopia and uncorrected refractive error are the leading causes of blindness & vision impairment in the world. Myopia can be classified in two groups, those with low to moderate myopia ("simple"or"school"myopia, 0 to -6D) & those with high or pathological myopia (greater than -6 D).

Simple Myopia can be corrected with spectacles or contact lenses, whereas High or Pathological myopia is often associated with potentially blinding conditions such as retinal detachment, macular degeneration. [31]

The incidence of myopia varies with age and other factors. When examined without the aid of cycloplegic agents, a significant number of infants are found to have some degree of myopia. The prevalence rate of Myopia in general population has been reported to be only 6.9%. It increases in school age and young adult cohorts, reaching 20-25 % in mid to late teenage population and 25-35% in young adults in India.

In aqueous humour the protein composition was significantly different between myopic and non-myopic persons. The proteins in myopic patients could be a potential biomarker for high myopia development. It may play a role in the mechanisms of ocular axial elongation.

A weak or degraded connective tissue is a very essential factor in causing myopia. Genetic inheritance of myopia does not mean that environmental factors and lifestyle have no effect on the development of myopia.

The children's exposed to extensive "near work" may be at a higher risk of developing myopia. Stress has been considered as a factor in the development of myopia.

For Refractive Errors, Refractive surgery is the last treatment alternative. These are Radial Keratotomy (RK), Photo Refractive Keratectomy (PRK) and Laser in situ Keratomileusis (LASIK), but all of these surgical procedures carry risks. Too much money is spent to get surgical relief from this condition. Eyeglass and Contact lens also has too much expenditure. Myopia can rarely causes blindness through retinal tears and detachments. Surgical intervention, though popular, is not a success for everyone, and complications such as dry eyes and night glare can be very annoying.

In ophthalmology, there are many ocular problems where modern techniques and drugs do not prove much effective. Refractive errors, errors of accommodation , progressive cataracts, degenerative changes of vitreous, iritis, cyclitis, different conditions of Retinopathy and several allergic problems of the eye are some diseases where modern ophthalmology has very limited role. *Ayurveda* speaks much about them but it needs some authentic and planned study.

Each person is not able to follow the proper *Dincharya*, *Ritucharya*, Dietetic rules and regulations. It may responsible to the aetiopathogenesis of visual disorders.

Sushruta, has recommended '*Kriyakalpa*' for the management of *Timir*, along with other forms of treatment. The term *Kriyakalpa* refers to the treatment, which can be applied for almost all types of eye diseases; and it comprises of *Tarpana*, *Putapaka*, *Anjana*, *Ashchyotana* and *Seka*. The drugs having *Chakshushya* properties may be helpful for treating the anomalies like refractive errors. By keeping this point in mind the present study is

taken to know the efficacy of *Shatawari Ghrita* (*Tarpana* and orally) on *Timir* w.s.r.to simple or developmental myopia. [10]

Sushruta and *Vagbhatta* have recommended the use of *Nasya*, *Ghritapana*, *Virechana*, *Anjana* etc. in the management of *Timir*. *Vagbhatta* has mentioned in *Ashtanga Sangraha* about the use of glasses to improve vision [*Kacho Dristikrita*]. A number of herbal and animal drugs are mentioned as *Chakshushya* in the *Samhitas* and *Nighantus* whereas mineral drugs are described in the texts of *Rasashastra*. [9,13]

In *Ayurveda* treatment of *Timir* is,

शतावरीपायस एव केवलस्तथा कृतोवा ऽऽ मलकेषु पायसः ।

प्रभूत सर्पिस्त्रिफलोदकोत्तरो यवौदनो वा तिमिरं व्यपोहति ।।

सु.उ १७

त्रिफला घृतं मधु यवाः पादाभ्यगं शतावरी मुद्गाः।

चक्षुष्यः संक्षेपाद् वर्गः कथितो भिषग्भिरयम्।।

(चक्रदत्त–नेत्र)

घृतं पुराणं त्रिफलां शतावरी पटोलमुद्गामलकं यवानपि।

निषेवमाणस्य नरस्य यत्नतो भयं सुघोरात्तिमिरान्नविद्यते।।

(सु.उ.१७/४८)

Shatawari and Ghrita these are easily available, cost effective and considered as *Chakshushya dravyas*.

It has been planned to do scientific work on *Tarpana Karma* and *Ghritapana* to know the efficacy on Simple myopia. The word "*Tarpana*" is derived from root '*Trup'* that means to become satisfied. Thus the word *Tarpana* means anything which satisfies or regenerates and rejuvenates. Hear mainly concerned with the eye, *Tarpana* by means of which the eye shed their weakness and attain better eye sight. [1,6]

From the different *Yogas* prescribed for treatment of *Timir*, for *Tarpana* & Orally *Shatawari Ghrita* has been selected for the present study. According to *Charaka (Ch. Su. 13/14) Ghrita* is effective in subsiding *Pittaja* and *Vataja* disorders; it improves *dhatus* and is overall boosters for improving *Ojas*. According to *Sushruta (Su. Su. 45/96-97)* along with above said properties it provides strength to eye sight.

Bhavaprakasha has also described *Ghrita* as *Rasayana*, good for the eyes and protects body from various diseases. The *Ghrita* has the quality of trespassing into minutes channels of the body. When applied in the eyes locally it gets absorbed through conjunctiva and corneal layer of the eye and probably provides nourishment to the eye and improves visual acuity. [20]

Nutritive factors also have a vital role in the management of *Timir*. As far as modern medical science is concerned, no medical treatment is available till date, for Simple myopia. In *Ayurveda*, the *Chakshushya* properties of certain drugs are proven like *Triphala*, *Shatawari* etc. So a combination of the *Chakshushya* drugs, in the form of *Ghrita* as *Tarpana* and oral supplement, might play a definite role in the management of *Timir.*

Sufficient works have already been carried out on *Timir* and its management with *Kriyakalpa* in this regard. But very little work has been done regarding the systemic treatment in *Timir* along with *Tarpan*. So the disease *Timir* and its management with systemic use of *Shatawari Ghrita* and *Shatawari Ghrita Tarpan* have been selected for the present study.

Previously various *Ghritas* were used for *Tarpana Karma* in *Timir* which were combinations of many *Dravyas* e. g. *Triphaladi Ghrita*, *Jeevantyadi Ghrita*, *Mahatriphala Ghrita*, *Sahadevi Ghrita*, *Triphala Ghrita*, *Patoladi Ghrita* etc.

Due to combinations of many *dravyas* it is difficult to assess the effect of specific *dravya* so in the present study only single *dravya* i. e. *Shatawari Ghrita* was used.

Previously various indigenous *dravyas* were also used for *Timir* e. g. *Saptamrita Lauha*, *Triphala* etc. Different *dravyas* and different procedures were used in same disease. It is difficult to understand which *dravya* and which procedure gives the results.

If single *dravya* is used in different manner i. e. orally and locally it might gives wonderful results and it is easy to assess the results.

In modern Ophthalmology Optical correction with concave lenses is the only treatment for Myopia

Availability, cost effectiveness, variety of options of medicines is the need of science.

No single study was carried out regarding the use of *Shatawari Ghrita* in *Timir* w.s.r. to simple myopia.

Taking all these points into consideration the present study was desined to assess the role of *Shatawari Ghrita* in *Pratham Patalagata Timir* w.s.r. to Simple Myopia.

Aim and Objectives

Aim:

To evaluate the role of systemic use of *Shatawari Ghrita* and *Shatawari Ghrita Akshi Tarpan* in *Pratham Patalgata Timir* w.s.r.to Simple Myopia.

LITERARY STUDY

Review of previous work done

Jamnager University:

1) Manesh Kumar E: A comparative study of efficacy of Tarpana and Triphaladi drug compound in the management of Timira w.s.r. to Myopia – 2003.
2) Vinayak Ashu – A clinical study on the efficacy of Tarpana and Shatavaryaadi Choorna in the management of Timir w.s.r. to Myopia- 2004.
3) Gupta Durgesh P – A clinical study on Akshi Tarpan with or without Nasya on Timir w.s.r. to Myopia. 2009.

In above mentioned topics no specific drug for *Tarpana* and *Ghratapana* for systemic use was taken.

Kerala University: Thiruvananthapuram:

1) Mohanan P.M. – Clinical evaluation of the effect of Tarpana in the management of Simple Myopia w.s.r. to Sahadevi Ghrita. 1991.

Here effect of *Tarpana* was seen in Simple Myopia but not in *Timir*

Andhrapradesh University – Vijaywada – Hyderabad:

1) Lakshamanacharya D. – A study on the effect of Triphala Ghrita Akshi Tarpana in Timir roga. 1989.

Here *patalagata* involvement of *Timir* was not taken for the study.

Rajiv Gandhi University of Health Sciences. Bangalore:

1) Ravi H.K. – A clinical study and management of Timir w.s.r. to Myopia. 1999.

2) Rajendra Y.Marakumbi –Management of Timir W.S.R. to Simple Myopia. 2001.

In above topics no specific drug was mentioned for the study.

Himachal Pradesh University, Shimala:

1) Singh Hardev – A clinical study on the effect of Chakshushya compound and Tarpana kriya kalp in Timir w.s.r. to Myopia. 2004.

Here also no specific drug was taken for the study.

Pune University:

1) Sathye S.M. – Ayurvedic treatment of Myopia. 1984.
2) Bharambe H. B. - The effect of *Akshi Tarpana (Netra Vasti)* in eye diseases- 1985.

No specipic treatment or disease was taken in these topics.

Banarus Hindu University – Varanasi:

1) Maurya S. C. - Role of Kriyakalpa in ocular disorders-1969.

2) Verma Anilkumar- Effect of Triphala Ghrita in cases of errors of refraction

Here also no specipic procedure or disease was taken for the study.

Thus after reviwing all the previous work done, it was clear that no single study was carried out regarding the systemic use of *Shatawari Ghrita* and *Shatawari Ghrita Akshitarpana* in *Pratham Patalagata Timir* w.s.r. to Simple Myopia.

AYURVEDIC REVIEW:

History is a root of knowledge in any scientific research. The development of knowledge is known only when one has the comparative knowledge of the past and the present in a particular subject. In the initial stage of planning in any scientific work, it is very important to know the evolution of the present knowledge, origin of the present knowledge and the basic idea given by ancient scientists. Our ancestors had a crystal clear view of health and disease of the body; this is applicable to the organ Eye as well. Hence, at the outset an attempt is made to throw light over the history of the eye disease, *Timir.*

It is necessary here to discuss the concepts on "*Drishtigata Roga*" made by the Indian scholars of ancient time. They have developed very interesting theories on "*Drishti*" and its diseases.

The concept of *Drishti* and its mechanism in maintaining the vision had been recognized since time immorial. The ancient Indian *Maharshis* were well versed with *Drishtigata Rogas* and their origin.

The History of primitive medicine began not less than five thousand to six thousand years ago. History of the *Shalakya Tantra* dates back to Vedic era. In Vedic periods we find in the '*Rigveda'*, many references of curing the disease by medicine as well as surgery by two *Ashwini kumaras*. The word *Timir* is not of Vedic origin, whereas if its meaning i.e. *Andhakara* or sequel of it i.e. diminution of vision is taken into consideration then one can get many references in the Vedic literature also. Here are few examples found in these literatures which are related to *Shalakya Tantra*, probably is the first evidence of flourished medical knowledge and the treatment of eye diseases have been recorded in the history.

- *Kanva* regained his eyesight after getting treatment from *Ashwini Kumaras (Rig. 1-116-12).*
- *Ashwini Kumaras* also treated the eyes of Puru and Rijashva *(Rig. 11187).*

• Blindness of *Paravriga* and deafness of *Shrona* was treated by *Indra (Rig.1-112-8).*

• *Upamanyu* a disciple of an *ashram* had lost his eyesight by taking some toxic plant leaves and regained his eyesight after treatment from *Ashwini Kumaras*.

'*Atharva Veda'* is a vital source of origin of *Ayurveda*. In the tenth kanda of *Kenasutra* in *Atharva Veda* there is a description of human anatomy and physiology. The origin and proper description of five sense organs and seven orifices in the head has also given in *Kenasutra*. (38)

Anjanas are applied in the eye diseases for the improvement of vision. Two main types of *Anjanas* have been described in *Atharva Veda* i.e. *Yamueyan* and *Sauveeranjanam*. Other uses of drugs like antipyretics, antianaemic and antivenum etc. have also been used. (38)

During *Upanishada* period, various authors as mentioned below wrote several books on the subject of *Shalakya*.

1. *Nimi – Tantra*
2. *Videha – Tantra*
3. *Karala – Tantra*
4. *Gargya – Tantra*
5. *Kankayana – Tantra*
6. *Galava – Tantra*
7. *Krishnatreya – Tantra*
8. *Satyaki – Tantra*
9. *Chakshushya – Tantra*
10. *Shaunaka – Tantra*

Unfortunately none of those books available today; but commentators of various *Samhitas* and other books quote names of these books and some *shlokas*.

'*Netropanishada'* is available today and it contains about 40-50 hymns for the improvement of vision power. Especially "*Brihat Aranyakopanishada*" gives us much information about anatomy and physiology of the eye, i.e. blood vessels, the iris, the pupil, lacrimation, lids of the eyes and the elements taking part in their formation.

The king of *Videha*, '*Nimi'* was the original expounder of the *Shalakya Tantra*; hence it is also called as '*Nimi Tantra'*. Today *Sushruta Samhita* is the main source of *Shalakya-Tantra*. In his *Samhita Maharshi Sushruta*

has accepted that the description regarding *Shalakya* given in *Uttartantra* has been taken from *Videha-Tantra*.

Timir is not described in any of the *Upanishadas*. The worshipping of God Sun vividly advocated for the renaissance of eyesight is explained in *Netropanishada*.

In *Samhita* period "*Netra Rogas*" have been elaborately illustrated by all the authors of the *Ayurvedic* literatures.

'*Charaka Samhita'* is the oldest available treatise of *Ayurveda*. It is regarded as the textbook of *Kaya Chikitsa*. *Charaka* did not try to go deep into the knowledge of *Shalakya*. He counted the eye diseases as four in *Sutrasthana* and ninety-six in *Chikitsasthana (Ch. Su. 19/5)*. He also gave names of eye diseases wherever reference came *(Ch. Chi. 26/130)* i.e. *Vartmastambha*; *Vartamasankocha*, *Timir*, *Pilla Roga* etc. *Charaka* did not elucidate the subject of *Shalakya* in detail *(Ch. Chi. 26/131).* Statement of *Charaka* indicates that *Shalakya* was well established in that period. In the same period *Karal*, *Videha*, *Satyaki*, *Shaunaka* and *Krishnatreya* wrote many treatises of *Shalakya*. They became very popular but unfortunately today only references of this treatise are found in various commentaries.
Acharya Charaka has included *Timir* under the *Vata Nanatmaja Vyadhi (Ch.Su. 20/11)* and commenting on this *Chakrapani* says that other doshas are present only in lesser proportion with *Vata* being predominant. *Gangadhara* calls it a special *Netra roga* when it is explained as a '*Rupa* of *Vataja Arsha'* and as Alpa *Drishti* while '*Rupa* of *Vataja Grahani'* is described. [4,5]

'*Pujyapada Muni'* in his book the "*Netra Prakashika*" explains *Timir* as the '*Upadrava* of *Meha Roga'*.

'*Acharya Vagbhatta*' (200-400 A.D.) the most dynamic physician of *Buddhist* era in his texts *Ashtanga Sangraha (A. S. Ut. 15-17)* and *Ashtanga Hridaya (A. H. Ut. 12-14)* described this disease in detail. *Vagabhatta* described ninety-four eye diseases. [12,13]

Various surgical procedures are also described in it. He has described *Timir* under 27 types of *Drishtigata rogas*. *Vagbhatta* considers *Timir*,

Kacha and *Linganasha* as separate clinical entities and each of them are of six types according to *Vagbhatta*. (11)

Madhava Nidana (*Uttarardha* Chapter 59), *Chakradatta* (Chapter 59), *Sodhala* (*Gadanigraha – Tritiyakhanda – Netrarogadhikara*), *Sharangadhara Samhita* (*Purva Khanda*, Chapter 7 and *Uttarkhanda* Chapter 13), *Bhavaprakasha* (*Madhyama Khanda* Chapter 63), *Yogaratnakara* (Netrarogadhikara) etc. have dealt the subject in detail along with its management aspects. But regarding disease aspect most of them have followed *Sushruta's* opinion only. Many *Rasa Shastra* texts like *Rasaraja Mahodadhi*, *Rasa Ratnakara*, *Rasa Kamdhenu* , *Rasa Ratna Samucchaya* etc. have advised a number of compound preparations for disease *Timir*, *Kacha* and *Linganasha* for both external and internal routes. *Timir* is said to be *Sadhya* when *Doshas* are limited to 1st and 2nd *Patala*, becomes *Yapya* when *Doshas* reach to 3rd *Patala* and come to *Asadhya Avastha* when *Doshas* reaches to 4th *Patala*. Various oral medications as well as local measures are advocated for management of *Timir*. (38)

OPHTHALMOLOGY ACCORDING TO *SUSHRUTA*

'*Dhanvantari Divodas'*, the king of *Kashi* taught the subject of *Shalya-Shalakya* to 12 desciples; amongs the seven *Sushruta* taught *Shalya Tantra* and *Shalakya Tantra* in eloberate and systematic way. *Shalakya Tantra* was tought by him to other five, they were *Bhoja*, *Nimi*, *Kankayana*, *Gargya* and *Galava (Su. Su. 1/2).* (7)

'*Maharshi Sushruta'* (2500 B.C.), the first and the foremost scientist of the *Dhanvantarian* School, has given vivid description of *Urdhvajatrugata Rogas* in *Uttartantra* where he described ailments of eyes, ears, nose and shiro-rogas. *Sushruta* was a pioneer of the Indian Surgery, and hardly left any specialized branch. We can find in his treatise from anatomical considerations to major delicate surgery. All detailed description of organs, instruments and various medicinal and surgical treatments have been incorporated in his book precisely with elaborated meanings.

His contribution to the surgical field is a most valuable and priceless gift. *Sushruta* in his treatise dealt with surgery mainly alongwith ophthalmology and otorhinolaryngology, giving the aetiology, pathogenesis, complications, medical and surgical treatment of the eye, ear, nose, and throat in the *Shalakya Tantra* in *Uttartantra* and also in *Nidana* and *Chikitsasthana*. In whole of *Sushruta Samhita*, this section is arranged in the most scientific way with classification of the diseases in sequential pattern on the basis of the anatomical components. This itself is one of the major breaks through which has been adopted by all modern authors later.

Present knowledge of *Shalakya* is totally derived from *Sushruta Samhita*. He had described ophthalmology in a systematic way. Various patterns of classification of eye diseases; surgical procedures adopted to treat them are so nicely given, that one can think, it was his favourite subject about surgery.

The aetiology of eye diseases is given in detail *(Su. Ut. 1/26-27).* Total numbers of eye diseases are counted as seventy-six *(Su. Ut. 1/28).* These seventy-six diseases were classified on various parameters. [6]

a) According to *Doshas* **:** *Vataja*, *Pittaja*, *Kaphaja*, *Raktaja*, and *Sannipataja*.

b) According to Prognosis **:** *Sadhya*, *Yapya*, and *Asadhya*.

c) According to Site **:** *Sandhigata*, *Vartmagata*, *Shuklagata*, *Krishnagata*, *Drishtigata* and *Sarvagata*.

d) According to Surgical Procedure **:** *Chhedya*, *Lekhya*, *Bhedya*, *Vedhya*, and *Ashastrakrita*.

Acharya Sushruta has considered *Timir* under 12 types of *Drishtigata Rogas*. According to *Sushruta*, *Timir*, *Kacha* and *Linganasha* are the progressive stages of the same disease. *Timir* stage of the disease is produced when the vitiated *Doshas* are situated in the 1st and 2nd *patala*. He has dedicated two Chapters of *Uttartantra* i.e. Chapter 7-*Drishtigata Roga Vigyaniya Adhyaya* and Chapter 17-*Drishtigata Roga Pratishedha Adhyaya* for the *Drishtigata Rogas*. [8]

These classifications reflect not only the status of knowledge about the subject but provides a systemic management with the right approach for surgery. The greatest contribution of *Sushruta* was method of cataract extraction and it is a mile stone in cataract surgery.

PHILOSOPHICAL CONCEPT OF EYE

In previous days or even now, *Ayurveda* is not only medicine rather it is philosophy of life. It had been told that body is made up of five '*Mahabhootas* and *Atma'*. These are called as six elements of '*Purusha' (Ch. Sha. 1/16).* All the *indriyas* are derived from *Mahabhootas*. So every part of the body has the properties of *Mahabhootas*. The same thing is true for eye also. Eye is originated from five elements with their attributes. Its muscular portion is contributed by the *Prithvi* component, blood by the *Agni* component, black portion by the Vayu, white portion by water and tear channels by the *Akasha (Su. Ut. 1/11). Upanishada* and *Aranyaka* literatures are more religious and it had been tried to emphasis that every part of eye has its own God. [2,6]

Eye is an important sense organ it has been enjoining privilege as the main sense organ because its loss of function leads to serious disability of man by keeping him in the darkness life without eyesight is miserable and valueless. Hence it is very important to protect vision from serious diseases.

A separate branch namely *Shalakya Tantra* has been dedicated in *Ayurveda* to care the precious parts above the clavicles and eye is one of them. The history of *Ayurveda* reveals that this branch has witnessed phenomenal growth in the ancient era since *Vedic* period to *Samhita* period. *Shalakya Tantra* being a surgical discipline has been taken up by *Sushruta Samhita* and is mentioned in *Uttaratantra* part of the text.

The beginning of the *Uttaratantra* with vivid description of eye, its anatomy, classification of its diseases and their management shows the importance of this organ of sight.

NETRA SHARIR-

1. Nirukti:

तत्र चक्षु श्रोत्रम् घ्राणम् रसनम् स्पर्शनमिति पन्चेन्द्रियानि । (च.सु ८/८)

तद्यथा श्रोत्रत्वकक्षीजिव्हा घ्राणवाग्घस्तोपस्थपायुपादमनांसीति ।

तत्र पुर्वाणि पञ्च बुद्धिइन्द्रियाणि इतराणि पञ्च कर्मेन्द्रियणि उभयात्मकम् मनः ।।

(सु. शा १/६)

त्तैजसास्तु रूपं रूपेन्द्रियम् । (सु. शा ३/३३)

Chakshu is one of the *panchendriyas*, which is responsible for *roopagrahana* where as a *buddhi indriya* originated from *'Roopatanmatra'* performing visual perception with the dominance of *'Tejomahabhoota'*.

2. Synonyms- *Netra, Nayana, Chakshu, Akshi, Drishti, Netragolaka, Nayanbudbuda, Akshigolak, Linga, Drik* etc.

Etymological derivations:

The scientific meanings of each of the synonyms as per *Ayurvedic* classics with their etymological derivations are as follows :

***Akshi*:**

A. $\sqrt{Ashu}$ – to reach + "*Ktin Karane*" *pratyaya* (*Shabdakalpadrum*)

This means source of reaching or seeing.

B. $\sqrt{Aks}$ + "in" *pratyaya* (*Panini* 4/118).

This means eye is more luminous part than the other parts of the body.

C. $\sqrt{As+Kshi}$ `– means, which grasps objects (*Unadi Sutra* 3/155/6).

D. According to V. S. Apte, *Akshi* means eye.

***Chakshu*:**

A. $\sqrt{Chaksh}$ – *Darshane* + "*Sinch Karane*" *pratyaya* (*Vachaspatyam*).

Which is responsible for sight.

B. $\sqrt{Chaksh}$ + "*us*" *pratyaya* (*Shabdakalpadrum*) Which means *Darshanendriya*.

C. According to Sir M.M. William (page 382) - It means eye, vision, faculty to see, Lord *Shiva*, name of *Maruta*, Sage, Sun etc.

D. According to V. S. Apte, *Chakshu* means the faculty of sight.

E. *Chakshin* – '*Chakshate yena Chakshu*' (*Panini* in *Unadi* 4/118).

***Drishti*:**

A. $\sqrt{Drish}$ – to see + "*Ktin Karane*" *pratyaya* (*Shabdakalpadrum*)

Means source or tool with which one sees. The word '*Drishti*' has different meanings in *Ayurvedic* texts including *Netra*, *Drishti Mandala*, *Netrakriya* (vision), *Darshana* etc. (38)

***Netra*:**

A. $\sqrt{Ni}$ – to drive + "*Ktin Karane*" *pratyaya* (*Shabdakalpadrum*): Means which takes or drives one towards knowledge.

B. According to V.S. Apte, *Netra* means conducting.

***Nayana*:**

A. $\sqrt{Ni}$ – to drive, to lead + "*Karane lyut*" *pratyaya* (*Shabdakalpadrum*).

Means the source, which drives towards the subject.

B. According to V. S. Apte, *Nayana* means ruling, governing or obtaining.

***Lochana*:**

A. $\sqrt{Loch}$ – to see + "*Karane lyut*" *pratyaya* (*Shabdakalpadrum*)

Means the tool with which one sees.

B. *Lochyate Anena Iti* (*Amarkosha*). This has the capacity to see.

C. According to V. S. Apte, *Lochana* means illuminating brightening, visible or sight.

Thus it is clear from the above discussion of the synonyms related to the organ of sight that A*kshi*, *Netra*, *Nayana*, and *Lochana* are the words used in anatomical sense and *Chakshu* in functional sense; whereas *drishti* is having amphisitomous meaning. *Netra* is the widely used word for the organ of sight. (38)

3. *Utpatti* (origin)-

तत्र वैकारिकादहङ्कारात्तैजससहायात्तल्लक्षणान्येवैकादशेन्द्रियाण्युत्पद्यन्ते।।(सु.शा. 1/5)

तृतीये मासि सर्वेन्द्रियाणि सर्वाङ्गवयवाश्च यौगपधेनाभिर्निर्वतन्ते ।। (च.सु.4/11)

सर्वैः सर्वाङगसम्पूर्णो भावैःपुण्याति सप्तमे ।। (अ.सं.शा. 2/13)

The subtle form all the *indriyas* are present during the formation of *garbha*. Where in *ekadasha indriyas* including *chakshurendriya* are derived from the combination of *vaikarika ahankara* with the *sattwika ahankara* but the *angapratyanga* and *indriya pravibhaga* takes place simultaneously in the 3rd month of *garbhavakranti* and completes at about 7th months. (1,8,13)

4. *Panchbhoutikatva-*

पलं भुवोऽग्नितो रक्तं वातात कृष्णं सितं जलात् ।

आकाशादश्रुमार्गाश्च जायन्ते नेत्रबुदबुदे ।। (सु.उ.1/11)

Mamsal or Solid part of *netra* is made up of *Prithvi mahabhuta*, *Raktavarna* part is made up of *Agni mahabhuta, Shuklabhag* is made up of *Jala mahabhuta*. *Krishnabhag* is made up of *Vayu mahabhuta* and *Aashru marga* (lacrimal ducts) is made up of *Akash mahabhuta*. (10)

Name of God

Parts formed with their probable synonyms (modern correlates)

Rudra - Reddish part of eye ball (Blood vessels)

Parajanya - Liquid portion (Aqueous & Vitreous humour)

Aditya - Kaninika, Ashrumarga (Lacrimal apparatus)

Agni - Blackish portion (Cornea, iris)

Indra - Whitish part (Conjunctiva, sclera)

Prithvi - Adho Vartma (Lower eyelid)

Akasha - Urdhva Vartma (Upper eyelid)

Vagbhatta described that developmental origin of different structures is attributed to various *Bhavas*. The development of senses according to *Vagbhatta* is attributed to *Kapha* and *Raktavaha srotas*. (A.S.Su. 5/29).

5. *Akshikuta-*

द्वे अक्षिकुटे। (च.शा. 7/11)

भ्रुवो अक्षिकुटोपरि रोमराजी । (डल्हण सु.सु ३५/१२)

Akshikuta (orbits) are two in number. *Akshikuta* are placed just below the *Bhru* (eye brows) which are shelters of two *netras* (eyes). [8]

6. *Akruti-*

सुवृत्तं गोस्तनाकारं सर्वभुतगुणोद्भवम् । (सु.उ.1/10)

The shape of eye is spherical from all sides like breast of cow and comprising of all the *mahabhutas*. [7]

a) *Suvrittam* : By the word *Suvrittam* means, that eye is spherical from all sides.

b) *Gostanakaram*: By the word we mean, that eye is shaped like the teat of cow i.e. oblong shaped or oval shaped. Eyeball seen along with extra-ocular muscles and optic nerve is very much similar to Cows teat.

c) *Nayana Budbudam*: It means like a bubble floating on the water i.e. round in shape and soft in consistency and glossy/glistening in character, this term suggestive of external appearance of the eye in the eye orbit.

7. *Pramana:*

विद्याद्वयङ्गुलबाहुल्यं स्वाङ्गुष्ठोदरसम्मितम् ।

द्वयङ्गुलं सर्वतः सार्ध्दं भिषङ्नयनबुदबुदम् ।। (सु.उ.1/10)

The measurements of the eyeball were described by *Sushruta* in terms of *Anguli* like any other organ but, *Anguli* in context to measurement of *Netra* is equal to *Swangushtodara. Sushruta* has mentioned measurement and dimensions of the eye as *antapravesh* - 2 *angula*, *Ayam* - 2.5 *angula*, *Vistar* - 2.5 *angula*. [10]

Krishnamandala is $1/3^{rd}$ of the length of eyeball and *Drishtimandala* is $1/7^{th}$ of *Krishnamandala. Patalas* are $1/5^{th}$ of *Drishtimandala.*

8. *Prakrut Netra:*

समे समाहितदर्शने व्यक्तभागविभागे बलवती तेजसोपत्रे स्वङ्गापाङ्गे चक्षुषी।। (च.शा.8/51).

Both eyes should be of same size and appearance; their parts should be separated well, eyes should have good visual strength and the eyes should be *tejasvi.* [1]

9. *Akshibandhana:*

सिराणां कण्डराणाञ्च मेदसः कालकस्य च ।

गुणाः कालात्परः श्लेष्मा बन्धनेऽक्ष्णोः सिरायुतः ।। (सु.उ. 1/19)

Proper alignment of the parts of eye depends upon *sira, kandara, meda, kalaka, shleshma* etc. [9]

10. *Marma:*

नेत्रयोर्बाह्यतोऽपाङ्गे भ्रुवोः पुच्छन्तयोरधः ।

यथोपरि ध्रुवोर्निम्नावावर्तान्वान्ध्यमेषु तु ।। (अ.हृ.शा. 4/31)

घ्राण श्रोताक्षिाजिव्हासन्तर्पणिनां सिराणां मध्ये सिरासन्निपातः ।

श्रुङ्गाटकानि, तानि चत्वारि मर्माणि, नेत्रापि सद्यो मरणम् । (सु.शा. 6/28)

Apanga and *Avarta* are the two *Marmas* related with the eyes. *Apanga* is situated in the lateral end of the eyes, which is a *Sira Marma* of the size of half *Anguli*. *Avarta* is a *Sandhi Marma* which lies above the eyebrows; it is also of the size of half *Anguli*. The damage to these may result in loss of sight or impairment of vision. [13]

The place, where *dhamani* nourishing tongue, ear, nose and eye unites called *Shrungatak marma* these are 4 in number and causes sudden death. [8]

11. *Sira* and *Dhamani:*

There are 38 *Siras*, which transport *Vata* (8 in number), *Pitta* (10), *Kapha* (10) and *Rakta* (10) to the eyes. *Siras* are said to be useful in palpebral movements. There are two *Dhamanis*, one in each eye for transmission of *Rupa* (visual impulse) to mind. Two other *Dhamanis* are there to drain tears. [6]

12. *Peshi* and *Snayu:*

There are 2 *peshies* and 30 *Snayues* in both the eyes. According to *Arundatta*, *Mandala* variety of *Peshi* and *Prithu* variety of *Snayus* are found in the eye. (8)

13. *Rachana:*

मण्डलानि च सन्धिश्च पटलानि च लोचने ।।

यथाक्रमं विजानीयात् पञ्च षट् च षडवे च ।।

पक्ष्मवर्त्मश्वेतकृष्णंदृष्टिनां मण्डलानि तु ।

अनुपूर्वन्तु ते मध्याश्चत्वारोऽन्त्या यथोत्तरम् ।।

द्वे वर्त्मपटले विद्याच्चत्वार्य्यन्यानि चाक्षिणि।

जायन्ते तिमिरं येषु व्याधि: परमदारुण: ।।

तेजोजलाश्रितं बाह्यं तेष्वन्यत पिशिताश्रितम् ।

मेदस्तृतीयं पटलमाश्रितन्त्वस्थि चापरम् ।

पञ्चमांशसमं दृष्टोस्तेषां बाहुल्यमिष्यते ।। (सु. उ. १/१४–१९)

Sushruta described the *Netra-sharira* according to *Nidan* and *Chikitsa* into three distinct parts called *Mandala, Patala & Sandhi. Mandalas* are 5 in number and *Patalas & Sandhis* are 6 in number. (7)

The same division was adopted by *Vagbhatta, Madhavakara and Bhavamishra* also.

A) Mandala:

These are 5 in number from outer most to inner most layers and are as follows:

1) *Pakshma mandala* 2) *Vartma mandala* 3) *Shweta mandala*

4) *Krushna mandala* 5) *Drushti mandala*

1) *Pakshma Mandala*:

This is the first and outermost *Mandala* of the eye formed by the *Pakshma* or the eyelashes. This *Mandala* not appears as a circle when the eye is closed and it is apparently elliptical in shape when the eye is open.

***2) Vartma Mandala*:**

Upper and Lower eyelids jointly form a circle in front of the eyeball, which is termed as *Vartma Mandala*. There are two *Nimeshani Siras* in the *Vartmas* which performs the functions of *Nimesha and Unmeshana* i.e. blinking. *Pakshmashaya* is also situated in this *Mandala. Vartma Mandala* is the seat of 21 diseases according to *Sushruta* and 24 diseases according to *Vagbhatta*. Upper and lower lids jointly form the two *Vartma Patalas* along with the orbital margins in front of the eyeball.

3) Shukla Mandala:

Shukla Mandala is the *Mandala*, which is present just inside the *Vartma Mandala* and beyond the black circle. This portion appears as whitish and therefore known as *Shukla Mandala. Sushruta* has described 11 clinical entities in *Shukla Mandala*, while according to *Vagbhatta* it is 13 in number. The *Shukla Mandala* can be correlated to the scleral part of the outer fibrous coat of the eyeball covered with conjunctiva. [7]

4) *Krishna Mandala*:

The black portion of the eyeball is called as *Krishna Mandala*. The size of this *Mandala* is 1/3rd of the whole *Netra*. This *Mandala* can be compared with the cornea; and appears as blackish because of the iris below, even though it is transparent in nature. This *Mandala* encloses *Drishti Mandala* in it and is the seat of four diseases according to *Sushruta* and five diseases according to *Vagbhatta*. Also in *Sushruta Samhita Sutrasthana* chapter 35/12, *Sushruta* has used the word *'Taaraka'* for one

structure of *Netra,* which is also 1/3rd of the total *Netra*. According to *Dalhana*, it is the black part of the eye. (7)

5) *Drishti Mandala*:

Last and innermost circular structure of the *Netra* is *Drishti Mandala* as it completes the function of *Drishti* (vision). Diameter of this *Mandala* is 1/7th of the *Krishna Mandala* in the opinion of *Videha* and *Dalhana*. *Sushruta* also expresses same thoughts. Again it is said to be equal to 1/9th part of the *"Taaraka".* The size of the Drishti *Mandala* is equal to the cotyledon of *Masura* and is a hollow structure. Such structure which has its position inner to *Krishna Mandala* seems to be pupillary area which is circular in shape. (7)

The pathologies either of cornea, or of iris are shared by both of them. Thus cornea and iris are considered as a unit for *Krishna Mandala*. Only then the meaning of this *Mandala* is justified.

C) Sandhi: These are 6 in numbers, and named as -

1) *Pakshmavartmagat* 2) *Vartmashuklagat*

3) *Shuklakrishnagat* 4) *Krishnadrishtigat*

5) *Kaninika* 6) *Apang*

1) Pakshma – Vartmagata Sandhi:

The union line of *Pakshma Mandala* and *Vartma Mandala* is called as the *Pakshma Vartmagata Sandhi* and it is considered as the lid margin. *Krimigranthi* is a disease that occurs at this particular *Sandhi*. (7)

1) Vartma – Shuklagata Sandhi:

The union line *of Vartma* and *Shukla Mandala* is called as *Vartma Shuklagata Sandhi*. The disease *Parvani* occurs at this

Sandhi. Fornix of the eyeball where the palpebral conjunctiva is reflected on to the bulbar conjunctiva seems to be *Vartma Shuklagata Sandhi*. (7)

2) *Shukla – Krishnagata Sandhi:*

The circular line joining between *Shukla Mandala* and *Krishna Mandala* is called as *Shukla Krishnagata Sandhi.* The disease *Alaji* is the one clinical problem among 9 diseases that occurs at *Shukla-Krishnagata Sandhi* and this junctional area can be considered as the sclero-corneal junction. (7)

3) *Krishna - Drishtigata Sandhi*:

The union line of *Krishna* and *Drishti Mandala* is called as *Krishna – Drishtigata Sandhi*. By considering iris part in *Krishna Mandala*, this *Sandhi* can be explained and the central free margin of the iris, which rests on the anterior capsule of the lens, can be considered as the *Krishna Drishtigata Sandhi.* Otherwise there is no apparent union line between the cornea and pupil. (7)

4) *Kaneenika Sandhi:*

Sushruta has not given any explanation regarding the anatomical position of this *Sandhi*, but *Dalhana* describes this *Sandhi as 'Nasasameepasthita Sandhi'*. So it can be considered as the inner or nasal canthus of the eye. The lacrimal passages are situated in this *Sandhi*. The diseases of this *Sandhi* include four types of *Srava* and *Puyalasa.* (7)

5) *Apanga Sandhi:*

Dalhana describes *Apanga Sandhi* as "*Bhrupuchhantah Sthita Sandhi",* and so it can be considered as the outer canthus of the eye. (7)

***PATALAS*:**

Patala is one of the structures told by *Sushruta* in *Netra Sharira*. Various authors have described and interpreted the concept of *Patalas* in their own way and yet no consensus has reached upon among them on this subject. V.S. Apte, in his Sanskrit – English dictionary describes the meaning of *Patala* as a film or coating over the eyes. According to Monier Williams, it can be considered as a layer of the eyeball.

Etymology:

Pat + "Klach" pratyaya

Which means a layer, veil, covering chest, membrane especially of the eyes, a film over the eyes. So it can be considered as the layers of the eyeball.

व्दे वर्त्मपटले विद्याच्चत्वार्यन्यानि चाक्षिणि।

जायते तिमिरं येषु व्याधिःपरमदारुणः।। (सु.उ.१–१७)

There are 6 *Patalas* in the eyeball – 2 *Vartma Patalas* and 4 *Akshi Patalas*. There are two outer *patals* which are considered as external layers of the eye. One upper and one lower eyelid are the two external patals. *Drishtigata roga* can not happens in these two *Vartma patals*. [7]

The pathogenesis of *Drishtigata Rogas*, especially *Timir* has been described in terms of involvement of successive *Patalas*. The prognosis of the disease also depends upon the involvement of respective *Patala*. *Sushruta* considers different *Akshi Patalas* and their constituting factors as shown below:

तेजोजलाश्रितम् बाहयं तेष्वन्यत् पिशिताश्रितम्।

मेदस्तृतीयमं पटलमाश्रितं त्वस्थि चापरम्।।

पञ्चमांशसमं दृष्टेस्तेषां बाहुल्यमिष्यते। (सु.उ.१–१७,१८)

The outermost first *patala* is supported by *Tejas* & *Jala*; the second one consists of muscles, the third *Patala* is described as

'*Medoashrita'* and the fourth *Patala* is '*Asthyashrita'*. Their thickness is equal to one-fifth of the *Drishti*. (7)

Dalhana has described,

अत्र तेजः शब्देनालाचक तेजःसमाश्रयं सिरागतं रक्तं बोध्दव्यम्।

जलं त्वग्गतो रसधातुः। (डल्हण)

The first or outermost *Patala* is described as "*Tejojalashrita*". According to *Dalhana*, the word *Teja* means *Alochaka Pitta* and so *Siragata Rakta* can be taken as *Teja Jala*, according to him implies *Rasa Dhatu*. So it can be considered that the first *Patala* is the *Ashraya* for *Rasa* and *Rakta Dhatus*. (8)

According to some scholars, the *Prathama Patalas* can be taken as Cornea and Aqueous humour; as they are the seat of *Tejas* and *Jala*. The 2nd *Patala*, which is *Mamsashrita*, can be taken as Iris and Ciliary body. Both iris and ciliary body are mesodermal in origin and contain muscles tissue. The 3rd *Patala* or *Medoashrita Patala* can be taken as Lens & Vitreous humour, as lens is explained as 3rd *patala* for its position next to uvea & vitreous is a jelly like structure which resembles *medas* (fat). The 4th *Patala* or *Asthyashrita Patala* can be taken as Retina, as it is the seat for *Linganasha*. Their opinion can be summarized as follows:

Name & Anatomical Structure

1st *Patala* - Cornea & Aqueous humour

2nd *Patala* - Iris and Ciliary body

3rd *Patala* - Lens & Vitreous humour

4th *Patala* - Retina

RELATIVE POSITIONS OF EACH *PATALA*:

Only one clinical feature of the first *patala* has been described by *Acharya Vagbhatta* is blurred/indistinct vision, which becomes clear sometimes without any reason. As the disease vitiate the superficial *Dhatus* only, the prognosis is good.

First *Patala*, among the four *Akshi Patalas*, is known as *Bahya* or outer; this means that the other three are relatively inner to the former. According to *Sushruta*, the disease *Timir* vitiates the first *Patala*, followed by second, third and fourth *Patalas*. Therefore the first *Patala* is considered as the outermost and the fourth *Patala* is considered as the innermost *Patala* according to *Sushruta*. But the commentary given by *Dalhana* did not correspond to it and he has reversed the relative position of each *Patala*. (8)

Dalhana describes '*Kalakasthi Ashrita' Patala* as the first *Patala* and considers it as innermost. According to him, the second *Patala* is *Medoashrita*, third *Patala* is *Mamsashrita* and the fourth *Patala* is *Tejojalashrita*. This description can be considered as a misinterpretation from *Dalhana*. Actually he had misunderstood the word '*Abhyantara'* given by *Sushruta* in the description of *Prathama Patalagata Timir* and considered the first *Patala* as the *Abhyantara* (innermost) *Patala*. (8)

According to some other scholars, the *Patalas* can be taken as the layers of the cornea. They quote *Vagbhatta* to justify their opinion. While describing the prognosis of the disease '*Kshata Shukla'*, it has been said that the disease is *Kricchra Sadhya* when it occurs in the first *Patala*. There the word '*Twak'* is used for *Patala*. When the disease involves the second *Patala*, it becomes *Yapya* and *Asadhya* when it involves the third *Patala*. As the disease '*Kshata Shukla'* is limited to the cornea only, these *Patalas* can be taken as successive layers of the cornea. (11)

According to some other views, the *Patalas* can be taken as different layers of retina. There is third *Patala* involvement for the diseases *Pittavidagdha Drishti* and *Kaphavidagdha Drishti*. These are the diseases where patients complain of day blindness and night blindness respectively. As these diseases occur due to degeneration of rods and cones. The *Patalas* can be taken as different layers of retina. But, by taking the retina as *Patalas*, we cannot explain the clinical entity *Timir*.

There is one other view in which the *Patalas* are taken as different layers of the lens itself. To justify this, they argue that the lens is the only

structure where the changes of the diseases *Timir, Kacha* and *Linganasha* are taking place. They consider the anterior lens capsule as the first *Patala* and nucleus as the fourth *Patala*. But this can not be taken as true, because *Timir* is a wide terminology including refractive errors, cataract, and posterior segmental diseases.

To conclude, we can say that *Patalas* were described by Ancient *Acharyas* in order to show the severity of the diseases when they involve deeper tissues and no single structure can be correlated with particular *Patala* exactly probably the used *Patala* is to be taken for different structures in different contexts.

14. *ASTHI* AND *SANDHIS*:

Akshikosha contain a *Tarunasthi*, according to *Arundatta* (Ah.Sha. 3/16). *Sandhis* of *Mandala* variety are also situated in the eye beside the six mentioned earlier. (37)

15. CONCEPT OF *DRISHTI*:

As *Timir* is one among the *Drishti gata Rogas*, it is quiet essential to know more about *Drishti*.

Etymology:

√*Drish* + '*Ktin Karane*' *pratyaya*

Meaning thereby the tools to see.

The concept of *Drishti* by *Acharya Sushruta* is little different and all the description of *Drishti* given by him points to the pupil.

Drishti is described by *Sushruta* as:

Masura dala matra [size of a *Masura dala*], *Prasada* of *Panchamahaboota,* Covered by the external *Patala,* Sparkle like glow worm (*Khadyotavisfulingabha*), Constantly irrigated by the cold aqueous, Shape resembles a hole (*Vivirakritim*), Benefited with cold things.

Sushruta has given the measurement of *Drishti* as $1/7^{th}$ of *Krishna Mandala*, in *Uttartantra*. But in *Sutrasthana*, it is described as $1/9^{th}$ of *Taraka*. Here the meaning of *Taraka* was given as *Krishna Mandala*. So different measurements for the same structure given by the same author points that *Drishti* is a constricting and dilating structure and this also

points to the pupil. So 1/7th of *Krishna Mandala* is the measurement when the iris is dilated, while 1/9th of *Krishna Mandala* is the measurement when the iris is constricted. [9]

All these descriptions prove that the *Drishti* was considered as pupil by ancient *Acharyas*. The anatomical description of *Drishti* is present only in *Sushruta Samhita*. But now it is very clear that the word *Drishti* is a broad sense having a wide range of meaning. If pupil alone will be taken as *Drishti*, then the *Drishtigata Rogas* should be confined only to the pupil. But it is clear that none of the *Drishtigata Rogas* are confined to the pupil. Instead, the *Drishtigata Rogas* are the diseases, where the structural lesion is present somewhere in the refractive medium or retina. In some of the *Drishtigata Rogas*, higher centers like optic nerve and visual cortex are also been involved. So it is better to take these all in toto as the *Drishti*.

Drishti in simple sense means vision. All the anatomical structures through which light passes to reach the retina including the optical zone of cornea, aqueous humour, lens, vitreous humour and retina can be included in the *Drishti*.

ROLE OF *TRIDOSHAS* IN PROCESS OF VISION:

Vision is a complicated phenomenon by which an inverted image of the object is formed on the retina, which is analyzed and interpreted into right sense by the occipital cortex. As *Tridoshas* are the foundation of the whole body, it is necessary to explain the eye and vision in terms of *Tridoshas*.

Refraction is a phenomenon of change in the direction of the light rays, when it enters from one medium to another. The degree of refraction depends upon the refractive indices of the media concerned.

In case of the eye, the light rays travel from the external media of air to the retina, through different refractive media including cornea, aqueous humour, lens and vitreous humour. All these structure are

transparent and are having different refractive indices, thus contributing their own part for the convergence of incident light rays.

We can take the refractive media one by one for analysis. In case of cornea, it can be considered as *Vayu Mahabhoota* predominant. There are so many reasons for taking cornea as *Vayu* predominant like cornea is transparent, it derives its nourishment directly from *Vayu* (partly), it is in constant contact with air etc. As the cornea is *Vayu Mahabhoota* predominant, the *Sthanika Dosha* will be *Vata*. Moreover it is stated by *Sushruta* as "*Vatat Krishnam*", which means the *Krishna Mandala* (cornea) is derived from the *Vayu Mahabhoota*. The function of *Vata* in the cornea includes transmission of light rays and their convergence. *Vata* is said to be responsible for *Pravartana* (stimulation, activation) of the *Indriya*.

The intra-ocular refractive media includes aqueous humour, lens and vitreous humour. The aqueous humour is liquid in consistency while the vitreous is a jelly like semi-liquid structure. Both are transparent enough to pass the light rays without any obstruction. The aqueous and vitreous are having predominance of *Jala Mahabhoota* and hence *Kapha* is the predominant *Dosha*. *Kapha* gives *Sthairya* (stability) to the *Indriyadhisthana* by providing *Tarpana*. [38]

As the aqueous is nutritive in function, the *Dhatu* concerned is *Rasa dhatu*. *Vata* functions in the medium of this fluid and hence we can say that *Kapha* maintains the functions of *Vata*. So normal consistency of *Kapha* is absolutely necessary for the normal process of refraction. Any defects in the qualities or properties of *Kapha*, deranges this process and may manifest disease. The lens being semi-fluid in nature, *Jala Mahabhoota* is the most prominent *Bhoota* and so *Kapha* can be considered as *Sthanika Dosha*. *Vata* has important functional role of conduction of light rays in this medium. [38]

After being refracted through different refractive media, the light rays converge upon the retina, where the stimulation of the photo pigments takes place. Because of its high vascularity and constant contact

with light rays, *Agni* can be considered as the most predominant *Bhoota* in the *Drishti*.

Functionally *Pitta* is the predominant *Dosha* and particularly the *Alochaka Pitta* is involved in analyzing the *Indriyartha*. *Vata* has an unavoidable role because it is the activating and controlling factor. So *Pitta* and *Vata* are considered as the prominent *Doshas* in this part of *Drishti*. (38)

VATA

	PRAN	UDAN	VYAN	SAMAN	APAN
Site	Visual centre	Visual centre	Visual centre	Anterior chamber	Angle of the ant chamber
Functions in the eye	Collects information from the universe	Action on Involuntary functions	Action on the voluntary & Involuntary functions	Gives nourishment to cornea & lens	Excretion of the waste products
Derangement	Leads to central blindness	I) Dilation of Pupil. II) Circulation of fluids IIIRemembering the previous incidences IV) Giving reaction to the information given by Pran.	Disturbance in the circulation to certain part	Will lead to diseases of cornea & lens	Waste products remain in the ant . chamber damage cornea lens Obstruction to circulation

PITTA

	Pachak	Ranjak	Sadhaka	Alochaka	Bhrajaka
Site	Amashaya (Gastrium)	Yakrut pliha Retina cone cells	Visual Centre	On the retina mainly at macula(Rods & Cone)	Skin around in the eye scleva Iris
Functions in the eye	Supplying nutrition to eye structures Nourishing Alochaka pitta	Responsible for colour vision	Details information about the objects seen	Information received from the universe is studied & transported to the brain through saman vayu	Keep the colour normal
Derangement	Will lead to desturb the nourishment of alochaka will produce ama	Will lead to colour blindness total or partial	Information collected is incomplete or wrong	Will lead to wrong or incomplete information	Discoloration of the skin discoloration of the sclera

KAPHA

	Avalambak	Cledaka	Bodhaka	Tarpak	Sanshleshaka
Site	In the eye ball	Retina – cone cells	Visual Centre	Visual Centre	Netrasandhi
Function in the eye	Keep eye ball soft work as a lubricating agent	Differentiates the objects seen into colour & dimentions etc.	Light intensity different colours & dimentions etc.	Keep the function of the Visual Centre by supplying proper nourishment	Keep proper functioning of the joint - Sclerocorneal junction
Derangement	No lubrication of the eye ball	Though the objects are seen detail description is lacking	Can not recognize colours Light intensity & dimensions	Lead to brain shrinkage or infarction	Leads to inflammation at Sclerocorneal junction
Disease	Dry eye syndrome	Metamorphosis Micropsia, object appear curves	Partial or Total colour blindness	Loss of vision central blindness	Spring Catarrah, Phlycten
Treatment	Local - Erandsneh, Ghrut Tarpan, Ghrut Nasya Arogyavardhini, Amlaki, Madhumalini, Vasant	Rasayana Suvarnkalp	Amapachan	Suvarna ghrut, Suvarnmakshik Basti & Virechan Brhamivacha	Gugulakalp, Amapachan Amalaki

CONCEPT OF VISION IN *AYURVEDA*:

रुपलोचनत्तः स्मृतम् । दृकस्थमालोचकम् ..... (अ.हृ.१२–११४)

यद दृष्टयां पित्तं तस्मिन् आलोचकोऽग्निरिति स्ंज्ञा स रूपगृहणाधिकृतः।।

(सु. उ. २१–१०)

In *netra* the function of visual perception is carried out by *drushti* which is the site of *Alochaka Pitta.* For this function *prana vayu* and *tarpak kapha* plays an important role. [10,11]

Visual perception, like all other sensory phenomena, is dependant upon the state of mind and soul. *Acharya Charaka* has described this process as the conjuncture of soul, mind and the sense organ with the objects (Ch. Su. 11/20). *Kashyapa* classifies senses into *Sannikrishta Indriyas* and *Viprakrishta Indriyas*. Eyes and ears are the *Viprakrishta Indriyas*, wherein object need not directly fall on the senses. Eye has developed sufficient skills to perceive the object from a sufficiently large distance. [2]

The theory of *Panchapanchaka* given by *Acharya Charaka* depicts the phenomenon of sensory perception by enumerating the five important factors that take part in this process. They are *Indriya*, *Indriya Dravya*, *Indriya Artha*, *Indriya Adhisthana* and *Indriya Buddhi* (Ch. Sam. Su. 8/8).

In case of eye, these factors are as follows:

Indriya	*Chakshu*
Indriya Dravya	*Teja* (*Jyoti*)
Indriya Artha	*Rupa*
Indriya Adhishthana	Eyes (2 *Netra*)
Indriya Buddhi	*Chakshurbuddhi*

Rupa (*Indriya Artha*) is traveling in the media of *Jyoti* (*Indriya Dravya*) towards the *Akshi* (*Indriya Adhisthana*). Impulses from both these *Akshi* are collected at *Chakshu* (*Indriya*), which is one in number. Further it will be analyzed at the level of *Chakshurbuddhi* (*Indriya Buddhi*) to give actual knowledge of the objects. [4]

As *Doshas* pervade all aspects of physiology, their impacts on these processes are worth-knowing to understand ancient considerations of visual perception. *Vata* is responsible for *Pravartana* (stimulation, activation) of the *Indriya* whereas *Pitta* performs *Alochana* (perception) of the *Indriya Artha*. *Kapha* bestows *Sthairya* (stability) to the *Indriya Adhisthana* by providing *Tarpana*. Further, the subtypes of *Doshas* like *Prana Vayu* and *Vyana Vayu* are specifically held responsible for *Vata Karmas*, *Alochaka Pitta* for *Darshana* and *Tarpaka Kapha* for *Akshi Tarpana* (Su. Sam. Su. 21/14; As. H. Su. 12/17). [10,16]

Eyes are most important among the five *Dnyanendriyas*. So its function can be considered as the function of *Dnyanendriya*. Here, eye is the *Indriya* and external object is the *Indriyartha*. In order to get a clear image of the external object, there should be *Indriyartha Sannikarsha, Roopalochana* and *dnyanotpatti*.

In the first step, the externally situated object is conducted into the eye in the form of light rays. Conduction is the function of *Vata*. As the refractive media are *Kapha* predominant, normal consistency of *Kapha* is absolutely necessary for the normal process of refraction. In the next stage, the analysis of the object is performed. The *Dosha*, which functions in presence of light, is *Alochaka Pitta*. So all the changes that take place in the retina after the convergence of light rays are due to the action of *Alochaka Pitta*. As a result of this action, a biological factor is formed which includes all the details of the object. Here mind is considered as the basement factor, because the function of *Alochaka Pitta* is possible only in the presence of mind. For *dnyanotpatti* to occur, the visual impulse formed is to be converted to actual visual sense. According to *Bhela*, *Alochaka Pitta* is having two functional fractions –*Chakshuvaisheshika*

Alochaka Pitta and *Buddhivaisheshika Alochaka Pitta* (*Bhela Sha*. 4/4-5). The first one acts at the level of retina while the later acts on occipital cortex. The *Buddhivaisheshika Alochaka Pitta* receives impulses sent by the *Chakshuvaisheshika Alochaka Pitta* and gives determination and confirmation; and this confirmed knowledge is known as *Pratyakshadnyana*. This conduction of visual impulses is carried out by *Prana Vayu*. [38]

The physiology of vision can be summarized as follows:

Indriyartha (Object) – *Vata*

↓

Indriyavayava – Chakshurvaisheshika Alochaka Pitta

↓

Indriya Samvedaka (nerve impulse) - *Prana Vayu*

↓

Buddhi (occipital cortex) *Buddhirvaisheshika Alochaka Pitta*

↓

Pratyakshadnyana (*Atma* – seat of knowledge)

Similar ideas are reflected in the description of two phases of *Chakshubuddhi*. The momentary knowledge is obtained by *Kshanika Chakshubuddhi*, which will be further confirmed in the second stage by *Nischayatmika Chakshubuddhi*, according to *Chakrapanidatta* (Ch. Sam. Su. 8/3-12). [5]

Sushruta relates the theory of common origin (*Tulya yoni*) as the basis of sensory perceptions. It is believed that light which illuminates the objects and the eye which receives the light, both are derivatives of *Tejo Mahabhoota*, hence eye perceives only *Rupa* of the objects and not other characters like sound etc. (Su. Sam. Sha. 1/15). [8]

CONCEPT OF *PATALAGATA* DOSHAS:

In *Ayurvedic* ophthalmology, the progression of pathogenesis of *Drishti*gata *Rogas* is explained in terms of involvement of successive

Patalas. Vitiated *Doshas* produces various clinical pictures, when they are situated in different *Patalas*. Involvement of successive *Patalas* means the pathology progresses to deeper tissues and the prognosis worsens accordingly. The symptoms, which are produced when the *Doshas* are vitiated in separate *Patalas* are as follows:

Doshas* in 1st *Patal:

सिरानुसारिणी मले प्रथमं पटलं श्रिते ।

अव्यक्तमीक्षते रुपं व्यक्तमप्यनिमित्ततः ।। अ. स. उ.(15/1)

The only symptom produced when the *Doshas* are vitiated in the first *Patala* is *Avyakta Darshana* (Su. Sam. Ut. 7/3-4; 7/7). The patient is not able to appreciate the exact nature of the object and there is slight blurring of vision. Here, the commentary given by *Dalhana* is little different and he considers the innermost *Patala* as the first *Patala*. [10]

Doshas* in 2nd *Patala:

दृष्टीर्भ्रशं विव्हलति द्वितियं पटलंगते ।

मक्षिकामशकान केशांजालकानि च पश्यति।।

मण्डलानि पताकान्श्च मरिचिः कुण्डलानि च।

परिप्लवांश्च् विविधान् वर्षमभ्रं तमांसि च।

दुरस्थानि रुपानि मन्यते च समिपत ।

The second *Patala* is constituted by *Mamsa* (Su. Sam. Ut. 1/18) having *Kandaras*, giving attachment (*Indu* on As. H. Ut. 15/2). The main symptom when the *Doshas* are situated in this *Patala* is *Vihwala Darshana*. The clinical picture can be summarized as follows (Su.Sam. Ut. 7/7-10), [10,15]

Haziness of vision, Visualization of false images such as gnats, hairs, webs, circles, flags, mirages and ear rings, distant objects appears to be near and near objects appears to be far away. Visualization of false

movements like rain, cloud and darkness, Unable to recognize the hole of needle.

According to modern science these symptoms can be taken as,

- More dimness of vision
- Floaters in the visual field
- Scotoma in visual field
- Accommodation anomalies
- Increasing hypermetropia
- Metamorphopsia, micropsia
- Diplopia

The iris and ciliary body are the most sensitive tissues of the eyeball and develop inflammatory reactions following innumerable exogenous causes. The iris and ciliary body are inherently autogenic tissues and therefore hypersensitive reactions due to dormant and silent systemic conditions are the commonest causes for their inflammation i.e. iridocyclitis; which results into fall in vision. (31)

Vitreous opacities result from inflammatory process in the posterior uveal tract or retina, which results into floaters in front of the eye. The retina overlying the healed patch of inflamed choroid suffers because of disappearance of chorio-capillaries resulting into relative or absolute scotoma depending on the severity of pathological changes in the choroid. Central Serous Retinopathy (CSR) usually occurs in young adults who present symptoms of blurred vision, metamorphopsia, micropsia, a central dark spot in the visual field and increasing hypermetropia. In epi-retinal membrane patient presents with blurred vision, diplopia, metamorphopsia or positive scotoma.

Accommodation means capacity to focus objects at different distance in quick succession. This is brought about by physiological component of ciliary body and physical component of lens. Thus morphological, physiological and pathological characters of second *patala* are alike that of uveal tract and retina. (31)

Doshas* in 3rd *Patala:

उर्ध्वं पश्यति नाधस्तातृतियं पटलगते।

महान्त्यापि च रुपानि च्छादीतानीव वाससा।।

कर्णनासाक्षियुक्तानि विपरितानि विक्षते।

यथादोषं च रज्येत दृष्टीर्दोषे बलियसि।

अध्:स्तिते समीपस्थं दूरस्थं चोपरिस्थिते।

पार्श्वस्थिते दोषे संकुलानिव पश्यति।

दृष्टिमध्यगते दोषे स एकं मन्यते द्विधा।।

द्विधास्थिते त्रिधा पश्येद बहुधा चानवस्थिते।।तिमिराख्य स.।

The third *Patala* is constituted by *Meda* and it can be compared to the vitreous humour or the cortex of the lens. The clinical picture when *Doshas* are vitiated in the third *Patala* includes (Su. Sam. Ut.7/11-14). Visualization of objects situated above and not below, Objects appears as if covered with cloths, Details like ear/eyes are not visible when looked at any face, Coloring of *Drishti called kacha.* [10,15]

According to modern science these symptoms can be taken as,

- Pupillary leucokoria
- Gradual loss of vision
- Details of even big objects not visible
- Visual field defects according to location of *Doshas*
- Diplopia or polyopia

The clinical features of vitiated *doshas* in third *Patala* are very much similar to the cortical opacity of the lens or vitreous opacities. The visual symptoms of cataract or vitreous opacity depend on the site of the opacity and degree of opacification. Some patients also complain of polyopia observed while sleeping under the sky and seeing one moon.

This is due to clear segment in a cataractous lens acting like separate pupil in cuneiform cataract. Change in color of pupil from black in young age to gray is a physiological change after the age of 45 – 50

years and this is due to the increased density of the nucleus with age, which causes some light being reflected back giving the pupil gray coloration. (31)

Doshas* in 4th *Patala:

The fourth *Patala* is the innermost *Patala* of eye and it is constituted by *Asthi*, which is supportive in function. The clinical features when *Doshas* are situated in the fourth *Patala* are (Su.Sam.Ut.7/15 -17).

- complete Loss of vision
- *Drishti Mandala* covered by vitiated *Doshas*
- Perception of bright illuminations unless there is some gross pathology in the eye. Inner to the third *Patala* is the hard and supportive structure of the lens, i.e. lens nucleus. The nucleus part is soft in early age, becomes harder later on. The embryonic nucleus acts as a nidus around which infantile, adult nuclear zone and cortex are arranged in layers. The clinical features of fourth *Patala Timir* (*Linganasha*) i.e. complete loss of vision occurs in complete opacity of the lens (mature cataract). With the advancement of cataract, nearly complete loss of vision is there and pupillary color changes to dense gray or white. (10)

Concept of *patala* is very well described in the *Drushtigata rogas*. In *Lingnash vyadhi* various conditions of disease is mentioned. *Timir*, *Kach*, *Lingnash* are the conditions of the *Lingnash*. According to type of the disease, symptoms of the vitiated *patala* is described by *Acharya Sushruta*.

Acharya Vagbhatas description about *patala* is similar to the *Sushrutas patala.*

In *pittavidgdha drushti*, if *dosha* vitiates the third *patala* then the patient can not see in the day light.

In *kaphavidgdha drushti*, if *dosha* vitiates all the three *patalas* then the patient can not see in the night.

Rhaswajadya is also one of the *Drushtigata roga* where *Acharya* said that if it vitiates all the four *patalas* then it becomes incurable.

In *Chakradattas Netrarogadhikar* chapter *patalas* are considered in *Drushtigata rogas*. He said that *Sukhavati varti*, *Chandrodaya varti*, *Sougat anjan*, *Nayansukha varti*, *Chandraprabha varti*, *Shrinagarjuna varti*, *Prabhooti anjan*, these all cures all types of *Patalagata rogas*. (37)

Thus in *Drushtigata rogas patala* can be taken as various meanings, sometimes like *twak*, sometimes conditions of a disease, sometimes various conditions of the disease *Timir*.

All the diseases of *drusti*, not only *Timir*, will involve *patalas*, their features are not explicit but *samanya lakshanas* are similar to *Timir* and *vishesh lakshanas* are different. So to understand the concept of *patala*, we must know the concept of *Timir*.

RELATIONSHIP OF *MAHABHOOTAS* AND LIGHT:

In the physiology of perception, the eye is the subject and the things are the objects. The process of perception of the forms of substances is helped by sun also. The five *Mahabhootas* are represented in the body as *Tridoshas*. The eye is composed by *Pitta* (*Alochaka*), *Sleshma* and *Vata* just like the sun by *Agni* and so on. The processes of recognition of form starts when the light rays strike the object and then the eye. The interpretation of the objects is dependent on the coordination of the *Buddhi* (Intellect), Soul and Mind. If any one of them is not coordinating, the perception will not be possible.

Panini described scientifically the process of phonation. Intellect and the soul are the main factors, which produce phonation being in coordination. The process is initiated by mind when it stimulates *Vata*. This '*Vata'* with its movement produces phonation.

In the eye also the soul indicates the mind and intellect in perceiving the objects. According to *Panini* theory, the mind stimulates the *Kayagni*. The body energy is transformed into nervous system and the recognition of the forms and colour becomes possible. (37)

Sushruta stated that all the five sensory organs are composed of *Pancha Mahabhootas* and all sensory organs are inter-related with the mind and soul. It has been said that there is a type of *Kapha* i. e. *Tarpaka*

Kapha, whose site has been told head and its function is denoted as *Tarpana* (It offers libation of *indriyas*) *(Su. Su.21/14)* If by any means *Tarpaka Kapha* is affected; the function of indriyas would be affected, so consequently *Chakshurendriya* and then eyesight might be affected. (7)

In nut shell as vision is a complex phenomenon and visual perception occurs in proper sequential association of objects, *Indriyas*, *Manas* and *Atma*. This perception is possible because of proper equilibrium of *Alochaka Pitta* with *Tarpaka Kapha*.

CLASSIFICATION OF EYE DISEASES:

The topographical classification of ocular disorders is unique contribution of *Acharya Sushruta* in the field of ophthalmology. All the later scholars have followed *Sushruta* in a similar manner while classifying the ocular disorders. The eye diseases according to various ancient scholars are tabulated as follow:

	SS	AS	AH	MN	YR	BP	Sha	NP	KT	RRS
Vartmagatarogas	21	24	24	21	21	21	21	24	24	24
Sandhigatarogas	09	09	09	09	09	09	09	29	09	09
Shuklagatarogas	11	13	13	11	11	11	13	13	13	13
Krishnagatarogas	04	05	05	04	04	04	05	05	06	05
Drishtigatarogas	12	27	27	12	12	12	08	-	25	08
Sarvagatarogas	17	16	16	17	17	17	08	-	16	08
Others	02	-	-	02	17	17	08	-	16	08
Total	76	94	94	78	76	78	94	100	96	94

SS = *Sushruta Samhita,* BP = *Bhava Prakasha*

AS = *Ashtanga Sangraha*, Sha = *Sharangadhara Samhita*

AH = *Ashtanga Hridaya,* NP = *Netra Prakashika*

MN = *Madhava Nidana,* KT = *Karala Tantra*

YR = *Yoga Ratnakara,* RRS = *Rasa Ratna Samucchay*

GENERAL AETIOLOGY OF THE EYE DISEASES

The general aetiology of the eye diseases is almost similar to the systemic diseases. The cause may be either general or local. Sushruta and Vagbhatta accepted the aetiological factors as discussed below *(Su. Su. 24/5).* [7]

	Sushruta	***Vagbhatta***
1	*Adi-Bala-Pravritta* (Hereditary)	*Sahaja* (Hereditary)
2	*Janma-Bala-Pravritta* (Congenital)	*Garbhaja* (Congenital)
3	*Dosha-Bala-Pravritta* (Acquired)	*Jataja* (Acquired)
4	*Sanghata-Bala-Pravritta* (Traumatic)	*Pindaja* (Traumatic)
5	*Kala-Bala-Pravritta* (Seasonal)	*Kalaja* (Seasonal)
6	*Daiva-Bala-Pravritta* (Idiopathic)	*Prabhavaja* (Idiopathic)
7	*Swabhavaja*	*Swabhavaja* (Natural)

Most of the above said causes are observed in aetiology of the refractive errors.

CONCEPT OF DRISHTIGATA ROGAS:

The saying "*Nayanam Pradhanam* "says that the eye is an important organ, which is the mediator between the outer world and *Atma* or *Buddhi*. So one has to keep this in highest place and protect from evils and other bad elements with great care and delicacy.

Acharyas have described diseases of eye in very systematic and scientific manner. After enlisting of other parts of eye they have enumerated diseases affecting vision. The diminished vision can be simple diminution of vision, monochromatic visual disorders, failure to perceive the shape and size or form of objects, failure to see near or far objects, various field defects, day or night blindness, or complete loss of vision. *Sushruta* enumerated twelve visual disorders *(Su. Ut. 1/45)* whereas *Vagbhatta* stated 27 visual disorders. *Timir* is the most important one which is of six types among the 12 visual disorders of *Drishti*. [6]

TIMIR

Human body is affected by many diseases but any disease which starts in the form of simple symptom but ends in complete loss of natural physiological phenomenon invites special consideration.

Timir is one such disease, which starts from simple visual disturbance but ends in complete loss of vision. It is due to this reason that *Acharyas* paid special attention to this disease. Indian bio-scientists are making all efforts to fight against this disease, since the time they have recognized it; not only in the management but they have given their deep and conceptual thinking in understanding the pathology of *Timir*. A separate concept and consideration of *Patalas* especially in reference to *Timir* is the direct evidence met within *Sushruta Samhita*. (Su.Sam.Ut. 7/5-18). [(9)]

Many of the clinical features described for *Timir* are having similarities with the refractive errors; hence an attempt has been made to understand the etiopathology of *Timir* in this context.

Etymology:

1) √'*Tim'* + *Unadi* suffix '*Kirach'* (*Shabdakalpadrum*)

which means :– The increase of watery substance in the eye, which is also followed by *Siddhanta Kaumudi*.

– Loss of light perception

2) In *Amarkosha*, the meaning of *Timir* is given as darkness.

3) In *Halayudha Kosha*, *Timir* means darkness whose enemy is sun.

From this etymological derivation it is clear that *Timir* means loss of light perception or darkness or blindness; but this stage is last in *Timir Roga*. Thus the nomenclature of this disease was made on the basis of its grave sequelae, which follows improper treatment of the diseases.

CONCEPT OF *TIMIR*:

There are differences in opinion regarding the disease *Timir* among different *Ayurvedic* texts. *Timir* is a disease, which is included under *Drishti*gata *rogas* by all *Acharyas*. The number of *Drishti*gata *Rogas* is 12 according to *Sushruta*; while it is 27 as per the opinion of *Vagbhatta*. This

difference in the number may be because according to *Sushruta, Timir*, *Kacha* and *Linganasha* are the progressive stages of the disease *Linganasha*. But *Vagbhatta* considers *Timir*, *Kacha* and *Linganashas* as separate clinical entities. So there are six *Timir*, six *Kacha* and six *Linganasha* according to *Vagbhatta*; while *Sushruta* considers six *Linganasha* only as diseases.

The disease *Timir* or the *Timir* stage of the disease *Linganasha* is produced when the vitiated *Doshas* are situated in the first and second *Patala.* When the vitiated *Dosha* affects the third *Patala*, it is termed as *Kacha*; and when it involves the fourth *Patala*, it is *Linganasha*. The word meaning of *Timir* is darkness. There is hindrance in the vision of the patient by darkness. But when the *Doshas* are in the 4th Patala, there is absolute darkness. (10)

There is one other opinion also. In subjective view, the disease is described by the patient as *Timir*. In objective view, it is called as *Kacha*. When the blindness occurs, it is called as *Linganasha*. The disease is a warning to the physician as well as to the patient as far as the treatment part is concerned.

ETIOLOGY OF *TIMIR*:

Every disease in this universe is the effect of some root cause i.e. *Nidana*. The specific etiology of *Timir* is not mentioned in the classics. However, certain general causes of the disease of the *Indriyas* in general and *Chakshurindriya* in particular are described here. The disease also has been mentioned as a symptom or sequelae of some diseases in few *Ayurvedic* classics. Thus *Timir Roga* varies from a symptom to a full-established disease. Even other *Urdhvajatrugata rogas* can also be the cause of this disease as many *Nidanas* for other diseases are same as of eye disorders. The etiological factors responsible for eye diseases, which are also meant for *Timir* as per different *Acharya* are as follows.

Excessive or deficient or wrong use of senses, *Diwaswapna, Vegavirodha* or *Veganigraha, Atimaithuna, Virudhahara are* the causes as

mentioned by *Acharya Charaka* (Ch. Su. 11/39-41). These have bad effect on all senses so on *Chakshuindriya.* [2]

Acharya Harita mentioned intake of *Ushna*, *Atikshara* and *Katu Ahara*, injury and looking at fine object to have deleterious effect on eyes (*Harita* 45/5). *Abhighata* to *Avarta* and *Apanga Marmas* may lead to the loss of vision both partial and complete (Su. Sam. Sha. 6/28). [8]

Netra Prakashika has enlisted the causes of eye diseases in detail, which include, excessive or deficient oil bath, working with shaking hands, drug addiction, heavy weight lifting, looking at illuminating objects like sun, gems, gold, or hot iron etc. *Pujyapada Muni*, the preacher of this text has observed eye diseases as a complication of *Meha Roga*.

Acharya Sushruta and others have described following *Nidanas* for eye diseases, which can be categorized into general and specific *Nidanas*.

A) General Causative Factors According To Various *Acharyas*:

Causative Factors	**SS**	**MN**	**BP**	**YR**	**VS**	**V.Ch**
Diving into water immediately after exposure to heat	+	+	+	+	+	+
Excessive looking at distant objects	+	+	+	+	+	+
Sleeping during day/awakening at night	+	+	+	+	+	+
Excessive weeping	+	+	+	+	+	+
Anger/grief	+	+	+	+	+	+
Injury to head	+	+	+	+	+	+
Excessive use of sour, gruel and vinegar	+	-	+	-	-	-
Kulattha and *Masha* pulses	+	-	+	-	-	-
Suppression of natural urges	+	+	+	+	+	+
Excessive perspiration	+	+	+	+	+	+
Smoking or working in smoke	+	+	+	+	+	+
Suppression of/or excessive vomiting	+	+	+	+	+	+
Suppressing tears	+	+	+	+	+	+
Concentrating on minute objects	+	+	+	+	+	+
Intake of fluids and other foods at night	-	+	-	+	+	+
Alcohol	-	+	-	+	+	+
Change of seasons	-	+	-	+	+	+

Traveling in very high speed	-	-	+	-	-	-
Abhishyanda	+	-	-	-	-	-

उष्णाभितप्तस्य जलप्रवेशाद् दूरेक्षणात् स्वप्नविपर्य्याच्च।
प्रसक्तसंरोदनकोपशोक क्लेशाभिघातादतिमैथूनाच्च ।।

शुक्तारनालाम्लकुलत्थमाष निषेवणाद्वेगविनिग्रहाच्च ।

स्वेदादधो धूमनिशेवणाच्च छर्देविघाताद्वमनातियोगात् ।

बाष्पग्रहात् सूक्ष्मनिरीक्षणाच्च नेत्रे विकाराञ्जनयन्ति दोषा: ।। (सु. उ. १/२६–२७)

• **उष्णाभितप्तस्य जलप्रवेशाद्** – Taking cold water bath, when the body is hot i.e. sudden variation in the body temperature causes eye diseases. When body is too hot, the vessels are dilated & the volume of fluids is increased, then if body temperature is suddenly dropped the vessels constrict & the vasculature is damaged. This causes circulatory disturbances; which in turn probably affects the mechanism of nutrition & it leads to eye diseases also.

• **दूरेक्षणात्** - means to see distant object continuously e.g. in professions like astronomers, Scientists in the observatories, persons in military at boarder, personnel from Railway Merchant, Navy to see signals. Eye can visualize the things up to some distance without any strain, but gazing at the very distant objects for a long time results into eye strain & later leads to eye disorders.

• **स्वप्नविपर्य्याच्च**: Means alteration of the pattern of sleep, *Diwaswapna* i.e. Day sleeping causes *Kapha* vitiation & *Ratrijagrana* causes *Vata – Pitta Prakopa*.

• **प्रसक्तसंरोदन** - It means continuous weeping. It causes excessive stimulation to Lacrimal gland, by that the gland secrets more fluid that washes away the nutrients and bacteriostatic activity of conjunctival sac so that conjunctival sac and Lacrimal apparatus losses the stamina

against the diseases, finally it causes xerosis and the diseases of Lacrimal apparatus.

• **कोप** – (Excessive anger): By indulging in *Kopa* continuously or excessive indulging *Pitta* vitiates and causes *pitta vikaras* in the eye.

• **शोक** (Grief) :- By excessive indulging gets in cries *Vata* vitiates and causes *Vataja netra vikara* in the eye.

• **क्लेश** – (Stress): - Physical & Mental exhaustion vitiates *Shareera* and *Manasa Doshas* & ultimately may leads to eye diseases.

• **अभिघाताद** (i.e. due to traumatic injury):- Minute irritative injuries or contusion injuries or perforating injuries cause a great loss to the eye, if proper care is not taken blindness follow immediately.

• **अतिमैथूनाच्च**: - Over Indulgence in sexual intercourse causes *Dhatu kshaya* and also eye diseases.

• **शुक्तारनालाम्लकुलत्थमाष** – *Shukta*, *Arnala* (Sour food item) taken excessively causes *Netra vikaras* because the above things are *Sandhana Dravyas* having the the properties oppose to Ojas & their excess use causes *Ojokshaya* & leads eye diseases.

Kulatha: - *Kashaya rasa*, *Katuvipaka*; if taken for a long time vitiates and causes *Raktaja Pittaja* disorders of eye.

Masha: - *Guru*, *Madhura*, *Snigda* - if taken for a long time causes *kaphaja* disorders of the eye.

• **निषेवणाद्वेगविनिग्रहाच्च** - By controlling essential urges like passing urine, or defecating stools, (these are 13 such urges which should not be controlled as per *Ayurveda*) produces *udavartha vyadhi* (Vitiation of *Vata*) & also causes eye strain and other *vataja* eye disorders.

• **स्वेदादधो** – Excessive fomentation or sudation to the eye :- *Swedana Karma* is contraindicated to the eyes, if necessary *Mrudu Sweda* is suggested with perfect care. Its excessive use causes *Pittaja Raktaja* disorder of eye.

• **धूमनिशेवणाच्च** : - Smoking is considered as harmful for eyes according to *Ayurveda* as well as modern medicine. As per *Ayurveda*, smoking may vitiate *Pitta* and *Vata* by increasing its *Tikshna*, *Ushna* and *Ruksha Gunas*, hence it can be considered as one of the important factors in the causation of *Timir*.

• **छर्देविघात** :- Suppressing the vomiting urge leads to *udavartha vyadhi* that causes eye strain and visual problems. Suppressing vomiting leads to *kushta* eye disorders.

• **वमनातियोगात्** - Indulging excessive *vamana* therapy produces complication like protrusion of eye ball (*Akshnor Vyavruthi*) and Retinal or sub conjunctival haemorrhages etc.

• **बाष्पग्रहात्** – suppressing the tears produces *Ashruja Udavartha* in which doshas get obstructed in the *Ashru vaha srotas* and causes eye disease.

• **सूक्ष्मनिरीक्षणाच्च** -observing the minute things regularly causes strain to the cilliary muscles and lens results in visual problems e.g. Pathology technicians, Diamond Cutter, Wrist watch repairers, Tailors, ladies doing embroidery work etc.

Additional Points by *Bhavamishra*:

• Exposing to dust, smoke causes foreign body sensation in the eyes.
• Quick walking - it causes discomfort and strain to the body and also eyes.
• Taking hot things in *Ushna ritu* causes vitiation of *Pitta* & Taking cool things in *Sheetha ritu* causes vitiation of *Kapha*. [20]

Additional points by *Yogaratnakara*:

• Taking more liquid diet-causes hypo vitaminosis leads to eye disorders.
• Excessive intake of alcoholic preparations causes *Ojo kshaya* and visual disorders. [19]

Additional Points by *Dalhana*:

• Sleeping by putting the head in the downward position than body. (Cervical, Brachial neuralgia)

- Sleeping by putting the head in the upward position than body. (Cervical, Brachial neuralgia)
- Due to high fever or sun stroke, head including eyes are affected and causes the eye diseases. [8]

Additional Points from *Hareetha Samhita:*

- Excessive intake of *Ushna*, *Kshara*, *Katu rasa*, food or drugs causes eye diseases.

Additional Points from *Sharangadhera*:

- The eye exposing to bright things causes *Timir* and other eye diseases.

B) Specific Causes of Disease *Timir:*

1) *Grahani Roga* :

Acharya Charaka specifies that *Grahani* if not treated will result in *Timir* (Ch. Chi. 15/61). [5]

2) *Nasya Karma* :

Acharya Charaka described that a person suffering from fever, grief or has consumed alcohol if given *Nasya Karma* can suffer from *Timir roga* (Ch. Si. 9/115). [4]

3) *Pinasa* :

Andhatva (blindness) and severe eye ailments are mentioned as complications of *Pratishyaya* by *Sushruta* (Su. Sam. Ut. 24/17). [9]

4) *Raktasrava* :

Excessive haemorrhage can leads to *Timir* (Su.Sam.Su. 14/30).

5) Constipation :

Constipation and *Vega nigraha* can leads to *Timir* as mentioned by *Acharya Bhela* (Bh. Su. 6/6).

6) *Shiro Abhitapa* :

Head exposed to heat produces *Raktaja* and *Pittaja* eye ailments (*Bhavamishra*). [20]

7) *Marmaghata* :

Injury to two *Marmas* of eye i.e. *Apanga* and *Avarta* can leads to loss of vision.

8) *Arsha* :

According to *Acharya Charaka*, *Timir* is a common *Lakshana* of *Sahaja Arsha* and *Acharya Vagbhatta* also describes it as a common symptom of *Arsha*. [2,11]

***SAMPRAPTI*:**

Samprapti can be explained as the pathological changes evoked by the etiological factors, leading to the manifestation of signs and symptoms of diseases. In other words *Samprapti* is the action of *Doshas* in the *Dhatus* via *Srotas*, which in turn manifests signs and symptoms. The pathological events of *Timir* began with the increment of *Doshas* at their respective sites.

सिरानुसारभिदोषैर्विगुणैरूर्ध्वमागतैः।

जायन्ते नेत्रभागेषु रोगाः परमदारूणाः।। (सु. उ. १/२०)

The *Vimarga Gamana* of these increased *Doshas* towards *Drushti* through *Siras* is said to be the *Samprapti* of *Timir*. [6]

Dalhana opines that the word '*Sira*' here denotes *Rupavaha Sira* and *Drishti* indicate inner part of *Drushti*. As already described, the progress of pathogenesis includes involvement of successive *Patalas*. The localization of *Doshas* in the *Patalas* further prevents the functional capacities of *Patalas* and leads to blurred vision or *Avyakta Darshana*. It further inhibits the nutritional supply by obstructing the channels responsible for it. The further progression leads to *Vihwala Darshana* due to the involvement of *Pishitashrita* and *Medoashrita Patalas*. The disease terminates into *Linganasha*, or the stage of absolute blindness. The *Ashraya* of the *Malas* in *Indriya* thus produces both *Upaghata* [*Nasha* or destruction] and *Upatapa* [*Vikriti* or disease] in *Chakshurindriya*. [7]

Acharya Charaka states that when humors get provoked in the seats of the sense organs, they cause either the impairment or the irritation of the senses concerned (Ch. Su. 28/20). [3]

***SAMPRAPTI GHATAKAS*:**

Dosha: Tridosha

Dushya: Rasa, *Rakta*, *Mamsa*

Agni: Mandagni leading to *Ama* formation

Srotas: Rupavaha Siras mainly

Srotodushti: Sanga and *Vimarga Gamana*

Rogamarga: Madhyama as *Shirah* is the *Pradhana marma*

Adhishthana: Drushti in general and *Patalas* in particular

Vyadhi swabhava: Chirakari.

Acharya Sushruta says that when *Doshas* get excessively vitiated, they travel through *Siras* and get lodged in the first *Patala* and give rise to symptoms of 1st *Patalagata Timir* (Su. Ut. 7/6-7). So from above description we can understand the same aetiopathogenesis for 2nd, 3rd and 4th *Patalagata Timir*. [6]

Same *Samprapti* has been mentioned by *Vagbhatta* and *Yogaratnakara*. But commentator *Indu* described that *Doshas* first affect *Patalas* and cause blurring of vision and also affect *Siras*. *Doshas* further affect *Patalas* by obstructing *Sira* and soon this vicious cycle goes on leading to 2nd, 3rd and 4th *Patala* involvement.

SAMPRAPTI* OF *TIMIRA

SAMANYA SAMPRAPTI

Nidana Sevana of *Netra Roga*

(*Aharaja*, *Viharaja* and *Abhighataja*)

⇩

Vatadi Dosha Prakopa

⇩

Sira, *Dhamani Ashrya* of *Doshas*

⇩

Dosha Moves to *Netra Avyava* (In *Patalas*)

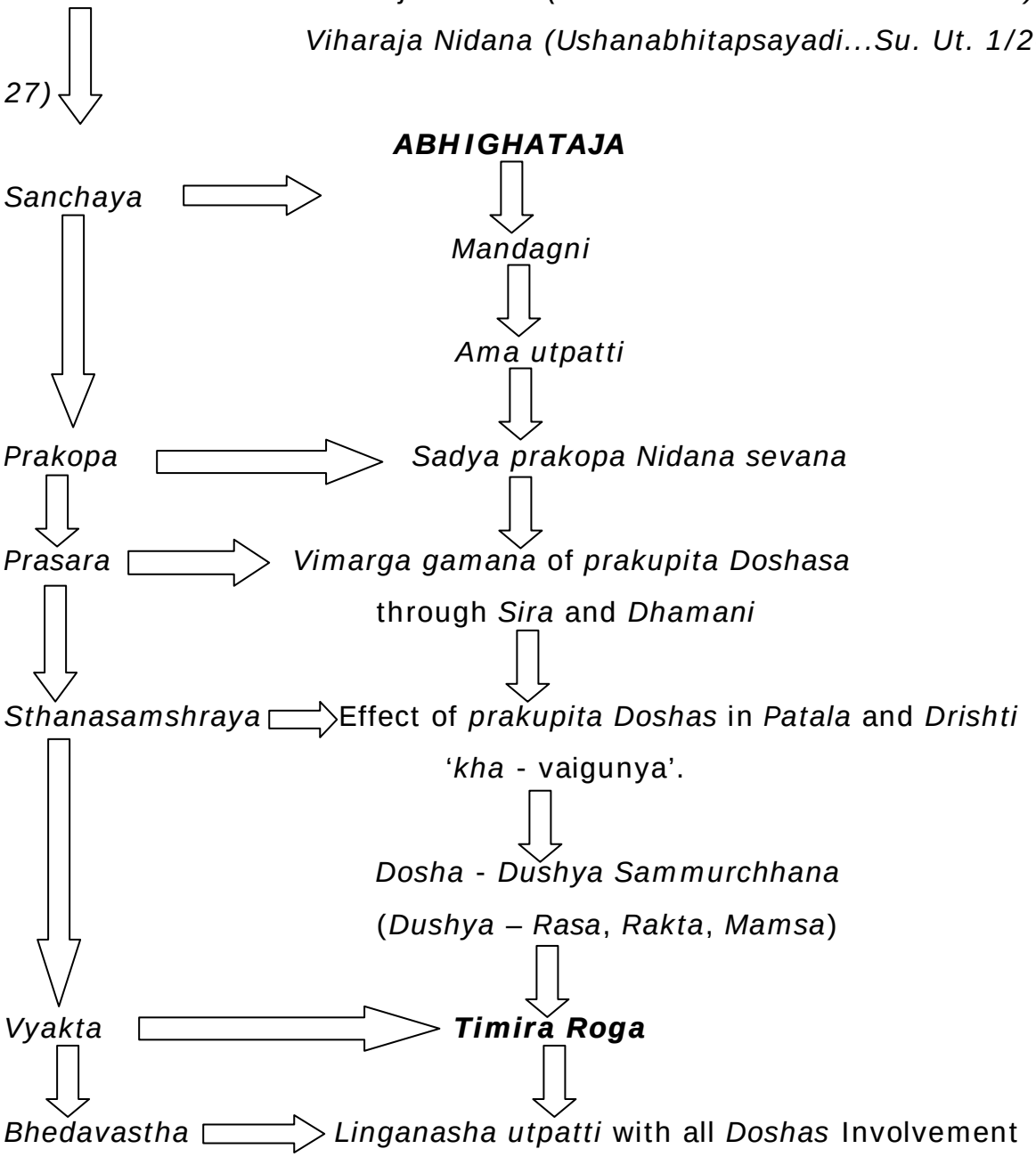
⇩

TIMIRA ROGA

SHAT KRIYA KALIYA SAMPRAPTI

NIDANA SEVANA – *Aharaja Nidana (Shukt arnala adi.... Su. Ut. 1/27)*

Viharaja Nidana (Ushanabhitapsayadi...Su. Ut. 1/26-27)



***PURVA RUPA*:**

Purvarupa is a group of symptoms indicating the forthcoming disease *(Ch. Ni.1/8)*. The clinical significance of *Purvarupa* lies in the fact that by analyzing *Purvarupa* it is possible to predict the nature and type of disease before the clinical features become evident and subsequently play an important part in the management. [(5)]

No specific Prodromal symptoms are mentioned for this disease however general *Purvarupa* mentioned by *Acharya Sushruta* are applicable to *Timir* also. *(Su. Ut. 1/21-23).* [5]

General *Purva Rupas* of the Eye diseases are as follows:-

Avilata - Muddiness of eyes

Samrambha - Slight congestion with mild pain

Ashru - Watering from eyes

Kandu - Itching sensation

Upadeha - Stickiness

Guruta - Heaviness

Ushna - Burning sensation

Toda - Ocular pain

Raga - Redness

Vartma kosha shoola - Pain in fornices of eye ball

Vartma kosha shook - Foreign body sensation in the fornices

Vihanyamana rupa - Reduced visual acuity

Vihanyamana kriya - Subnormal functions of the eyes

***RUPA*:**

The actual diagnosis of the disease mainly depends upon the signs and symptoms. Full manifestation of the disease is indicated by *Rupavastha*. The signs and symptoms of *Timir* are described on the basis of *Patala* affliction and *Dosha Dushti*.

According to *Patala* Involvement:

The clinical picture of *Timir*, when the *Doshas* are vitiated in successive *Patalas* (Su. Sam. Ut. 7/6-17) has already been described earlier. The clinical features of *Timir* according to the location of dosha in *Drushti* can be summarized as shown in table. [6]

Clinical Features of *Timir* According to Location of *Doshas* in *Drushti Dosha*

Location Symptoms	SS	BP	AS	AH	MN	YR	VS
Lower part Unable to see near objects	+	+	+	+	+	+	+
Upper part Unable to see distant objects	+	+	+	+	+	+	+
Sides Unable to see sides	+	+	+	+	+	+	+
All around Overlapping of the objects	+	-	-	+	+	+	+
Center Double images	+	+	+	+	+		+
Two places Triple images	+	+	+	+	+		+
Unstable Several images	+	-	-	+	+	+	+
Inner part Big objects appear small and small objects appear bigger	-	+	+	-	-		+

***Patalagata Timir Lakshanas* according to various authors:**

1st *Patala*

Location Symptoms	SS	BP	AS	AH	MN	YR	Vang
Blurred vision	+	+	+	+	-	+	+

2nd *Patala*

Location Symptoms	SS	BP	AS	AH	MN	YR	Vang
Haziness of vision	+	+	+	+	+	+	+
Visualization of false images such as gnats, hairs, webs, circles, flags, mirages and ear rings	+	-	-	+	-	+	+
Distant objects appears to be near and near objects appears to be far away	+	+	+	+	+	+	+
Visualization of false movements like rain, cloud and darkness	+	-	-	+	-	+	+
Unable to locate the eye of needle	+	-	-	+	-	+	+

3rd *Patala*

Location Symptoms	SS	BP	AS	AH	MN	YR	Vang
Visualization of objects situated above and not below	+	+	+	+	+	+	+
Objects appears as if covered with cloths	+	+	+	+	+	+	+
Details like ear/eyes are not visible when looked at any face	+	+	+	+	+	+	+
Coloring of *Drushti*	+	+	+	+	+	+	+

4th *Patala*

Location Symptoms	SS	BP	AS	AH	MN	YR	Vang
Complete obstruction of vision	+	+	+	+	+	+	+

According to *Dosha* Involvement:

Predominance of particular *Dosha* governs the clinical features of *Timir* to a great extent. The signs and symptoms of *Timir* according to *Doshas* are as follows:

Vataja Timir:

तत्र वातेन रुपाणि भ्रमन्तिव स पश्यति ।
आविलान्यरुणाभानि व्याविद्धानि च मानवः ।। (Su. Sam. Ut. 7/18).

Objects appear as if they were moving, hazy, reddish in color and tortuous in shape. [6]

तत्र वातेन तिमिरे व्याविध्दमिव पश्यति ।।

चलाविलारुणाभास प्रसन्नं चेक्षते मुहुः ।।

जालानि केशान मशकान रश्मींश्चोपेशीतेअत्र च ।। (A. H. U. 12/8-9)

In *Timir* caused by *Vata*, the person sees the objects as though covered with thin cloth, unsteady, dirty, slightly red. sometimes and some other times as clear and clean; sees webs, hairs, musquitoes and rays of light in front of his eyes. (11)

Pittaja Timir:

पित्तेनादित्यखद्योतशक्रचापतडिदगुणान् ।

शिखिबहरविचित्राणि नीलक्रुष्णानि पश्यति ।। (Su. Sam. Ut.7/19).

Visualization of false flashes of the sun, glowworm, rainbow and the lightening. Bluish and blackish shades appear as variegated like the feathers of a peacock. (6)

पित्तजे तिमिरे विद्युतखद्योतदीपितम् ।

शिखितित्तिरिपत्राभं प्रायो नीलं च पश्यति ।। (A. H. U. 12/8-9)

In *Timir*, born from *Pitta*, the person sees lightening (flashes of light), glow worm and burning lamp etc. objects appear as deep blue in colour like the feather of the peacock, Tittiri (partridge). (11)

Kaphaja Timir:

कफ़ेन पश्येद्रूपाणी स्निग्धाणि च सितानि च ।

गौरचामरगौराणि श्वेताभ्रप्रतिमाणि च ।।

पश्येदसुश्माण्यत्यर्थं व्यभ्रे चैवाभ्रसंप्लवम् ।

सलिलप्लावितानीव परिजाड्यानि मानवः ।। (Su. Sam. Ut. 7/20-21).

All objects are seen as glossy and white like the clouds. Moving clouds are seen in a cloudless sky and stationary objects appear as if inundated in water. (6)

कफ़ेन तिमिरे प्रायः स्निग्धं श्वेतं च पश्यति ।

शखेंन्दुकुन्दकुसुमैः कुमुदैरिव चाचितम् ।। (A. H. U. 12/16)

Generally in *Timir*, born from *Kapha*, the person sees the objects as unctuous (greasy), white, as that of a conch shell, moon, flower of *kunda* and as though covered with *kumuda* (Petals of lilly). (11)

Raktaja Timir:

तथा रक्तेन रक्तानि तमांसि विविधानि च ।

हरितश्यावकृष्णानि धुमधुम्राणि चेक्षते ।। (Su.Sam. Ut. 7/22).

Objects appear to be in various colors such as dark greenish, grayish, or blackish and smoky all around. (6)

रक्तेन तिमिरं रक्तं तमोभूतं च पश्यति । (A. H. U. 12/20)

In *Timir* caused by blood, the organ of vision is red and the person sees objects as though in darkness. (11)

***Sannipataja Timir*:**

सन्निपातेन चित्राणि विप्लुतानि च पश्यति ।।

बहुधा वा द्विधा वाअपि सर्वाण्येव समन्ततः ।।

हीनाधिकांगान्यथवा ज्योतींष्यपि च पश्यति ।। (Su.Sam. Ut. 7/23-24).

In *Timir* due to vitiation of all *Doshas* together, objects appear to be in various colors, scattered and as having double or manifold images all around. Images appear to be luminous and are seen to possess more or less than normal parts. (6)

संसर्गसन्निपातेषु विद्यात् संकीर्णलश्यणान् ।

तिमिरादीनकस्माच्च तैः स्याद व्यक्ताकुलेश्यणः ।। (A. H. U. 12/22)

In those *Timir* etc. caused by combination of two and three *Doshas*, the symptoms of the *Doshas* involved are present; in *Timir* the objects are seen some times clear and sometimes as covered. (11)

***Parimalayi Timir*:**

पित्तं कुर्यात् परिम्लायि मुर्चितं रक्ततेजसा ।।

पीता दिशस्तथोद्यन्तमादितियमिव पश्यति ।।

विकीर्यमाणान् खद्योते वृश्यास्तेजोभिरेव च ।। (Su.Sam. Ut. 7/25).

Pitta when associated with *Tejas* of *Shonita* produces the *disease* called *Parimalayi Timir*. In this variety of *Timir*, the patient sees all sides as yellow and visualizes as if the sun is rising. (6)

All trees appeared to be interspersed with glow worms and flashes of the light.

SADHYA / ASADHYATA OF _TIMIR_:

Timir is easily curable when the *Doshas* are limited to first and second *Patala*; it gets the stage of chronicity and becomes *Yapya* by the involvement of *Dushti* in third *Patala*. *Timir* attains the incurability when the *Doshas* reach fourth *Patala* wherein surgical intervention is advocated in case of *Kaphaja Linganasha*. (8)

1st *Patalagata Timir - Sadhya*

2nd *Patalagata Timir - Krichhasadhya*

3rd *Patalagata Timir - Yapya (Su. Ut. 17/53)*

MANAGEMENT OF _TIMIR_:

The management of *Timir* essentially consists of the avoidancce of etiological factors; and specifically, it implies counteracting the increased *vata* and other *Doshas*.

It is well explained by *Acharya Sushruta* that '*Nidana Parivarjana'* is the foremost principle for any disease and then *Pratighata* of *Vatadi Doshas* is required.

Chakradatta has also given very important *chikitsa sutra* for *Timir roga*:-

1) Patients of *Timir Roga* must use *Ghee* with *Triphala* daily.

2) Washing the eyes with *Triphla quath* (decoction of Triphala) definitely cures all the eye disorders, and also prevents the occurrence of eye disorders. (21)

Timir is a disease of *Drishti Mandala* which starts from simple visual disturbances. Pathology of *Timir* in different *Patala* explains the disturbance in vision due to different organic and physiological causes.

Acharya Sushruta has described *Timir* as *Sadhya* i.e. curable while *Doshas* are localized at 1st and 2nd *Patala*. *(Su. Ut. 17/53; A. H. Ut. 12/33)*. [8,12]

The general line of management of *Timir* consists of avoidance of aetiological factors and specifically it implies counteracting the increased *Vata* and other *Doshas (Su. Ut. 1/25).* The treatment of *Timir* depends upon the stage of the disease and dominance of the *Doshas*. The body should be cleansed with *Langhana* and *Virechana* in the early stages of the disease *(Su. Ut. 17/47).* [7]

Management can be broadly divided into:-

1) Prophylactic measures

2) Curative measures

A) Local

B) Systemic

1) Prophylactic measures

Samanya chikitsa:

दोषानुरोधेन च नैकशस्तं स्नेहास्त्रविस्त्रावणरेकनस्यैः ।
उपाचरेदाजंमुर्धवस्ति वस्तिक्रियातर्पणलेपसेकै ॥ (A. H. U. 13/47)

Oleation, Blood Letting, *Virechana*, *Nasya*, *Anjana*, *Murdha Basti*, *Basti*, *Tarpana*, *Lepa* and *Seka* – these therapies administered many times, suitable to the Doshas is the mode of treatment. [12]

Preventive measures:

घृतं पुराणं त्रिफलां **शतावरी** पटोलमुद्गामलकं यवानपि।

निषेवमाणस्य नरस्य यत्नतो भयं सुघोरात्तिमिरान्नविद्यते॥ (सु.उ.१७/४८)

The person who is regularly in habit of taking old preserved *Ghrita*, *Triphala*, *Shatawari*, *Patola*, *Mudga*, *Amalaki*, and *Yava* (barley) has no reason to fear from even the severest form of *Timir*. [6]

Prophylactic measures:

शतावरीपायस एव केवलस्तथा कृतोवा ऽऽमलकेषु पायसः ।

प्रभूत सर्पिस्त्रिफलोदकोत्तरो यवौदनो वा तिमिरं व्यपोहति ॥ सु.उ १७/४९

Payasa prepared from *Shatawari* or that prepared similarly from *amalaki* or else barley meal cooked with sufficient quantity of *Ghrita* and the decoction of *Triphala* are the prophylactic measures to prevent *Timir*. (6)

Diets to improve eyesight:

जीवन्तीशाकं सुनिषण्णकं च सतण्डुलीयं वरवास्तुकं च ।
चिल्ली तथा मुलकपोतिका च दृष्टेर्हितं शाकुनजागंलं च ।। (Su.Sam. Ut. 17/50).

The cooked vegetables of *Jivanti*, *Sunishannaka*, *Tanduliya*, good quantity of *Vastuka*, chilli and *madhuka* and also the flesh of birds and of wild animals are beneficial for eyesight. (6)

पटोलकर्कोटककारवेल्ल वार्त्ताकुतर्कारीरजानि ।
शाकानि शिग्रुवार्त्तगलानि चैव हितानि दृष्टेर्घृतसाधितानि ।। (Su.Sam. Ut. 17/51).

Patola, *karkotaka*, *karavellaka*, brinjal, *tarkari*, *karira* fruits, *shigru* and *artagala*; all these vegetables cooked with *Ghrita* promote eyesight.

2) Curative measures: It consists of two divisions.

A) *Local:*

Acharya Sushruta has given a very beautiful and unique description of local application of drugs in several eye diseases by the name of '*Kriyakalpa'*. *Sushruta* and *Vagbhatta* have indicated *Samshodhana karma* which includes *Virechana*, *Raktamokshana* and *Nasya*. *(Su. Ut. 18/4) Kriyakalpa* which includes *Putapaka*, *Anjana*,*Dhooma*, *Tarpana (Su. Ut. 18/4), Shirovasti*, *Lepa* and *Seka (A. H. Ut.13/47).* (10,14)

तर्पण पुटपाक श्च सेक आश्च्योतनाञ्जने।
तत्र तत्रोपदिष्टानि तेषां व्यासं निबोध मे।। (सु.उ.१८/४)

Great emphasis has been given to *Anjana* in the management of *Drishtigata Rogas*, as *Anjana* expels the localized *Doshas* from the eye. Later Scholars have advocated the use of *Swarasa* and *Arkas* for local use in *Timir*. *Lekhana Ashchyotana* is more useful in eradicating the localized *Doshas* from the *Netra Patalas*. *(Su. Ut. 18).* (10)

B) *Systemic*:

The systemic treatment of *Timir* begins with *Siramokshana* to relieve *Rakta Dushti (Su. Ut. 17/28). Virechana* is said to be ideal for *Anulomana* of *Doshas* specially vitiated *Pitta*, as eye is the sight of *Pitta* predominance for which *Eranda Taila* (*Vataja Timir*), *Triphala Ghrita* (*Pittaja Timir*) and *Trivrita Ghrita* (*Kaphaja Timir*) are indicated.

पुराणसर्पिस्तिमिरेषु सर्वशो हितं भवेदायसभाजनस्थितम् ।। (Su. U. 17/30)

Old Ghee Kept in Iron container is beneficial in *Timir* in all ways. A number of *Nasya Prayogas* are also described for *Timir*, as nose is a gateway of drug administration in case of *Urdhvajatrugata Rogas (Su. Ut. 17/47)*. *Triphala* is said to be drug of choice in case of *Timir* with various *Anupanas* according to the involvement of *Doshas (A.S.Su.13/3).*

IMPORTANCE OF TREATMENT

It is specially indicated by *Acharya Vagbhatta* that if *Timir* is ignored by physician or patient, it will get converted into '*Kacha'* and after '*Kacha'* it get converted into '*Linganasha'* and in this stage patient becomes blind *(A. H.Ut. 13/1).* [13]

Yogaratnakara explained that *Timir* is the main cause of blindness so it must be treated with all efforts *(Y. R. Net. Pg. No. 362).* [19]

Contraindication of *Timir*:

विवर्जयोत्सिरामोक्षं तिमिरे रागमागिते ।
यन्त्रणोत्पीडितो दोषो निहन्यादाशु दर्शनम् ।। (Su. U. 12/52)

Raktamokhna should be avoided in *Timir* when colourised as *Dosha* excited by the instrument destroys vision immediately. [6]

***Timir* as refractive error:**

The progress of the disease *Timir* has been mentioned in *Uttartantra*, in terms of involvement of successive Patalas. The symptoms when Timir invades each *Patala* are given in detail; and critical analysis of these symptoms may establish an exact correlation for the clinical condition.

प्रथमे पटले दोषो यस्य दृष्टौ व्यवस्थित: ।

अव्यक्तानि स रूपाणि सर्वाण्येव प्रपश्यति ।। सु.उ ७/६

When the vitiated *Doshas* invade first *Patala*, the patient complains of difficulty in seeing objects distinctly. (6)

Accoding to *vagbhatta*,

सिरानुसारिणि मले प्रथमं पटल श्रिते ।

अव्यक्तमीक्षते रूपं व्यक्तमप्यनिमित्ततः।। (अ.हृ.उ.१२/१)

When the *Malas* (*Doshas*) moving in the *shiras* get localized in the first *patala* the person sees the objects hazy & sometimes see the object clearly without any obvious causes. (12)

This is the common complaint of Myopia, hypermetropia, astigmatism and presbyopia. So the *Timir* of first *Patala* can be correlated to refractive errors easily.

The following symptoms are complained of by the patient, when the vitiated *Doshas* are situated in the second *Patala*.

उर्ध्व्ं पश्यति नाधस्तातृतियं पटलगते।

महान्त्यापि च रुपानि च्छादीतानीव वाससा।।

कर्णनासाक्षियुक्तानि विपरितानि विक्षते।

यथादोषं च रज्येत दृष्टीर्दोषे बलियसि।

अध्:स्तिते समीपस्थं दूरस्थं चोपरिस्थिते।

पार्श्वस्थिते दोषे संकुलानिव पश्यति।

दृष्टिमध्यगते दोषे स एकं मन्यते द्विधा।।

द्विधास्थिते त्रिधा पश्येद बहुधा चानवस्थिते।।तिमिराख्य स.।

1. Confused visual perception
2. Appearance of bees, flies, hairs, etc.
3. Appearance of distant objects as near
4. Appearance of near objects as distant

5. Inability to thread a needle

The confused visual perception and appearance of bees, flies, hairs etc. symptoms are present in high myopia also, where degenerative changes occur.

Appearance of distant objects as near and vice versa is mainly due to accommodative failures. The inability to thread a needle denotes presbyopic changes and it is an age related accommodative failure.

So considering these views, it can be concluded that *Timir* at the stage of second *Patala* involvement can be correlated to errors of refraction including Myopia.

The vitiated *Doshas* will produce following symptoms when they are situated in the third *Patala*.

उर्ध्व पश्यति नाधस्तातृतीयं पटलं गते । (Su. U.7/11)

1) Unable to see objects in lower field
2) Absence of parts of objects

Both these two symptoms simulate with segmental defects in the retina or lenticular opacity which also be included in the wide range of *Timir*.

When the disorder advances to the fourth *Patalas*, vision is obstructed completely, it is known as "*Linganasha*".

. ..... चतुर्थं पटलं गते ।
रुणध्दि सर्वतो दृष्ति लिगंनाशः स उच्यते ।। (Su. U. 7/15)

This type of condition occurs in mature and hyper-mature cataract and certain retinal degenerative conditions. (6)

To conclude, *Timir* is a disease when the vitiated *Doshas* are situated in the first and second *Patala*. The disease progresses to *Kacha* and *Linganasha* when the *Doshas* involve third and fourth *Patala* respectively. The clinical picture of vitiated *Doshas* in first and second *Patalas*, which are analyzed here, simulates very much with refractive errors including myopia.

Kriyakalpa

As *Panchkarma* is the basis of *Kayachikitsa*, similarly the *kriya kalpa* is the basis of the treatment of eye diseases.

Etymology:

Kriya: _ Kri + Sa pratyaya.

The variants of which are *arambha*, *shiksha*, *nishkriti*, *pujana*, *sampradharana*, *upaya*, *karma*, *cheshta* and *chikitsa*. *Kriya* means to do, to perform or to practice; the word kriya refers here to medical treatment.

Kalpa: _ Klrip + Ghan pratyay - kalpa

Means practicable, feasible, proper or competent method of curing the diseases or treatment of sick.

Hence, the word *Kriyakalpa* literally means to perform proper treatment.

Definition of *KriyaKalpa*:

No specific definition of *Kriyakalpa* has been given by the ancient scholars except the commentator *Dalhana*, who opines as to prepare various preparations like *Tarpana*, *Putapaka* etc. for the treatment of eye diseases.

Generally, *Sushruta* has advocated the line of treatment to all the diseases in the first stage, whereas, in case of failure in bringing down the disease process medically, he advises parasurgical interference.

Classification:

Although *Charaka Samhita* deals with the diseases of the entire body without paying any special reference to the disorders of the eye, ear, nose and throat. However, some references are available regarding the eye ailments saying that eye disorders should be treated with the help of *Anjana, Ashchyotana, Vidalaka* and *Tarpana*. No further details are available in reference to *'Kriyakalpa'* viz. their classification as well as method of application.

Acharya Sushruta and other *Acharya* told the various types of *Kriyakalpa*.

तर्पण पुटपाक श्च सेक आश्च्योतनाञ्जने।

तत्र तत्रोपदिष्टानि तेषां व्यासं निबोध मे।। (सु.उ.१८/४)

सेकं आश्च्योतनं पिण्डी बिडालक स्तर्पण स्तथा।

पुटपाकं अंजनं श्चेति कल्पो नेत्र मुपाचरेत्।। (sharangdhara ut.13)

Kyiyakalpa	*Charaka*	*Sushruta*	*Vagbhata*	*Sharangdhar*	*Bhavmishra*
Tarpana	+	+	+	+	+
Putapaka	-	+	+	+	+
Seka	-	+	+	+	+
Aschyotana	+	+	+	+	+
Anjana	+	+	+	+	+
Pindi	-	-	-	+	+
Vidalaka	-	-	+	+	+

TARPANA:

Ayurveda is a science with a very rich legacy which describes various physicotherapeutic procedures in many clinical conditions. *Akshi Tarpana* is also one such procedure which is widely indicated in many ophthalmic conditions. It is found to be effective on anecdotal and clinical experience grounds. It is the foremost treatment procedure mentioned in *Sushruta Samhita* for eye disorders. But even then, neither proper acceptance nor precise scientific reasoning for the procedure is established.

There are lots of discrepancies found in the whole process. Drug absorption and mode of action are also big riddles to understand & explain to modern as well as *Ayurvedic* physicians, so that its acceptance and significance could be understood by the masses.

The word '*Tarpana'* is derived from the root '*Trup'* by adding the '*Lyut' Pratyaya*. The literary meaning of the *Tarpana* is to give nourishment of the eye through *Ghrita*, *Ghritamanda*, medicated *Ghritas*, *Vasa*, *Majja* (bone marrow) etc.

Indication for *Tarpana karma*:

ताम्यत्यतिविशुष्कं यदृक्षं यच्चातिदारुणम् ।

शीर्णपक्ष्माविलं जिह्मं रोगक्लिष्टं च यदभ्रुशम् ।।

तदक्षितर्पणादेव लभेतोर्जामसंशयम् ।। (Su. U. 18/17-18)

When a patient sees darkness in front of eyes.

In severe dryness of the eyes.

Much roughness of the eyes.

Stiffness of the eyelids.

Falling of eye lashes / Madrosis

Dirtiness of the eyes / Altered or lost luster of ocular surface.

Deviated eye ball / Squint

In extreme aggravation of the diseases of the eye.

Vagbhatta has further added a list of disease specifically selected for *Tarpana*.They are *Kricchronmilana*, *Siraharsha*, *Sirotpata*, *Arjuna*, *Shukra*, *Timir*, *Abhishyanda*, *Adhimantha*, *Anyatovata*, *Vataparyaya* and inflammatory conditions of the eyes *Vatika* and *Paitika* diseases of eyes as well as injured eyes due to *Abhighata*. [8]

Contraindications for *Tarpana karma*:

दुर्दिनात्युष्णशीतेषु चिन्तायासभ्रमेषु च ।

अशान्तोपद्रवे चाक्षिण तर्पणं न प्रशस्यते ।। (Su. U. 18/18)

According to *Acharya Sushruta*, the various conditions where *Tarpana* is contraindicated are given below:

1. Cloudy day.
2. Excessive hot and cold season.
3. Worry and Anxiety – Mental state
4. In Exhaustion, Giddiness – Physical health state
5. In the condition of acute pain, complication of ocular disease.

Procedure:

The patient is asked to lie down on his back, in a chamber free from direct sun rays, wind and dust, and is given mild fomentation with a cotton soaked in lukewarm water, then the eyes are encircled with firm, compact leak proof wall made up of paste of powdered *Masha pulse* (black gram). The patient is asked to close the eyes and over the closed eyes, liquefied *Ghrita* is poured very slowly till the entire eyelashes are under the liquefied *Ghrita*. Patient is instructed to close and open his / her eyes (*Unmesha* & *Nimesha*). After retaining for the stipulated time, the *Ghrita* is drained out through the hole made near the outer canthus and the eye is irrigated by lukewarm water fomentation (Su. U.18/6-10). [8]

Modification In the Procedure of *Tarpana Karma:*

Nowadays, time is money and patients don't have so much time to undergo this traditional procedure. So, a new technique is developed.

A specially designed *Tarpana* goggle is taken and it is used for *Tarpana Karma*. There is no chance of leaking of the medicine in this method. This gives best results and more comfort to the patient in less time.

***Pashchat karma*:**

After finishing the main procedure of *Akshitarpana*, *Dhoompana* i.e. medicated smoke is given to the patient. Then patient is advised to avoid direct exposure to excessive cold, heat, wind, lustrous & shiny things. [8]

Course of procedure:

ऐकाहं वा त्र्यहंवाऽपि पंचाहं चेष्यते परम् । (Su.U. 18/12)

Sushruta, without clarifying the condition of the eye, simply asks to perform the procedure for one day, three days and five days or till the proper satiating features are attained.

Dalhana in his commentary quotes the view of *Gayadasa*, *Jejjata* and *Videha*. According to *Gayadasa*, this duration is given in accordance to *Vatika*, *Paittika* and *Shlaishmika* eye disease respectively. [7]

According to *Jejjata*, the duration of treatment in mild, moderate and severely aggravated *Doshas* is of one, three and five days respectively.

Videha says that the procedure should be carried out daily in *Vatika* diseases, alternatively in *Paittika* and *Raktaja* diseases, with interruption of two days in healthy eye and *Sannipataja* disease and with the interruption of three days in *Kapha* diseases.

Vagbhatta is in agreement with *Videha*, except for *Kapha* diseases where he advises an interruption of two days.

Period of retention:

Tarpana should be retained for a period, which is taken for counting the number of syllables mentioned according to the healthiness or unhealthiness of the eye. It can be summarized as below(Su.Ut.18/8-10).

Table Showing the Period of Retention of Tarpana:

Condition of the Eye	Time taken for the counting of number of syllables found in				
	S.S.	S.S.	A.H.	B.P.	Sha. Sam.
Healthy	500	500	500	500	500
Kapha Predominant	600	500	500	500	500
Pitta Predominant	800	600	600	600	-
Vata Predominant	1000	1000	1000	1000	1000
Site of lesion in eye disease					
Sandhigata	300	300	300	500	500
Vartmagata	100	100	100	100	100
Shuklagata	500	500	500	-	600
Krishanagata	700	700	700	700	700

Drishtigata	800/1000	800	800	800	800
Adhimantha	1000	1000	1000	1000	1000

S.S. = *Sushruta Samhita* A.S. = *Ashtanga Sangraha*

A. H. = *Ashtanga Hridaya* B.P = *Bhavaprakasha*

Sha. Sam. = *Sharangadhara Samhita*

Signs and symptoms of proper *Tarpana*:

सुखस्वप्नावबोधत्वं वेशद्यं वर्णषाटवम् ।

निर्वृति व्याधिविध्वंसः क्रियालाघवमेव च ॥ (Su. U. 18/13)

The features of properly conducted *Tarpana* i.e. sound sleep, Blissful awakening, cessation of secretion, clearness of vision, discernment of individual colours, agreeable sensation, lightness of the eye and proper functioning of eye, ability of the eye to tolerate Sunlight. (8)

Complications of excessive *Tarpana*:

गुर्वाविलमतिस्निग्धमश्रुकण्डुपदेहवत् ।

द्येयं दोषसमुतक्लिष्तं नेत्रमत्यर्थतर्पितम् ॥ (Su. U. 18/14)

Features of heaviness, indistinct vision, excessive oiliness, lacrimation, itching, stickiness and aggravation of *Doshas* especially *Kapha Dosha* results from excessive *Tarpana*. (8)

Effect of inadequate *Tarpana*:

रुक्षमाविलमस्त्राढयमसहं रूपदर्शने ।

व्याधिवृध्दिश्चतजद्येयंहीनतर्पितमक्षिच ॥ (Su. U. 18/15)

Dryness, indistinct vision, excessive lacrimation, intolerance to light and aggravation of the disease are the features of insufficient *Tarpana*.

Treatment of inadequate and excessive *Tarpana*:

अनयोर्दोषबाहुल्यात् प्रयतेत चिकित्सिते ।

धुमनस्यन्जने सेकेः रुक्षेः स्निग्धैश्चयोगवित् ॥ (Su. U. 18/16)

In these two conditions, treatment will be applied according to predominance of *Doshas* with *Dhoompana*, *Nasya*, *Anjana* and *Seka* either

Snigdha or *Ruksha* are to be used for them. *Snigdha* in diseases of *Vata*, *Ruksha* in *Kapha* and *Sheeta* in *Pitta*. (8)

Various *Acharyas* have different opinions regarding the duration of *Tarpana* procedure. Taking consideration of previous research work, site and sevearity of the disease *Tarpana* procedure was done for 7 days in three settings with 7 days interval. (38)

MODERN REVIEW:

The human eye is the organ which gives us the sense of sight, allowing us to observe and learn more about the surrounding world than we do with any of the other four senses. We use our eyes in almost every activity we perform, whether reading, working, watching television, writing a letter, driving a car, and in countless other ways. Most people probably would agree that sight is the sense they value more than all the rest. The eye allows us to see and interpret the shapes, colors, and dimensions of objects in the world by processing the light they reflect or emit. The eye is able to detect bright light or dim light, but it cannot sense an object when light is absent.

Myopia is the commonest eye defect affecting the young eyes & also called near- or short-sightedness. It is a refractive defect of the eye in which Parallel rays of light coming from infinity are focused in front of the retina when accommodation is at rest. Those with myopia see nearby objects clearly but distant objects appear blurred.

A brief anatomical & physiological consideration of the eye is followed by the in depth exploration of the details of myopia in the forthcoming pages.

Anatomy of eyeball:

The eye is the organ of sight situated in the orbital cavity. It is almost spherical in shape and is about 2.5 c.m. in diameter. The space between the eye and the orbital cavity is occupied by fatty tissue. The bony wall of the orbit and the fat helps to protect the eye from injury.

Structurally the two eyes are separate but they function as a pair. It is possible to see with only one eye, but three-dimensional vision is impaired when only one eye is used specially in relation to the judgement of distance.

THE EMBRYOLOGY OF EYES:

The central nervous system is developed from the neural groove, which invaginates to form the neural tube running longitudinally down the

dorsal surface of the embryo. At either side of the anterior portion of this structure a thickening appears at the early stage (the optic plate), which grows outwards towards the surface to form the primary optic vesicle. The two eyes develop from these optic vesicles and the ectoderm and mesoderm coming in contact with the optic vesicles. [28]

After it meets the surface ectoderm, the primary optic vesicle invaginates from below to form the optic cup. The line of invagination remains open for sometime as the embryonic fissure. The inner layer of the cup forms the main structure of the retina, from which the nerve fibres eventually grow backwards towards the brain. Its outer layer remains as a single layer of pigmentary epithelium; between the two, lies a narrow potential space representing the original optic vesicle; and from its anterior border develop parts of the ciliary body and iris. The neural ectoderm secretes jelly like structure - the vitreous, which fills the cavity.

The mesoderm around the cup differentiates to form the coats of eye, orbital structures, angle of anterior chamber and main structure of cornea.

Meanwhile, the surface ectoderm invaginates and later separates to form the lens. The surface ectoderm remains as the corneal and conjunctival epithelium. The mesoderm in front of the cornea grows in folds, unites and separates to form the lids. [28]

PRIMORDIA OF OCULAR STRUCTURES:

The eye originates from neural ectoderm, surface ectoderm and mesoderm.

Surface ectoderm	Mesoderm	Neural ectoderm
1.Conjunctival epithelium 2. Corneal epithelium 3. Crystalline lens 4. Eyelashes 5. Epithelium of - Meibomian glands - Glands of Moll - Glands of Zeis - Lacrimal gland - Accessory lacrimal glands	1. Corneal stroma 2. Corneal endothelium and Descemet's membrane 3. Iris stroma 4. Choroids 5. Sclera 6. Vitreous 7. Extra ocular muscles 8. Ciliary muscles 9. Bony orbit	1. Sensory retina 2. Retinal pigment epithelium 3.Pigment epithelium of iris 4. Sphincter pupillae 5. Dilator pupillae 6. Melanocytes 7. Neural part of optic nerve

1. Eyelids – They develop from both surface ectoderm and mesoderm.
2. Zonules – They develop from surface ectoderm and mesoderm.
3. Bruch's membrane – It develops from neural ectoderm and mesoderm.

THE EYEBALL AT BIRTH:

The eyeball at birth is 16 mm in diameter and hence hypermetropic.

The cornea is relatively large in size. The sclera is thin and bluish in colour. The anterior chamber is rather shallow and the pupil small. The uveal tract has scarce pigments. The lens is round. The cones are short. The fovea is not properly developed structurally and functionally. It continues to develop till 4 - 6 weeks after birth and hence the frequent consequence of bilateral ocular nystagmus of congenital origin or lesions developing in both eyes soon after birth. [28]

The infant starts fixing objects by 6 weeks. He follows objects with both eyes by six months of age and develops full range of binocular vision

by the age of 6 years. The eyeball as a whole is developed to full adult normal size by the age of 10 years. [28]

Dimensions of an adult eye ball:

(a) Antero - posterior length: 24 mm approx.

(b) Horizontal diameter: 23.5 mm approx.

(c) Vertical diameter: 23.00 mm approx.

(d) Volume of eyeball: 7.00 cc

(e) Weight of the eyeball: 6.8 gm.

(f) Circumference of the eyeball: 72 mm.

(g) Radius of curvature of posterior 5/6th (scleral shell): 12 mm.

(h) Radius of curvature of anterior 1/6th (cornea): 8 mm.

(i) Refractive index of cornea: 1.37

(j) Refractive index of Aqueous: 1.33

(k) Refractive index of Vitreous: 1.33

(l) Refractive index of lens cortex: 1.38

(m) Refractive index of lens nucleus: 1.40

(n) Refractive index of capsule: 1.35

Structure of the eye:

The eyeball has three layers:

1) The outer fibrous layer: Sclera and Cornea.

2) The middle vascular layer: Iris, Ciliary body and Choroid.

3) The inner nervous tissue layer: Retina.

(i) Fibrous Tunic:

The wall of the eyeball is composed of a dense imperfectly elastic supporting membrane. The anterior part of the membrane is transparent- the cornea: the remainder is opaque – the sclera. The anterior part of the sclera is covered by mucous membrane, the conjunctiva, which is reflected from its surface on to the lids. [28]

Cornea is a clear, transparent and elliptical structure with a smooth shining surface. The average diameter of cornea is 11 – 12 mm. The thickness of the central part is 0.52 mm and the peripheral part is 0.70 mm. The central 5 mm of the cornea is known as the optical zone.

The refractive index is about 1.37 and Dioptric power of cornea is + 43 to + 45 D. The cornea consists of 5 layers namely:

1. The epithelium.
2. Bowman's membrane.
3. Substantia propria or stroma.
4. Descemet's membrane
5. The endothelium.

Stratified squamous type of epithelium consists of three cell types namely the basal columnar cells, two or three layers of wing cells and surface cells. [28]

The Bowman's membrane, which is made up of collagen fibrils, does not regenerate when damaged. This results in the formation of permanent corneal opacity. It is about 12µm in thickness and binds the corneal stroma anteriorly with basement membrane of the epithelium. It is not a true elastic membrane but it shows considerable resistance to infection.

Stroma consists of keratocytes, wandering macrophages, histicocytes and a few leucocytes, regularly arranged collagen fibrils and ground substance. It is about 0.5 mm in thickness and constitutes most of the cornea i.e. 90% of total thickness. The lamellae (fibrils) are arranged in many layers. The alternating layers of lamellae are at right angle to each other. [28]

Descemets membrane is a thin but strong homogenous elastic membrane, which can regenerate. It is very resistant to chemical agents, trauma and pathological processes. It consists of collagen and glycoproteins. Normally it remains in a state of tension and when torn it curls inwards on itself. [28]

The endothelium is a single layer of flattened hexagonal cells.

The cornea is an avascular structure. It derives nutrition from perilimbal blood vessels, aqueous humour and oxygen directly from atmospheric air. [28]

The nerve supply is purely sensory and it is derived from the ophthalmic division of the 5th cranial nerve through the nasociliary branch. [28]

The sclera is a strong, opaque, white fibrous layer, which forms 5/6 of the external tunic of the eye. It is relatively avascular, therefore infections rarely affect it. If they do occur, they are chronic and sluggish. It is blue and thin in childhood and in pathological conditions where uvea shines through it. It may be yellow in old age due to fat deposition. It is about 1 mm thick and is thinnest at the attachment of extra ocular muscles. The sclera gives shape to the eyeball, makes it more rigid, and protects its inner parts. Its posterior surface is pierced by the optic foramen, which encircles the optic nerve. At the junction of sclera and cornea is an opening known as the scleral venous sinus or canal of Schlemm, through which the acqeous drains. [28]

(ii) Vascular Tunic:

The vascular tunic or the uveal tract consists of three parts, of which the two posterior i. e.choroid and ciliary body which lines the sclera while the anterior forms a free circular diaphragm i. e. iris. The plane of the iris is approximately coronal: the aperture of the diaphragm is the pupil.

The iris divides the anterior segment of the eye into anterior and posterior chambers, which contain aqueous humour secreted by the ciliary body. The measurement of the pupil is about 4 mm. and it regulates the amount of light rays reaching the retina. The pupillary margin slides to and fro upon the lens capsule. [28]

When the pupil is constricted, more of the posterior surface of the iris is in contact with the lens capsule. When pupil is fully dilated, the iris may not touch the lens. [28]

Anterior surface of the iris can be divided into two zones by a zigzag line called the collarette.

1. Ciliary zone.
2. Papillary zone.

The iris consists of three layers:

1. Endothelium.
2. Stroma.
3. Pigment epithelium.

The endothelium contains crypts or tissue spaces, which communicate freely with the anterior chamber. Stroma consists of loosely arranged connective tissue, blood vessels, nerves and two unstripped muscles – sphincter pupillae and dilator pupillae. Two layers of pigment epithelium are situated on the posterior surface of iris. [28]

The ciliary body in antero-posterior section is shaped roughly like an isosceles triangle, with the base forwards. The iris is attached about the middle of the base, so that a small portion of the ciliary body enters into the posterior boundary of the anterior chamber at the angle. Ciliary body has two parts namely,

(i) Pars plicata

(ii) Pars plana.

The pars plicata forms the anterior 1/3rd of the ciliary body (about 2 mm.). The posterior 2/3rd of the ciliary body (about 4 mm) is pars plana. It is relatively avascular therefore posterior segment of the eye is entered through the pars plana incision 3 – 5 mm behind the limbus. Pars plicata part of the ciliary body secretes aqueous humour. The ciliary body consists of four layers namely,

(i) Ciliary muscles

(ii) Stroma

(iii) Ciliary processes

(iv) Epithelium

The ciliary muscles are flat bundles of non-striated muscle fibres which are helpful in accommodation of the lens. The stroma consists of loose connective tissue of collagen and fibroblasts, nerves, pigments and blood vessels. Macroscopically the ciliary processes are about 70 in number. Suspensory ligament or Zonule of Zinn is attached to them and the equator of the lens. Each finger like process is lined by two layers of epithelial cells. The core of the ciliary processes contains blood vessels and loose connective tissue. These processes are the main site of aqueous production. The epithelial layer consists of two layers of pigmented and nonpigmented epithelial cells. The ciliary body extends backward as far as

the ora serrata, at which point the retina proper begins abruptly; the transition from ciliary body to choroids, on the other hand, is gradual, although this line is conveniently accepted as the limit of the two structures. The ciliary body is richly supplied with sensory nerve fibres derived from the trigeminal nerve. The ciliary muscle is supplied with motor fibres from the oculomotor and sympathetic nerves. [28]

The choroid is an extremely vascular membrane in contact everywhere with the sclera, although not firmly adherent to it so that there is a potential space between the two structures – the epichoroidal space. The choroid is dark brown and extends from the ora serrata up to the optic nerve aperture. The outer layers of retina are dependent for their nutrition upon the choroids. The inflammation of choroid always involves the retina. The choroid consists of three layers namely,

1. Supra choroidal lamina.
2. Vascular layer or stroma.
3. Bruch's membrane.

The suprachoroidal lamina is a thin membrane of collagen fibres, melanocytes and fibroblasts. The stroma contains loose collagenous tissue, pigment cells, macrophages, mast cells and plasma cells. Its main bulk is formed by blood vessels, which are arranged in three layers,

(i) Layer of large vessels (Haller's layer).
(ii) Layer of medium vessels (Sattler's layer)
(iii) Layer of chorio - capillaries.

The inner side of the choroid is covered by a thin elastic membrane lamina vitrea or membrane of Bruch. Bruch's membrane lies in approximation with the pigment epithelium of the retina. The blood supply of the uveal tract is almost entirely derived from the posterior ciliary and anterior ciliary arteries. [28]

(iii) Nervous Tunic:

Nervous tunic or the retina is the innermost layer of the eye and is derived from neuroectoderm. Retina is a thin membrane extending from

the optic disc to the ora serrata in front. It varies in thickness from 0.4 mm near the optic nerve to 0.15 mm anteriorly at the ora serrata. [28]

The retina consists of a number of layers formed by three strata of cells and their synapses – the visual cells (lying externally), a relay layer of bipolar cells (lying intermedially) and a layer of ganglion cells, the axons of which run into the central nervous system.

The retina consists of 10 layers namely,

1. **Layer of pigment epithelium**: A single layer of hexagonal cells containing melanin pigment is situated on the outer aspect of retina.
2. **Layer of rods and cones**: These are end organs for visual sensation.
3. **External limiting membrane**: It lies between rods and cones and outer nuclear layer.
4. **Outer nuclear layer**: It consists of nuclei of rods and cones.
5. **Outer plexiform layer**: It consists of arborisations of the axons of rods and cones nuclei with dendrites of the bipolar cells.
6. **Inner nuclear layer**: It consists of nuclei of bipolar cells.
7. **Inner plexiform layer**: It consists of synapses of the axons of the bipolar cells with the dendrites of ganglion cells.
8. **Layer of ganglion cells**: Large ganglion cells are present in this layer.
9. **Nerve fibre layer**: These are axons of the ganglion cells. These fibres are non-medullated and are continued as optic nerve fibres. [28]
10. **Internal limiting membrane**: It separates the retina from vitreous.

Most externally, in contact with the pigment epithelium is the neural epithelium, the rods and cones, which are the end organs of vision. The microanatomy of rods and cones reveals the transductive region (outer segment), a region for the maintenance of cellular homoeostasis (inner segment), a nuclear region (outer nuclear layer) and a transmissive region (the outer plexiform or synaptic layer). [28]

The photoreceptors are specialised to transduce light rays into receptor potentials. The two types of photoreceptors are rods and cones, named for the differing shapes of their outer segments, which nestle among fingerlike extensions of the pigment epithelium cells. Each retina

has about 60 million cones and 120 million rods. Rods are most important for black and white vision in dim light. They also allow us to discriminate between different shades of dark and light and permit us to see shapes and movement. Cones provide colour vision and high visual acuity in bright light. [28]

At the posterior pole of the eye, which is situated about 3 mm to the temporal side of the optic disc, a specially differentiated spot is found in the retina, the 'fovea centralis', a depression or pit, and here only cones are present in the neuroepithelial layer and the other layers are almost completely absent. The fovea is the most sensitive part of the retina, and it is surrounded by a small area, the macula lutea, or yellow spot, which although not so sensitive, is more so than other parts of the retina. There are no blood vessels in the retina at the macula, so that its nourishment is entirely dependent upon the choroid. [28]

OPTIC NERVE:

The optic nerve extends from the lamina cribrosa upto the optic chiasma. The fibres of the optic nerve originate from the nerve fibre layer of the retina. All the retinal fibres converge to form the optic nerve about 5 mm to the nasal side of the macula lutea. The nerve pierces the lamina cribrosa to pass backwards and medially through the orbital cavity. It then passes through the optic foramen of the sphenoid bone, backwards and medially to meet the nerve from the other eye at the optic chiasma.

The optic nerve is covered with the meningeal sheaths, i.e. the piamater, arachnoid mater and duramater after it pierces the lamina cribrosa. These meningeal spaces are continuous with those in the brain. The total length of the optic nerve is 5 cm. [28]

It can be divided into four parts:

Intraocular: 1 mm

Intra orbital: 25 mm

Intracanalicular: 4 – 10 mm

Intracranial: 10 mm

OPTIC DISC:

It represents the optic nerve head. It has only nerve fibre layer so it does not excite any visual response so it is called as “blind spot”. It is a pink, oval or circular disc of 1.5 mm diameter. There is a depression in its central part, which is known as the “physiological cup”. It occupies the central 1/3 of the optic disc. Therefore the normal cup-disc ratio is 1:3 or 0.3. [28]

INTERIOR OF THE EYE:

Crystalline Lens:

The lens is a biconvex mass of peculiarly differentiated epithelium. It develops from an invagination of the epidermal epiblast of the fetus, so that what was originally the surface of the epithelium comes to lie in the centre of the lens, the peripheral cells corresponds to the basal cells of the epidermis. Just as the epidermis grows by the proliferation of the basal cells, the old superficial cells being cast off, so the lens grows by the proliferation of the peripheral cells. The old cells, however, cannot be cast off, but undergo changes (sclerosis) analogous to that in the stratum granulosum of the epidermis, and becomes massed together in the centre or nucleus. [28]

The lens is suspended by the suspensory ligament of the lens or zonule of Zinn, which is attached to the ciliary body and equator of the lens. The accommodative power varies with age, being 14 to 16 D (at birth), 7 to 8 D (at 25 years of age) and 1 to 2 D (at 50 years). The refractive index of the lens is 1.39 and thickness is about 4 mm. The radius of curvature on anterior surface is 10 mm approximately and 6 mm on posterior surface. It weighs 250 mg approximately. [28]

The parts of the crystalline lens are:

(i) Lens capsule.

(ii) Cortex

(iii) Nucleus

The lens capsule is a smooth, homogenous acellular envelop, secreted by the underlying epithelial cells. It is thicker anteriorly and

thinnest posteriorly. The cortex lies in between the lens capsule and the nucleus. It consists of lens fibres. The anterior cuboidal cells gradually become columnar and elongated towards the equator. Anterior and posterior Y shaped suture lines are formed at the junction of lens fibres. The lens has four nucleus, which are formed at different stages of life up to late adolescence namely embryonic nucleus (1 – 3 months of gestation), fetal nucleus (from 3 months of gestation till at birth), infantile nucleus (from birth to puberty) and adult nucleus (early adult life). [28]

Aqueous Humour:

The aqueous humour is a clear watery fluid filling the anterior chamber (0.25ml) and posterior chamber (0.06 ml) of the eyeball. In addition to its role in maintaining normal intra ocular pressure, it also plays an important role in providing nutrients and removing metabolites from the avascular cornea and lens. [28]

Aqueous humour is derived from the plasma within the capillary network of ciliary processes. For many years Leber's theory of simple filtration from the blood was generally accepted. However, the chemical analysis of the aqueous humour indicated that ultra filtration and secretion are involved in the formation of the aqueous humour. The system of semi permeable membranes separating the blood from the ocular cavity is known as the blood – aqueous barrier. [28]

The normal outflow of the aqueous humour takes place by two routes:

(i) Angle of anterior chamber (conventional route) – 80%.

(ii) Uveoscleral outflow (unconventional route) – 20 %

The conventional route of drainage is:

The Trabecular meshwork -------- Canal of Schlemm ------ Aqueous vein ------ Venous circulation.

The uveoscleral route of drainage is:

The ciliary body ------ Suprachoroid space ------ Venous circulation of ciliary body ------ choroid and sclera.

Vitreous Humour:

The vitreous is an inert, avascular, transparent, jelly like structure, which serves only optical functions. It consists of a delicate framework of collagen and hyaluronic acid. It is a hydrophilic gel, which becomes fluid when its protein base is coagulated due to advancing senile age, degenerations, chemical and mechanical trauma. [28]

The vitreous is attached anteriorly to the lens and ciliary epithelium in front of the ora serrata. It is known as the base of vitreous. Posteriorly, the vitreous is attached to the edge of the optic disc and macula lutea forming ring shaped structure around them. The vitreous undergoes significant physical and biochemical changes with ageing. At birth, the Cloquet's canal runs straight from the lens to the optic disc. It contains the primary vitreous. In young persons, the vitreous gel is homogenous but its fibres become coarse with the process of advancing age. In old age and in high myopes, the secondary vitreous liquefies (syneresis) and shrinks, producing a vitreous detachment, vitreous and retinal haemorrhage and retinal break. [28]

The vitreous forms one of the refractive media of the eye. The vitreous does not have any blood vessels. It derives nutrition from the surrounding structures like choroid and ciliary body. [28]

ANATOMY OF CONJUNCTIVA

The conjunctiva is a translucent mucous membrane which lines the posterior surface of the eyelids and anterior aspect of the eyeball. The name conjunctiva (conjoin : to join) has been given to this mucous membrane owing to the fact that it joins the eyeball to the lids. It stretches from the lid margin to the limbus and encloses a complex space called conjunctival sac which is open in front at the palpebral fissure. [28]

PARTS OF CONJUNCTIVA

Conjunctiva can be divided into the following parts:

1. Palpebral conjunctiva: marginal, tarsal and orbital.

2. Bulbar conjunctiva: scleral and limbal.
3. Conjunctival fornix: superior, inferior, lateral and medial.

1. **Palpebral conjunctiva**:

It lines the lids and can be subdivided into the marginal, tarsal and orbital conjunctiva.

a. Marginal conjunctiva extends from the lid margin to about 2 mm on the back of the lid up to a shallow groove- the *sulcus subtarsalis.* It is actually a transitional zone between the skin and the conjunctiva proper. At the sulcus subtarsalis, the perforating vessels pass through the tarsus to supply the conjunctiva. The sulcus is a common site for lodgement of a conjunctival foreign body. [28]

b. Tarsal conjunctiva is thin, transparent and highly vascular. It is firmly adherent to the whole tarsal plate in the upper lid. In the lower lid, it is adherent only to half width of the tarsus. The tarsal glands are seen through it as yellow streaks. Tarsal conjunctiva is a common site for the follicular and papillary reaction. [28]

c. Orbital part of palpebral conjunctiva lies loose between the tarsal plate and fornix. Orbital conjunctiva of the upper lid is loose and lies over the Muller's muscle. [28]

6) Bulbar conjunctiva :

It is thin, transparent and lies loose over the underlying structures and thus can be moved easily. It is separated from the anterior sclera by episcleral tissue and Tenon's capsule. Subconjunctival vessels and the anterior ciliary arteries forming the pericorneal plexus can be seen in the loose tissue under the bulbar conjunctiva. A 3 mm ridge of bulbar conjunctiva around the cornea is called *limbal conjunctiva*. [28]

In the area of limbus, the conjunctiva, Tenon's capsule and the episcleral tissue are fused into a dense tissue which is strongly adherent to the underlying corneo-scleral junction. It is the preferred site for obtaining a firm hold (fixaton) of the eyeball with the forceps during

ocular surgery. At the limbus, the epithelium of conjunctiva becomes continuous with that of cornea. [28]

7) Conjunctival fornix :

Conjunctival fornix is a continuous circular cul-de-sac, which is broken only on the medial side by caruncle and the plica semilunaris. Conjunctival fornix joins the bulbar conjunctiva with the palpebral conjunctiva. It can be subdivided into the superior, inferior, medial and lateral fornices.

1) Superior fornix: It extends from slightly above the upper border of the tarsal plate to a distance about 10 mm from the upper limbus and is thus located at the fascial sheath of the levator and superior rectus muscle is attached to the conjunctiva in the upper part of the superior fornix in the movements of upper lid. In the subconjunctival tissue of the superior fornix are present glands of Krause and Muller's muscle. A knife passed through the superior fornix, enters the fibrous tissue between the levator and superior rectus muscle. A foreign body lodged in the superior fornix can be seen after double eversion of the upper lid. [28]

2) Inferior fornix: It extends from slightly below the lower border of the lower tarsal plate to a distance about 8 mm from the lower limbus and is located near the inferior orbital margin. The extension of the fascial sheath of the inferior rectus and inferior oblique muscles are attached to the conjunctival fold in the lower fornix. It helps in maintaining the recess of the inferior fornix during movements of the lower lid. Glands of Krause are lodged in the subconjunctival tissue of the lower fornix. A knife passed through the lower fornix will enter the fibrous tissue between the inferior rectus and inferior palpebral muscle and on further push it hits the aponeurotic expansion from the inferior rectus and inferior oblique muscles. [28]

3) Lateral fornix: It is a small cul-de-sac which extends to just behind the equator of the eyeball and is about 14 mm from the lateral limbus and about 5 mm from the lateral canthus.

4) Medial fornix: It is a shallow cul-de-sac in which lie the caruncle and plica semilunaris dipped in the pool of tears called the 'lacus lacrimalis' or 'tear-lake'. [28]

Conjunctiva contains 3 layers

1. Epithelial layer - The layer of epithelial cells in conjunctiva vary from the region to region.
2. Adenoid layer - it is also called as lymphoid layer and consists of fine connective tissue reticulum in the meshes of which lie lympocytes.
3. Fibrous layer - It consists of a meshwork of collagenous and elastic fibres. It is thicker than the adenoid layer, except in the region of tarsal conjunctiva, where it is very thin. This layer contains vessels and nerves of conjunctiva.

THE CONJUNCTIVAL GLANDS

The conjunctiva contains two types of glands: the mucin secretory glands (goblet cells, crypts of Henle, glands of Manz) and the accessory lacrimal glands (glands of Krause and glands of Wolfring). [28]

Accessory structures of the eye:

a) Eyebrows:

Eyebrows are two arched ridges of the supra orbital margins of the frontal bone. They protect the eye ball from dust and other foreign bodies.

b) Eyelid & Eyelashes:

The eyelids are two movable folds of tissue situated above & below the front of each eye. There is short curved hair, the eyelashes situated on their free edges.

c) Lacrimal Apparatus: It consists of,

1. Lacrimal gland and its ducts

2. Accessory lacrimal glands
3. Lacrimal canaliculi
4. Lacrimal sac
5. Nasolacrimal duct

The tears are secreted by the lacrimal gland and accessory lacrimal glands. They drain into the conjunctival sac by small ducts. [28]

EXTRA OCULAR MUSCLES:

The eyeballs are moved by six extrinsic muscles, attached at one end to the eyeball and at the other to the walls of the orbital cavity. There are four straight and two oblique muscles. They consist of striated muscle fibres. Movement of the eyes to look in a particular direction is under voluntary control, but coordination of movement needed for convergence and accommodation to near or distant vision, is under autonomic control.

The extra ocular muscles are:

(i) **Medial rectus**: Rotates the eyeball inwards.

(ii) **Lateral rectus**: Rotates the eyeball outwards

(iii) **Superior rectus**: Rotates the eyeball upwards

(iv) **Inferior rectus**: Rotates the eyeball downwards.

(v) **Superior oblique**: Rotates the eyeball so that the cornea turns in a downward and outward direction.

(vi) **Inferior oblique**: Rotates the eyeball so that the cornea turns upwards and outwards. [28]

BLOOD SUPPLY TO THE EYE:

Arterial supply:

The eye is supplied by the short (about 20 in number) and long ciliary (2 in number) arteries and the central retinal artery. These are the branches of the ophthalmic artery, one of the branches of the internal carotid artery.

Venous drainage:

Venous drainage is done by the short ciliary veins, anterior ciliary veins, four vortex veins and the central retinal vein. These eventually empty into the cavernous sinus.

NERVE SUPPLY TO THE EYE:

The eye is supplied by three types of nerves,

1. The motor nerves.
2. The sensory nerves
3. The autonomic nerves.

1. The motor nerves:

(i) The 3rd cranial nerve (Oculomotor)

Levator palpebrae superioris

Superior division Superior rectus

3rd Nerve Medial rectus

Inferior division Inferior rectus

Inferior oblique

Branch to ciliary ganglion

Sphincter pupillae

Ciliary muscle.

(ii) The 4th cranial nerve (Trochlear): It supplies the superior oblique muscle.

(iii) The 6th cranial nerve (Abducent): It supplies the lateral rectus muscle.

(iv) The 7th cranial nerve (Facial): It supplies the orbcularis oculi muscle.

2. The sensory nerves:

The 5th cranial nerve (Trigeminal): The ophthalmic division supplies the whole eye.

3. The autonomic nerves:

1) The sympathetic nerve supply is through the cervical sympathetic fibres:

(i) Iris – Dilator pupillae muscle

(ii) Ciliary body

(iii) Muller's muscle in the lids

(iv) Lacrimal gland

(2) The parasympathetic nerve supply originates from the nuclei in the mid brain. It gives branches to:

i) Iris – Sphincter pupillae muscle

ii) Ciliary body

iii) Lacrimal gland [28]

Physiology of vision:

For vision to occur, the following conditions must be fulfilled; an image must be formed on the retina to stimulate its receptors (Rods & Cones), and the resulting nerve impulses must be conducted to the visual areas of the cerebral cortex for interpretation.

Formation of Retinal image:

Four processes focus light rays so that they form a clear image on the retina;

1) Refraction of light rays:

It is produced by refracting media of eye i. e. cornea, aqueous humour, lens & vitreous humour. In a relaxed normal eye the four refracting media together bend light rays sufficiently to bring to a focus on the retina the parallel rays reflected from an object 20 or more feet away.

2) Accommodation of lens:

Contraction or relaxation of the ciliary muscle affects lens shape. Contraction pulls the choroid layer closer to the lens; this in turn, loosens the tension of the suspensory ligament, allowing the lens to bulge. For near vision, the ciliary muscle is contracted and the lens is bulging, whereas for far vision the ciliary muscle is relaxed and the lens is comparatively flat. Continuous use of the eyes for near work produces eye strain because of the prolonged contraction of the ciliary muscle.

3) Constriction of Pupil:

Part of the accommodation mechanism consists of contraction of the circular fiber of the iris, which constrict the pupil. This prevents divergent rays from the object from entering the eye through the periphery of the cornea and lens. Such peripheral rays could not be

refracted sufficiently to be brought to a focus on the retina and therefore would cause a blurred image.

4) Convergence of eyes:

Convergence is the movement of the eye ball inward so that their visual axes come together, or converge, at the object viewed. The nearer the object, the greater the degree of convergence necessary to maintain single vision.

To achieve unified movement of the two eye balls, a functional balance between the antagonistic extrinsic muscles exit. For clear distance vision, the muscles must hold the visual axes of the two eyes parallel. For clear near vision, they must converge them. [28]

The role of photo pigments:

Both rods & cones contain photo pigments or light sensitive pigmented compounds in the presence of light, these chemicals undergo structural changes that result in the generation of nerve impulses, which the brain is able to interpret as sight.

a) Rods: The photo pigment in rods is named rhodopsin, it is so highly light sensitive that even dim light causes breakdown into opsin (a protein) and retinal A (vitamin A derivative). Light causes retina to change its shape and the opsin molecule to expand, or open. When opsin & retinal open and separate in the presence of light (A process called bleaching) active sites are exposed and an action potential is created in the rod cell. This signal then travels to the brain for interpretation. Objects are seen in shades of gray but not in colours. Energy is required to bring opsin back to its original shape and reattach retinal to it. Until this occurs, the photo pigment is unable to respond to light.

b) Cones:

Three types of cones are present in the retina. Each contains a different photopigment, erythrolabe, chlorolabe or cyanolabe. Cone photo pigmentations are less sensitive to light than rhodopsin, brighter light is necessary for their breakdown. [28]

Cones therefore function to produce vision in bright light. In addition, cones contribute more than rods to perception of sharp images. The reason for this difference involves the way in which information generated by the stimulation of rods & cones is “processed” before it reaches the brain.

Neuronal pathway of Vision:

a) Fibers that conduct impulses from the rods and cones reach the visual cortex in the occipital lobes via the optic nerves, optic chiasma, optic tracts and optic radiations.

b) Optic nerve contains fibres from only one retina, but optic chiasma contains fibres from the nasal portion of both retinas; these anatomical facts explain peculiar visual abnormalities that sometimes occur. [28]

[Gary A. Thibodeau & Kevin T. Patton. Anthonys textbook of Anatomy & Physiology, 14th edi. Alison Miller, USA.]

MYOPIA

Eye is an essential part of the body by which it forms image of an object on the light sensitive layer of retina. When the refractive condition of the eye is normal, the incident parallel rays from a distant object will fall on the retina exactly and there will be no refractive error. This condition is said to be Emmetropia. Thus an emmetropic eye will have a clear image of a distant object without any internal adjustment of its optics. While the axial length of most emmetropic eyes is approximately 24 mm, a larger eye can be emmetropic if its optical components are weaker, and a smaller eye can be emmetropic if its optical components are stronger.

Ametropia is a condition of refractive error, wherein the parallel rays of light coming from infinity, are focused either in front or behind the sensitive layer of retina, in or both meridia. The ametropia includes Myopia, Hypermetropia and Astigmatism. [31]

DEFINITION:

Myopia or Shortsightedness is a type of refractive error in which parallel rays of light coming from infinity are focused in front of the retina, when accommodation is at rest.

The first satisfactory definition of the condition was stated by Kepler in 1611 and Plempius in 1672, as they examined myopic eye anatomically and attributed the condition to a lengthening of its posterior part. The majority of cases result as variants in the frequency curve of axial length and of curvature, the former being more important although curvature myopia occurs commonly as a factor in astigmatism.

The word myopia is a Greek one which means “I close the eye”, introduced from the habit which short sighted people frequently have of half closing the lids while looking at distant objects, so that they may gain the advantage of stenopaeic opening (pin hole vision). [31]

PREVALENCE AND INCIDENCE:

The prevalence of myopia varies with age and other factors. When examined without the aid of cycloplegic agents, a significant number of infants are found to have some degree of myopia. Their myopia tend to decrease and most of those infants reach emmetropia by 2 – 3 years of age. The prevalence of myopia is high in premature babies.

Myopia of at least 0.50 D has a lower prevalence (< 5%) in 5 year old population than in any other age group. The prevalence of myopia increases in school age and young adult cohorts, reaching 20 – 25% in mid to late teenage population and 25 –35 % in young adults in developed countries. The prevalence of myopia declines somewhat in the population over the age 45 years, reaching about 20% in 65 years old and decreasing to as low as 14% of persons in their seventies. [31]

Reviews of the literatures on myopia identify some factors associated with prevalence. Some studies have found a slightly higher prevalence of myopia in females than in males. Though the sex appears to have an equal influence in the lower degrees, yet the females are more prone to higher degree of myopia and degenerative changes. The prevalence of myopia increases with income level and education attainment and it is higher among persons who work in occupations requiring a great deal of near work. [31]

Risk factors:

An important risk factor for simple myopia is a family history of myopia. Studies have shown 33 – 60% prevalence of myopia in children whose parents both have myopia. In children who have one parent with myopia, the prevalence was 23 – 40%. Most of the studies have found that when neither parent has myopia, only 6 – 15% of the children were myopic. A difference in prevalence of myopia as a function of parental history exists even for children in their first few years of school. [31]

Myopia that is revealed by non-cycloplegic retinoscopy in infancy and subsequently decreases to emmetropia before the child enters the school appears to be a risk factor for the development of myopia during

childhood. One analysis suggests that refractive error at school entry is a better predictor of who will become myopic in childhood than either parental history of myopia or the presence of myopia in infancy. Both children and young adults with refractive errors in the range of emmetropia to about 0.50 D of hyperopia are more likely to become myopic than the individuals of same age who have hypermetropia greater than about 0.50 D. Moreover, the risk for myopia is higher in children who have against the rule astigmatism. [31]

Some characteristics of the ocular accommodative and vergence systems may be risk factors for myopia development. These include esophoria at near, low positive relative accommodation and a more convergent position of the mid point between the near base in and base out fusional vergence ranges. Young adults with myopia have a more distant dark focus of accommodation than young adult with emmetropia or hypermetropia. Accommodative response to stimuli from a closer viewing distance or from added minus lens power is lower in persons with myopia and in children who are actively progressing towards more severe myopia than in persons with emmetropia or hyperopia. Decreased accommodative response for near point viewing detectable by more plus lens power on dynamic retinoscopy or the binocular cross cylinder test is a risk factor for myopia that is consistent with contemporary theories of development of myopia. The theories are based on studies of experimental animal models in which retinal image defocus can result in myopia. [31]

Doing a substantial amount of near work on regular basis can increase the risk of myopia. Myopia is associated with greater time spent reading and doing near work, better reading test scores, more years of education, occupation that requires a great deal of near work and greater academic ability. Steeper corneal curvature and ratio of axial length to corneal radius that is greater than 3.0 D may also be a risk factor. [31]

In children, conditions that prevent normal ocular image formation e g. Eyelid haemangiomas, neonatal eyelid closure, corneal opacity, retro

lental fibroplasias associated with retinopathy of prematurity and vitreous haemorrhage, often result in myopia. The relative severe disruptions result in a higher degree of myopia, which is usually pathological.

Statistical data shows that myopia of over 6 D represents 27 - 30% of the population and over 8 D represents 6 – 18 %. Myopia of higher degree is very common among the advanced races like Japanese, Americans etc. while it is uncommon amongst the Negroes. [31]

CLASSIFICATION OF MYOPIA:

1. BASED ON ETIOLOGICAL FACTORS:

The etiology is basically a disturbance of growth on which degenerative changes are superimposed. The part anterior to the equator will be normal. The increase in axial length may affect the posterior pole and the surrounding areas.

Mechanisms of production of myopia include:

1. AXIAL MYOPIA:

Results from increase in antero – posterior length of the eyeball. It is the commonest form and generally seen in,

a) Simple or Physiological Myopia which is common in Puberty.
b) Pathological Myopia.

2. CURVATURAL MYOPIA:

Occurs due to increased curvature of the cornea, lens or both.

It is seen in,

a) Keratoconus
b) Corneal Ectasia
c) Anterior Lenticonus
d) Posterior Lenticonus
e) Spasm of Accommodation
f) Anterior dislocation of the lens

3. INDEX MYOPIA:

Results from the increase in the refractive index of crystalline lens. It is commonly seen in,

a) Incipient Cataract

b) Nuclear Cataract or Sclerosis

c) Uncontrolled Diebetis

4. POSITIONAL MYOPIA:

It is produced by anterior placement of crystalline lens in the eye.

5. MYOPIA DUE TO EXCESSIVE ACCOMODATION:

Occurs in patients with spasm of accommodation.

2. BASED ON CLINICAL VARIETIES :

Myopia can be:

a. Congenital myopia

b. Simple or Developmental myopia

c. Pathological myopia

d. Acquired myopia

a. Congenital myopia:

It is a rare condition. Congenital myopia is present since birth; however it is usually diagnosed by the age of 2 – 3 years. It is seen more frequently in children who were born prematurely or with various birth defects, such as Marfan's syndrome and Homocystinuria. It is usually unilateral and manifests as anisometropia. It is usually associated with an increase in axial length and overall global size, associated with congenital convergent squint. Usually the error is about 8 to 10 Dioptres, which mostly remains constant. Congenital myopia may be associated with other congenital anomalies such as cataract, macrophthalmos, aniridia, megelocornea and congenital separation of retina. Unilateral congenital myopia is frequently discovered either by routine screening or after a strabismus develops because of associated amblyopia. [31]

Early correction of congenital myopia is desirable to help the child to develop normal distant vision and perception of the world. The prognosis for good vision and normal binocularity is poor in unilateral cases if the anisometropia and myopia are severe.

b. Simple myopia:

Simple myopia or developmental myopia is the commonest variety. There will be no degenerative changes in the fundus of the patients with

simple myopia. It is considered as a physiological error, not associated with any disease of the eye. It results from the normal biological variation in the development of eye, which may or may not be genetically determined. Inheritance is considered to be autosomal dominant. [31]

Simple myopia is rarely present at birth. Most of such patients are rather born hypermetropic but during development the normal mark is overshooted and the child becomes myopic. Simple myopia usually begins between the ages of 8 to 12 years and may increase during the years of growth until stabilising around the mid teens usually at about –5 D or less and never exceeds – 8 D.

Poor vision for distance (short sightedness) is the main symptom of myopia. Asthenopic symptoms may occur in patients with small degree of myopia. Symptoms of eyestrain develop due to dissociation between convergence and accommodation. Changes in the psychological outlook of the uncorrected myopic children are very common. A rough measure of the visual acuity of the myopic patient's vis-à-vis degree of myopia is as follows:

Visual Acuity	Degree Of Myopia
6/9 – 6/12	-0.50
6/18	-1.0
6/24	-1.50
6/36	-2.0
6/60	-3.0
4/60	-4.0
3/60	-5.0
2/60	-6.0

Etiology:

Some factors associated with Simple Myopia are as follows:

a) Axial type of simple myopia may signify just a physiological variation in the length of the eyeball or it may be associated with precocious neurological growth during childhood.

b) Curvatural type of simple myopia is considered to be due to underdevelopment of the eyeball
c) Role of diet in early childhood has also been reported without any conclusive results.
d) Genetics plays some role in the biological variation of the development of eye, as prevalence of myopia is more in children with both parents myopic (20%) than the children with one parent myopic (10%) and children with no parent myopic (5%).
e) Theory of excessive near work in childhood was also put forward, i.e. close work, watching television and by not using glasses. [34]

Clinical Picture of Simple Myopia:

1) Poor vision for distance
2) Asthenopic symptoms like headache, eyestrain, redness, watering may occur in patients with small degree of myopia
3) Half shutting of the eyes may be complained by parents of the child
4) Prominent eyeballs
5) Anterior chamber is slightly deeper than normal
6) Pupils are somewhat large and a bit sluggishly reacting
7) Normal fundus rarely temporal myopic crescent may be seen
8) Simple myopia does not exceed above -6 to -8 D

c. Pathological myopia:

Pathological myopia is a rapidly progressing error resulting in high myopia during early adult life, which is usually associated with degenerative changes in the eye. It is evident that the pathological myopia results from a rapid axial growth of the eyeball, which is outside the normal biological variations of development. So far no satisfactory hypothesis has emerged to explain the etiology of pathological myopia. However, it is definitely linked with heredity and general growth process.

1) Role of heredity:

It is now confirmed that genetic factors play a major role in the

aetiology as progressive myopia is familial, more common in certain races like Chinese, Japanese, Arabs and Jews; and uncommon among Negroes, Nubians and Sudanese.

It is presumed that heredity - linked growth of retina is the determinant in the development of myopia. The sclera due to its distensibility follows the retinal growth but the choroid undergoes degeneration due to stretching, which in turn causes degeneration of retina. (34)

2) Role of general growth process:

Role of general growth process cannot be denied in the progress of myopia. Lengthening of the posterior segment of the globe commences only during the period of active growth and probably ends with the termination of active growth. Therefore the factors such as nutritional deficiency, debilitating diseases, endocrinal disturbances and indifferent general health, which affect the general growth process, may also have some influence of the progress of myopia. (34)

The etiological factors for the progress of pathological myopia, according to some authors are:

A. Distension of Sclera:

(1) Distension of normal sclera mechanically:

a) Increased ocular pressure due to - Extra ocular muscles.
- Intra ocular muscles.
- Insidious chronic glaucoma.

b) Moulding of the globe by extra ocular muscles.

c) Traction of the choroids by the intra ocular muscles.

d) Traction of the optic nerve.

(2) Distension of the sclera weakened by:

a) Ocular congestion due to:
- Posture
- Severe manual labour
- Blocking of the circulation at the disc or the vertex veins.

- Cardio vascular diseases.
- Visual difficulties by increasing ocular congestion.
- Autolysis of the sclera.

b) Choroido – retinitis.

c) General deficiency diseases - Ca, Vit.D etc.

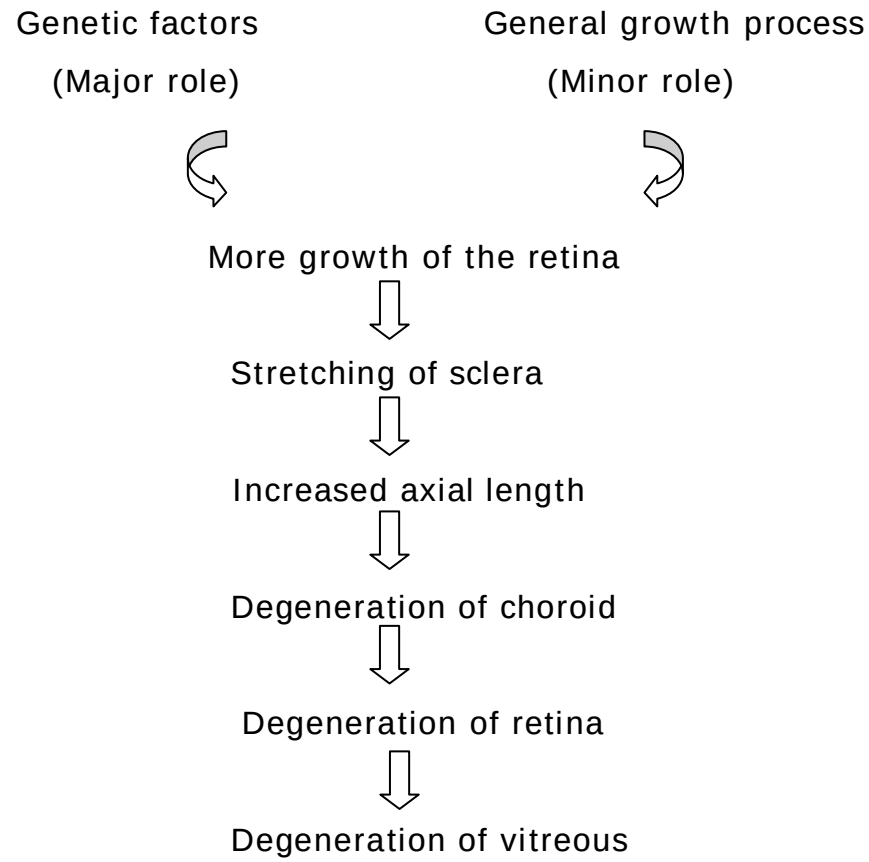
d) Endocrine disturbances – pituitary mainly

e) General debilitating diseases.

f) Intrinsic weakness of tissue. [34]

B. Genetically determined disharmony:

Genetically determined disharmony in growth among the ocular tissues, dominated by the retina, frequently combined with abiotrophic degeneration forming a multiple but usually related hereditary complex. The etiological hypothesis for pathological myopia can be summarized as follows:



Clinical picture of pathological myopia:

1) There is considerable failure in visual function as the error is usually high.
2) Many patients also complain of Muscae volitantes and floating black opacities in front of the eyes. These occur due to degenerated liquefied vitreous.
3) Night blindness may be complained by very high myopes having marked chorioretinal degenerative changes.
4) The eyes are often prominent in pathological myopia, appearing elongated and even simulating an exophthalmos, especially in unilateral cases. The elongation of eyeball mainly affects the posterior pole and surrounding area; the part of the eye anterior to the equator may be normal.
5) Refractive error increases by as much as 4 D yearly and usually stabilizes at about the age of 20 years, but occasionally may progress until mid 30's and frequently results in myopia of 10 – 20 D, may even progress to 30 – 40 D.
6) Posterior staphyloma due to ectasia of sclera at posterior pole may be apparent as an excavation with the vessels bending backward over its margins.
7) Degenerative changes in vitreous include liquefaction, vitreous opacities and posterior vitreous detachment appearing as Weiss's reflex.
8) Visual fields show contraction and in some cases ring scotoma may be seen.
9) Electroretinography reveals subnormal electroretinogram due to chorioretinal atrophy.
10) Optics disc appears large and pale and myopic crescent is present at its temporal edge.
11) Degenerative changes in retina and choroid are common. These are characterized by white atrophic patches at the macula with a little heaping up of pigment around them. Subretinal

neovascularization and choroidal haemorrhage may be present at the macula. [34]

Complications of pathological myopia:

1) Retinal detachment
2) Complicated cataract
3) Vitreous haemorrhage
4) Choroidal haemorrhage
5) Strabismus fixus convergence
6) Nuclear sclerosis
7) Chronic simple glaucoma

d. Acquired Myopia:

Myopia is seen as acquired in the following conditions:

(1) Index myopia:

It is seen in:

- Nuclear sclerosis
- Incipient cataract
- Diabetic myopia

In all these cases, there may be changes in the refractive index of the lens. [34]

(2) Curvature myopia:

It develops in pronounced cases of a true increase of corneal curvature in diseased conditions such as corneal ectasias and keratoconus. Rarely curvatural myopia may also develop due to increase of lenticular curvature in conditions such as lenticonus anterior and lenticonus posterior.

(3) Positional myopia:

It may occur in conditions producing anterior subluxation of the lens.

(4) Consecutive myopia:

It may occur following surgical over correction of hypermetropia and pseudophakia with over correcting intra ocular lens. [34]

(5) Pseudo myopia:

It is also called as artificial myopia, may be produced in conditions such as excessive accommodation and spasm of accommodation.

Artificial myopia also develops after too full a hypermetropic correction in children.

(6) Space myopia:

This condition is experienced when the individual has no stimulation for distance fixation. The eyes tend to choose a near fixation plane, which can be variable. The degree of myopia due to this condition is never more than 0.75 to 1.5 dioptres. It is particularly troublesome to aviators when flying in cloud or at night.

(7) Night myopia or twilight myopia:

The shift from photopic to scotopic vision at twilight is associated with increased sensitivity to the shorter wavelengths of light.

The emmetropic eye, if accommodated for the middle range of visual spectrum will be slightly myopic for the shorter wavelengths.

(8) Drug induced myopia:

May be seen in patients using cholinergic drugs such as pilocarpine, echothiophate and di-isopropyl flourophosphate. Steroid induced myopia may occur because of water metabolism changes involving the crystalline lens. Sulphonamides may also produce myopia for the same reason and cause slight changes in the refractive indices of the media. [34]

3. BASED OF DEGREES OF MYOPIA :

A.Mild Myopia - < -3.00 diopters

B. Moderate Myopia - -3.00 to -6.00 diopters

C.Severe Myopia - -6.00 to -9.00 diopters

D. Extreme Myopia - > -9.00 diopters

4. BASED ON AGE :

With respect to the age in which myopia appears first four categories of myopia have been defined (Grosvenor T., Goss D.A.,1999).

A. Congenital myopia

It exists already at birth and stays through the whole life. 1-2% of the population is affected by this category.

B. Youth-onset myopia

It starts between age 5 and 20. In the late teens e.g. in USA about 20% of the population is affected by this category.

C. Early adult-onset myopia

It starts between age 20 and 40. About 8% of the population is affected by this category.

D. Late adult-onset myopia

It starts after age of 40 years. In general the earlier the myopia appears, the higher are the Diopter values it will reach. But on the other hand, "myopia progression can stop at any time transiently or permanently".

Optics of Myopia:

1) Optical system of a myopic eye is too powerful for its axial length.
2) Image of distant object on the retina is made up of the circles of diffusion formed by the divergent beam.
3) Far point of the myopic eye is a finite point in front of the eye.
4) Nodal point in myopic eye is further away from the retina.
5) Angle alpha of the eye may be negative resulting in an apparent convergent squint.
6) Accommodation in uncorrected myopes is not developed normally, since they need not accommodate to see the near objects clearly. [34]

EARLY DETECTION AND PREVENTION:

Reduced unaided visual acuity is a possible indication of myopia, particularly when unaided near visual acuity is normal or better than unaided distance acuity. Myopia can be detected by visual acuity testing, retinoscopy, autorefraction or photorefraction during vision screening or

clinical examination. The modified clinical technique, one of the most common vision screening test batteries includes visual acuity, ophthalmoscopy, retinoscopy and a cover test. Some screening programs include autorefraction or photorefraction rather than retinoscopy. Patients or their parents should be cautious that screenings do not substitute for a comprehensive eye and vision examination, visual acuity testing, retinoscopy, autorefraction, or photorefraction alone can not distinguish among the types of myopia. [34]

There is no universally accepted method of preventing myopia. However, some clinicians identify near point vision stress as a possible contributor to the development of simple myopia. When presented with signs of near point vision stress, such as distance blur, poor accommodative facility and refraction at about plano, some clinicians recommend regimens such as the following.

• Plus power lenses in simple vision or bifocal form for reading and near work, as indicated by phoria, relative accommodation or other findings.

• Vision therapy or orthoptics to eliminate deficiencies in accommodation and vergence function. [34]

PARENTS SHOULD BE CAUTIOUS:

1) While reading or writing, whether the child keeps the book very near to the eyes?

2) After keeping the notebook on floor, whether child does the writing after bending down?

- If it is so, that child is having poor vision and he/she needs spectacles.

1) While seeing at distant objects or while reading and writing, does the child squeezes the eyes?

2) While going out, distant shop boards, bus boards, which you can read easily, whether the child feels it difficult in reading or can't read?

- In both the conditions, the child might be suffering from myopia.

1) After coming from school or after homework, if the child repeatedly complaints of headache Or After seeing film or TV, if she/ he is oftenly complaining of headache?

- Definitely he/ she is suffering from dimness of vision and needs to be checked for spectacles.

1) If child's eyes are not appearing of normal size or protruding outside and looks deviated inward?

- Definitely child is having very poor vision, and his/ her life will be limited to one room only, if he/she is not using spectacles; as he may be suffering from high myopia.
- If mother and father both are suffering from myopia, then there are 75% chances of child also having myopia. In such case when the child starts reading or writing work, his/her visual acuity should be checked by the doctor. (37)

TO BE OBSERVED BY TEACHERS:

1) If the child sitting in central or back seat and complaints that he/she can't read the average size and clear words on the blackboard. But the same child can read even very small sized letters from the books without much difficulty.

- If such is the case, he is mostly suffering from shortsightedness.

2) If you observe carefully, you may find:

- Such children are generally more intelligent in comparison to others.
- Such children are fond of reading books.
- Such children may not show interest for outdoor games like cricket, hockey, football, kite flying etc. but they take more interest in indoor games.
- If child is having affinity towards art and music, then definitely he is more capable of getting perfects in music and art as compared to other children.
- Even after learning the alphabets or writing work in higher standard, if the child instead of looking on the blackboard, if he/she peeps in nearby students notebook then mostly he/she is having poor vision for distance and easily copies from nearby student.
- In such case, teacher may feel that child is not concentrating or talking with other students but fact is that he/she is suffering from short

sightedness. So it is the duty of the teacher to inform the parents at the earliest. [37]

Courtesy – Dr. Piyush. D. Matalia - Broad based screening of the refractive errors in children (especially primary school children) – 1997.

PROGNOSIS:

Low or moderate degrees of simple myopia, unless occurring in young children, have a good prognosis. They are not likely to progress, and in some of the conditions of civilised life they may even be an advantage to the individual. The same condition in a child before the age of six or seven should give rise to anxiety, if it is not of the congenital type, since the degenerative condition is clinically indistinguishable from the simple at this stage. The former is of grave prognosis, because it is almost certain to progress so that eventually there may be 10 or 15 D of myopia or more, accompanied by serious degenerative changes in the fundus and defects of vision. The likelihood of these developments must be judged by the acuity of vision after correction, the condition of the fundus and the evidence of heredity. [37]

TREATMENT OF MYOPIA:

The management aspect of myopia can be looked up in 2 ways –

A. Prophylactic management

B. Therapeutic management

A. Prophylactic Management:

As the pathological myopia has a strong genetic basis, the hereditary transfer of disease may be decreased by advising against marriage between two individuals with progressive myopia. Their need no restraint on marriages and procreation among simple myopes.

The parent with degenerative myopia should be warned that any offspring would be liable to the same disability according to the law of recessive Mendalian inheritance.

Two highly myopic adults with degenerative fundus should never – from medical point of view have children. [34]

The children of such parents should be closely supervised from their earliest year and if an increase in refractivity appear to evolve more rapidly than would be normally expected. They should be treated as if they were pathological myopes, particularly if the early clinical signs suggestive of degenerative myopia appear.

1. General Hygiene:

General health should be maintained including balanced diet rich in Vitamins and Proteins, fresh air and early management of associated debilitating disease.

2. Visual Hygiene:

It is very important to avoid asthenopic symptoms. Care needs to be taken for a proper posture and adequate illumination during close work. The clarity of the print should be good to avoid undue ocular fatigue. [34]

3. Eye Exercises:

Various centers in India as well as in abroad advocate the eye exercises as mentioned by Dr. Bates of New York. This type of vision therapy is called **orthoptics,** in which there is the use of eye exercises to improve the vision. The four basic exercises are –

Palming:

Eyes covered by palms (no pressure on the eyes); fingertips at hairline; fingers overlapped to allow breathing room for your nose. Elbows resting on table, chair back, pillow, etc. Relax, feel your eyes give up the tension of trying to see. Let yourself go as much as you can. Let go into what you may be seeing; keep breathing. Memorize the feeling of palming. To be done especially before doing a visual task such as reading.

Swinging:

Rotate your body from left to right and back.

Eyes, torso and head move together. Turning mostly around your waist. Don't look at anything as you swing; be aware of movement mainly. Let your eyes go, let your consciousness stay in front of you while you turn. Make sure to keep breathing.

Sunning:

Face the sun, eyes closed. Allow the warmth of the sun to penetrate deeply in your eyes and forehead. Relaxely turn your head from side to side. Keep breathing. Feel the position of the sun.

Blinking and Breathing:

Beware of the stare. We lock ourselves into a stare, eyes immobile and breath stopped. Spaced. Blink your eyes rapidly as you take two big breaths whenever you become aware of your eyes or breath. [38]

Other exercises are –

Reading fine print: in candle light and in good light.

Game of ball: by throwing a tennis ball from one hand to the other hand following its movements with blinking after each catch.

Vapour and cold pack: Steam vapour was to be inhaled with blinking of the eyes for 2 – 3 minutes. Two cotton pads dipped in cold water were kept over the closed eyelids for 10 minutes.

These exercises should be preferably done in early morning hours from 30 seconds to 10 minutes. These relaxation exercises have their more significant effect in increasing visual efficacy.

Treatment consists in wearing suitable correcting spectacles and attention to the hygiene of the eye. Each case must be considered on its merits. [38]

Medical (Pharmaceutical) treatment:

Cycloplegic agents are sometimes used to reduce accommodative response as part of the treatment of pseudo myopia.

Some studies have reported that daily topical administration of atropine and cyclopentolate reduces myopia progression rates in children with youth-onset myopia. However, this benefit does not seem to out weight the discomfort and risks associated with chronic cycloplegia.

The associated pupillary dilatation results in light sensitivity. Because of the inactivation of the ciliary muscle, high plus lens additions (i.e., 2.50 D) are required for near vision. In addition to potential allergic reactions,

idiosyncratic reactions, and systemic toxicity, chronic application of atropine can have adverse effects on the retina. [34]

B.Therapeutic Management:

a) Optical treatment

b) Surgical treatment

1. Optical treatment:

Optical treatment of myopia constitutes prescription of appropriate concave lenses, so that clear image is formed on the retina. Conversely to hypermetropia, the minimum acceptance providing maximum vision should be prescribed in myopia; every surgeon agrees that myopia must never be over-corrected. In low myopia, up to 5 or 6 D, no harm is done by ordering the full distance correction for constant use, and if this is done the patient must be warned not to hold near work closer than ordinary reading distance. Many surgeons order lenses weaker by 2 or 3 D for near work with a view to diminishing accommodation.

Children, especially those below 8 years of age, should be fully corrected and instructed to use their glasses constantly, both to avoid developing the habit of squinting and to enhance developing a normal accommodation – convergence reflex. It must be impressed upon the patient that, in the matter of near work the glasses are not meant to improve the vision but to make him read at proper distance and to keep his eyes in proper relationship.

Adults, under the age of 30 years, usually accept full myopic correction. However, those above 30 years of age are not able to tolerate a full correction over 3 D if they have never worn glasses as their ciliary muscles are not accustomed to accommodate. So, such patients may be prescribed less than full correction with which patients have comfortable near vision with resulting under-corrected distance vision. The patients should be told that a full correction might be given in the future; if desired. Adults need not wear their correction constantly in the absence of symptoms provided they resign themselves, when they do not wear spectacles, to their poor vision and do not impose the strain upon their

eyes of attempting to see the difficult or impossible. In low degrees of error, spectacles for near work are rarely required after the presbyopic age. [34]

In high myopia, it is advisable to under-correct even for distance, and the same or still weaker lenses may be ordered for near work. Usually an under-correction to the tune of 1 to 3 D or even more may be required depending upon the age of the patient and degree of myopia. Under-correction is always better to avoid the problem of near vision and that of minification of images. In the highest grades the patient often sees best with lenses, which are decidedly weaker than the full correction; he should be allowed to choose those he prefers. One reason is that strong minus lenses considerably diminish the size of the retinal images and make them very bright and clear. The retinal images are diminished because the lenses have to be worn further from the eye than the anterior focal plane; spectacles for high myopia should therefore be made to fit as closely to the eyes as possible. The very bright clear images are uncomfortable because the retina has become accustomed to large and indistinct images. Moreover, looking obliquely through strong lenses produces much artificial astigmatism and therefore distortion of the image.

Modes of prescribing concave lenses are spectacles and contact lenses. Their advantages and disadvantages over each other are to be taken into consideration.

Contact lenses are particularly justified in cases of high myopia as they avoid peripheral distortion and minification produced by strong concave spectacle lens. It is important to note that a myope wearing a full contact lens correction needs more accommodation for near work as compared with a spectacle wearer. So, they develop presbyopia comparatively earlier. [34]

Disadvantages of spectacles:

Includes less desirable cosmetic value, less convenience and dependency on mechanical devices which can be broken or misplaced.

Major optical drawback is the minification of the image. There is 2% minification for every diopter of spectacle power. Difficult to handle for children and sports persons. Accidental breakage and "scratching" more common. Provided limited field of peripheral vision. Social stigma specially in children Peripheral distortion specially in high powered lenses.

Disadvantages of contact lenses:

Problems including high maintenance care solutions, corneal warpage, corneal suffocation, corneal infections, corneal ulcerations and eyelid allergies. Require more maintenance (or meticulous maintenance). Chances of infection in the eye are more common if cleanliness is inadequate. Require better hand-eye co-ordination while wearing. Uncomfortable to use in dusty, humid, or polluted environments, or in the presence of chemical fumes, etc. [34]

2. Surgical treatment:

Surgical treatment of myopia is becoming very popular now a days. It should be performed after the error has stabilised, preferably after 20 years. Many surgical techniques have been developed over the years. These include,

- Radial Keratotomy [RK]
- Photorefractive keratectomy [PRK]
- Laser in-situ Keratomileusis [LASIK]
- Extraction of clear crystalline lens
- Intracorneal rings
- Phakic intraocular lenses

i. Radial Keratotomy:

To correct myopia, Radial Keratotomy was introduced by Sato in Japan in 1940.

Radial keratotomy, as today, refers to making deep (90% corneal thickness), radial incisions in the peripheral part of cornea leaving about 4 mm central optical zone. These incisions on healing flatten the central cornea, thereby reducing its refractive power. The most accepted theory

hold that normal intraocular pressure (IOP) pushes the peripheral cornea weakened by the incisions, leaving a relatively flatter centre. This procedure gives good results in low to moderate myopia (-1.0 D to–6 D).

Disadvantage of Radial Keratotomy:

• Cornea is weakened, so chances of globe rupture following trauma are more after RK than after PRK.

• Rarely, uneven healing may lead to irregular astigmatism.

• Patients may feel glow at night. [32,33]

With the advent of LASIK and PRK, the RK is becoming less popular now-a-days.

ii. Photorefractive Keratectomy [PRK]:

Photorefractive keratectomy (PRK) is a procedure of photoablation by excimer laser which has been in use for the treatment of myopia. Excimer laser ablation leads to extremely smooth contour of cornea, which is not possible even with the highest quality microtomes used for lamellar keratectomy. The PRK also gives good results for – 2 D to – 6 D of myopia. In this technique, to correct myopia, a central optical zone of anterior corneal stroma is photoablated using excimer laser to cause flattening of the central cornea.

Disadvantages of PRK:

Longer recovery and more postoperative discomfort than with radial keratotomy or LASIK. Possible corneal haze and scarring. More expensive than radial keratotomy. [32,33]

iii. Laser in-situ Keratomileusis [LASIK]:

Laser in-situ keratomileusis [LASIK] is keratorefractive surgery that combines the precision of excimer laser photoablation with the advantages of an intrastromal procedure that maintains the integrity of Bowman's layer and the overlying corneal epithelium. It requires greater surgical skills and the use of sophisticated and expensive mechanical equipments. LASIK can be used to correct upto –13.0 D of myopia and upto – 6.0 D of astigmatism. [32,33]

In this procedure, several automated microkeratomes have been developed to perform a uniform homogenous planar cut on the corneal surface. The aim is to cut a corneal disc of precisely calculated thickness and diameter with a sufficient hinge to maintain its position and apposition during replacement.

The advantages of LASIK over RK and PRK are:

1. Minimal or no post operative pain.
2. Recovery of vision is very early as compared to PRK.
3. No or little risk of perforation during surgery and later rupture of globe due to trauma unlike RK.
4. No residual haze unlike PRK where sub epithelial scarring may occur.
5. LASIK is effective in correcting high myopia of – 6 to – 30 D. [32,33]

Disadvantage of LASIK:

It is more expensive than other treatment modalities. Corneal flap complications are common. Surgical complications are bound to be.

iv. Extraction of clear crystalline lens:

Extraction of clear lens had been advocated for myopia of – 16 to – 18 D, especially in unilateral cases, even before the IOLs became popular. Now-a-days many surgeons prefer to treat myopia of – 16 to – 30 D with clear lens extraction by phacoemulsification with appropriate IOL implantation [Fucala's operation].

With phacoemulsification, recovery is very early, continuous curvilinear capsulorrhexis offers good IOL centration, a posterior chamber IOL hugs the posterior capsule and thus chances of opacification are reduced. Therefore, now it is accepted that a zero power IOL is better than no IOL, since it not only retards posterior capsule opacification but also minimizes the incidence of retinal detatchment. [32,33]

v. Intracorneal ring implantation:(Intacs)

Intracorneal ring (ICR) implantation into the peripheral cornea at approximately 2/3 stromal depth is another refractive corneal surgery being considered recently for the correction of myopia. It results in a

vaulting effect that flattens the central cornea, decreasing myopia. The ICR procedure has the advantage of being reversible.

Disadvantages:

• Currently, intacs does not safely correct astigmatism, actually inducing 10 or more of astigmatism in 20% of eyes.

• The technology is limited for use in low to moderate myopia only. [32,33]

vi. Phakic intraocular lenses:

In this refractive surgery, an intraocular lens of appropriate power is implanted inside the eye, without touching the normal crystalline lens, thus without disturbing the accommodation. Because of the potential complications, this approach is not much popular for correcting refractive errors. [32,33]

Other procedures for correcting myopia are:

1. Low vision aids:

Low vision aids are indicated in patients of progressive myopia with advanced degenerative changes, where useful vision cannot be obtained with spectacles and contact lenses. [34]

2. Orthokeratology:

It is a non-invasive procedure that involves the wearing of a series of specially designed rigid contact lenses to progressively reshape the curvature of the cornea over time. The last set of lenses become 'retainers' that the patient wears for a limited time each day to maintain the new corneal shape. Some eye care providers use special names, such as "Precise corneal molding" (PCM) or "Controlled Kerato-reformation" (CKR) to refer to their method of performing Ortho – Keratology. [34]

3. Pinhole glasses:

Pinhole glasses also known as stenoptic glasses are not made of glass at all, but of an opaque substance such as metal (or) plastic. These work on same principle used in the camera to increase the depth of focus by decreasing the aperture. These glasses could be a major tool in preventing myopia also. These pinholes can be used to prevent myopia and even improve the vision of myopia to some extent by relaxing the

ciliary muscle spasm when it exists. When used for reading or other close work, pinholes reduce the amount of accommodation or focusing power that the eye must use to see clearly. Pinholes can not replace prescription glasses in every situation. People with over 6 diopters of myopia will probably not find pinholes useful, because pinholes can not eliminate all of the blur. [34]

4. Myopter viewer:

The development of the Myopter viewer was based upon the belief that acquired myopia is caused by an excessive amount of close work resulting in a ciliary muscle spasm (or, in other words, a change in the relaxation level of accommodation), followed by an increase in axial length. The instrument does not merely treat symptoms, but instead attempts to eliminate the cause. [34]

Principle of myopter viewer:

It appeared that accommodation, convergence and stereopsis are the three factors which would have to be closely controlled, since they were normally minimal for distance vision and increase more or less in proportion to each other as the viewed object approaches the eyes. The viewer was designed therefore to reduce these three factors as much as possible.

The Myopter viewer is an instrument with a lightweight plastic housing containing lenses and mirrors, and it is worn instead of glasses for close work. Light coming from the viewed object enters the single opening at the front of the viewer and is split by a beam-splitter into two identical parts. A beam-splitter is a mirror with a special coating which only reflects half of the light, which strikes its surface. Thus half of the incoming light is reflected 90 degree at the beam-splitter, and is again reflected 90 degree by a mirror into the left eye. The other half of the light passes through the beam-splitter and is reflected by two other mirrors into the right eye. The two beams emerging from the instrument are parallel, and the axes of the eyes must also be parallel. Convergence is eliminated and each eye therefore sees an identical picture.

The accommodation is eliminated by selecting the proper Myopter lenses for the distance usually used for the near point tasks.

For the average person, this means selecting lenses which are about 3D more positive than the distance correction, if one is used. This brings the far point into 1/3 meter. [34]

CONCLUSION:

Myopia is a common refractive condition that can affect clarity of vision, limit occupational choices, and contribute to increased risk for vision threatening conditions. The major symptoms of myopia (blurred distance vision) and the major sign (reduced unaided distance visual acuity) can generally be improved with appropriate minus power lenses.

Simple myopia is much more common than other types of myopia. The usual treatment for simple myopia is optical correction (i.e. the Prescription of minus power spectacle lenses or contact lenses to restore distance visual acuity). Other treatment options include myopia control to reduce the rate of myopia progression in patients whose myopia is increasing or myopia reduction in patients whose myopia has stabilised. Myopia control with rigid contact lenses does not appear to reduce vitreous chamber elongation, nor does myopia reduction with corneal modification procedures alter existing axial elongation that has already occurred. This does not decrease the risk for the posterior segment sequelae of myopia.

The treatment for nocturnal myopia is to prescribe minus power correction for night seeing only, to compensate for the dark focus of accommodation. The management for pseudo-myopia involves eliminating the accommodation excess responsible for the pseudo-myopia. Degenerative myopia is more severe than other forms of myopia and is associated with retinal changes, potentially causing loss of visual function. The management of degenerative myopia includes correction with minus lenses to improve distance vision and monitoring retinal and ocular changes. Because various agents and conditions can induce

myopia, the treatment of induced myopia should be tailored to the specific inducing agents or conditions.

The examination of the patients who have any of the forms of myopia should include a comprehensive patient history, measurement of refraction, investigation of accommodation and vergence function, and evaluations of ocular health. The patient should be advised available treatment options and counseled regarding the need for follow up study.

MATERIALS AND METHODS

DRUG REVIEW

The word drug is derived from the French word “Drogue”, which means dry herb. Drug can be defined as “Any substance or product that is used or intended to be used to modify or explore physiological systems or pathological states for the benefits of the recipient” (WHO). This definition appears more in compliance with the terms of *Ayurveda*, which aims at the preservation of good health apart from mitigation of disease.

Drug is main armour of a doctor against disease. As, it is said to be the second most important factor of ‘*Chikitsa Chatushpada’*. According to *Acharya Charaka*, patient’s ailment should be thoroughly explored first, to get proper knowledge about particular pathological involvement, and then the decision of appropriate drug should be done which counters the process of the disease *(Ch. Su. 20/20).* [2]

According to *Acharya Vagbhatta*, selection of a drug is based on many subtle factors that are involved in the pathogenesis of that particular disease, as the treatment is nothing but only *Samprapti Vighatana*.

According to *Ayurveda*, drug or diet article that reverses or break the *Samprapti* is ideal. It is often the total effect of all the ingredients in the formula rather than the action of individual drugs that plays a vital role in therapeutics.

The comprehensive knowledge of the drug is of prime importance to physician “at par with the knowledge of the disease and its diagnosis”. For it is said that, the efforts of physician who has the sound knowledge of pathology and pharmacology with due consideration of place, time and quantum will never be fruitless. Drug combinations are envisaged to

serve synergistic action, combined action, toxicity neutralizing action, rejuvenation of body tissues and specific action.

Ayurvedic literature speaks about the importance of the drug "nothing in the world exists, which does not have therapeutic utility". Taking this fact into consideration, *Ayurvedic* physicians have formulated single as well as compound drugs for the cure and prevention of various ailments.

The drug having *Chakshushya* property might be helpful for treating the disease *Timir*. So, here *Shatawari Ghrita* is taken for systemic use and for *Tarpana Karma* for the present study.

Shatawari

शतावरी बहुसुता भीरुरिन्दीवरी वरी ।
नारायणी शतपदी शतवीर्या च पीवरी ।।
महाशतावरी च्यान्या शतमुल्युर्ध्वकण्टिका ।
सहस्त्रवीर्या हेतुश्च ऋष्यप्रोक्ता महोदरी ।।
शतावरी गुरुः शीता तिक्ता स्वादी रसायनी ।
मेधाऽग्निपुष्टिदा स्निग्धा नेत्र्या गुल्मतिसारजीत ।।
शुक्रस्तन्यकरी बल्या वातपित्तास्तशोथजित ।
महाशतावरी मेध्या ह्रुद्या वृष्या रसायनी ।।
शीतवीर्या निहन्त्यर्शोग्रहणी नयनामयान् ।
तदकरास्त्रिदोषघ्नो लघुरर्शः क्षयापहा ।।

[B. P. Ni. Guduchyadi Varga 184-188]

Synonyms –

Shatawari, Shatapadi, Bahusuta, Atirasa, Bhiru, Indivari, Vari, Mahodari, Narayani, Shataveerya, Pivari, Shatamooli, Urdhwakantika, Rishyaprokta.

Botanical name – ***Asparagus racemosus*** Willd.

Family – Liliaceae

Distribution: Tropical and subtropical India

Shatawari is an indigenous medicinal plant used in *Ayurveda*, *Siddha* and Homoeopathy medicines.

It is estimated that in India, more than 500 tonnes of S*hatawari* roots are needed every year for various medicinal preparations.

Vernacular Names:-

English – Willd asparagus

Sanskrit - *Shatmuli*, *Shatawari*

Marathi - Shatamuli,Shatawari, Asvel, Zatar

Hindi - Shatawar, Shatawari

Tamil - Shimai-shadawari, Ammaikodi, Kilwari

Telgu - Challagadda, Pilligadalu, Kilwari

Kannada - Majjige-gedde, Aheru balli, Makkala

Gujarathi - Saatawari, Ekalakanto

Bengali - Satamuli

Malayalam - Shatawali, Shatawari

Urdu – Shatawari, Satawara

Panjab – Shatawar, Bozidan

Sindhi – Shatawariya

Farsi – Surjasasti

Arabic – Shaguagul

Burma – Kanyomi

Nepal - Shatamuli

Classical Categorization -

Charaka – Balya, *Prajasthapana*, *Vayasthapana*.

Sushruta – Vidarigandhadi, *Varunadi*, *Kantakapanchmoola*.

Vagbhatta – Vidaryadi, *Varunadi*.

***Ayurvedic* Properties -**

Rasa – Madhura, *Tikta*

Guna – Guru, *Snigdha*

Veerya – Sheeta

Vipaka – Madhura

Srotogamitva-

Dosha – *Vatapittakaphashamaka*.

Dhatu – *Rasayani*, *Medhya*, *Shukravrudhikar*, *Raktagami*.

Mala - *Purish samgrahani*

Avayava – *Netrya*, *Aamashaya*, *Pittashaya*, *Hrudya*.

Rogaghnata - *Apasmara*, *Murchha*, *Amlapitta*, *Hridroga*, *Raktapitta*, *Drishtimandya*, *Daurbalya*.

Parts used - Tuberous root, Leaves, Infloroscence

Major Chemical Constituents -

Root - Sapogenin, 4 saponins, Shatavarin I to IV, Sitosterol, two spirostanolic, Polycyclic alkaloid, asparagamine A,disaccharide

Flower & Fruit - Sarsapogenin, Saponins A4 – A7, hyperoside

Leaves - Diosgenin

Karma-

Vedanasthapana, *Medhya*, *Raktapittashamaka*, *Rasayana*, *Chakshushya*, *Pittashamaka*, *Shukrala*, *Mootrala*.

Actions and uses –

Shatawari is a versatile traditional plant used for variety of diseases. The Asparagus genus is considered to be of medicinal importance because of the presence of steroidal saponins and sapogenins in various parts of the plant. A recemosus is commonly mentioned as a *Rasayana* in *Ayurveda*. *Rasayana* are those plant drugs which promotes general well being of an individual by increasing cellular vitality or resistance.

In recent study by Sharma *Shatawari* is shown to possess anabolic properties viz. growth promotion.

The roots are bitter, sweet, emollient, cooling, nervine tonic, constipating galactagogue, ophthalmic, rejuvenating nutritive, tonic, carminative, and appetiser. They are useful in nervous disorders, burning sensation, ophthalmopathy, burning micturition, cardiac debility and hypertension.

Pharmacological activities –

Nematicidal, anti cancer, anti dysenteric, anti fungal hypotensive, anticoagulant, phagocytic, enzymatic. [23,24,35,36]

Shatawari:

Go-Ghrita

गव्यं घृतं विशेषेण चक्षुष्यं वृष्यंऽग्निकृत ।
स्वादुपाककरं शीतं वातपित्तं कफ़ापहम ।।
मेधालावण्यकान्त्योजस्तेजोवृद्धिकरं परम् ।
अलक्ष्मिपापरक्षोघ्नं वयसः स्थापकं गुरु ।।
बल्यं पवित्रमायुष्यं सुमगंल्य रसायनम् ।
सुगन्धं रोचनं चारु सर्वाज्येषु गुणाधिकम् ।। *[B. P. Ni. Ghrita Varga 1-4]*

The *Goghrita* especially having *Chakshushya*, *Vrishya*, *Agnivardhaka*, *Madhura vipaka*, *Sheeta veerya* and *Tridoshashamaka* properties. It is recommended to treat the eye diseases. It is *Medhavardhaka*, *Kantivardhaka*, *ojovardhaka*. *Alakshminashaka*, *Paapanashaka*, *Vayahsthapaka* and *Guru*. It is also *Balya*, *Ayuvardhaka*, *Rasayana*, *Pavitrakaraka* and *Mangalya*. It has *Sugandhya* and *Rochana* properties.

Ghrita is one among the best *Ajasrika Rasayanas*. It is supreme in the *Snehana Dravyas* while *Goghrita* is supreme in all the *Ghritas*. [(26)]

Latin Name - Butyrum deparatu

Sanskrit name - *Ghrita*.

English name - Clarified butter.

Hindi name - Ghee

Synonyms - Ghritam, Havish, Sarpish, Ajya

Pharmacodynamic properties of Goghtrita with their varga

Nighantu	***Varga***	***Rasa***	***Guna***	***Veerya***	***Vipaka***	***Doshaghnata***
Dhanvantari	Suvarnadi	-	-	*Sheeta*	*Madhura*	VP ↓
Kaiyadeva	*Ghritavarga*	*Madhura*	*Guru Mridu*, *Slakshna*	*Sheeta*	*Madhura*	VPK ↓

Raj.	*Kshiradi*	*Madhu raa*	*Snigd ha Guru*	*Sheeta*	*Madhura*	VK ↓
Bhavaprakasha	*Ghrita*	-	*Guru Rocha ka*	*Sheeta*	*Madhura*	VPK ↓
Dravyaguna Vigyana	*Snehavarga*	*Madhu ra*	*Guru Snigd ha*	*Sheeta*	*Madhura*	VP ↓

***Karma* of *Goghrita*:-**

Rasayana, *Agnivardhaka Rasavardhaka*, *Balya*, *Ojavardhaka*, *Kantivardhaka*, *Indriyabalavriddhikara*, *Buddhivardhaka*, *Vayahsthapana*, *Unmadahara* etc.

***Rogaghnata* of *Goghrita*:**

Kshata, *Daha*, *Vrana*, *Shosha*, *Shiroroga*, *Akshiroga*, *Murchha*, *Mada*, *Unmada*, *Apasmara*, *Agnimandya*, *Jwara*.

Chemical constituents of *Goghrita*:

Triglycerides	97.98%	Phospholipids	0.2 - 1.0%
Diglycerides	0.25 - 1.5%	Steroles	0.22 - 0.4%
Monoglycerides	0.16 - 0.038%	Vitamin A	2500 / 100 gms
Ketocid glyceride	0.0.15 - 0.18%	Vitamin D	8.5 x 10.7 gm/100 gm
Glycerylestors	0.11 - 0.015%	Vitamin E	24 x 10.3 gm /

			100gm
Free fatty acid	0.1 - 0.44%	Vitamin K	1 x 10.4 gm / 100 gm

Fatty acids	**Percentage (%)**
Butyric acid	4.5 - 6.0
Caproic acid	1.0 - 1.36
Caprylic acid	0.9 - 1.0
Capric acid	1.5 - 1.8
Lauric acid	6.0 - 7.0
Myristic acid	21.0 - 23.0
Palmitic acid	19.0 - 19.5
Stearic acid	11.0 - 11.5
Arachidic acid	0.5 - 0.8
Oleic acid	27.0 - 27.5
Linoleic acid	4.0 - 5.0

Recent Studies:-

Ghrita contains 8% lower saturated fatty acids, which makes it easily digestible. Due to 4-5% linoleic acid, an essential fatty acid, it promotes proper growth of human body. *Ghrita* also contains vitamin A, D, E and K. Vitamin A and E are antioxidant and are helpful in preventing oxidative injury to the body (A cause of about 80-90% degenerative diseases). Vitamin A also keeps epithelial tissues of body intact, keeps outer lining of eyeball moist and prevents blindness. *Ghrita* is lipophilic and this action of *ghrita* facilitates transportation of ingredients of formulation to target organ and final delivery inside the cell, because cell membrane also contains lipids. This lipophilic nature of *ghrita* facilitates entry to the cell and its delivery to mitochondria, microsome and nuclear membrane. In the process of evaluating the activities of natural compounds, it is found that when herbs are processed or mixed with *ghrita* their activity and rate of absorption is potentiated. Thus *Ghrita* in general and *Goghrita* in particular is one of the easily digestible and assailable food which provides essential nutrients and critical anti oxidants or free radical scavengers to human body for its protection and growth.

The lipids serve the following important functions:

Structural components of bio membranes (phospholipids)

Metabolic regulators (steroid hormone and prostaglandins)

Storage forms of energy (Triglycerides)

Acting as electric insulator in neurons

Adding taste and palatability to food.

Fatty acids having carbon atoms 4 to 6 are called small chain fatty acids (SCFA), those with 8 to 14 carbon atoms are known as medium chain fatty acids (MCFA); those with 16 to 18 carbon atoms are long chain fatty acids (LCFA) and those carrying 20 or more carbon atoms are named as very long chain fatty acids (VLCFA).

Short chain fatty acid (SCFA), butyric acid (4C) and caproci acid (6C) are

present in *ghrita*. Digestion and metabolism of SCFA and MCFA are drastically different from those of LCFA, containing triglycerides do not require prolonged digestion, also not required any pancreatic lipase or bile salts. They diffuse directly into portal circulation and taken to the liver and are immediately utilized for energy.

SCFA and MCFA are preferentially oxidized by peripheral cells and so they are not deposited in adiposed tissues.

Linoleic acid and linoleinic acid are the only fatty acids which cannot be synthesized in the body. Archidonic acid is the precursor of prostaglandin. Prostaglandin is local hormone and functions through G protein coupled receptor this hormone combine with the specific receptor on the plasma membrane. The H-R complex activates the regularoty component of the protein designated as protein is a peripheral protein.

The G protein is a peripheral membrane protein which carries the excitation signal to adenylate cyclase and it embedded in the plasma membrane. Prostaglandin also effect on inflammation and immunity.

Vitamin E is the most powerful natural anti oxidant, free radicals are continuously being generated in living systems. Their prompt inactivation is of great importance. The free radicals would attack bio membranes. Vitamin E protects RBC from hemolysis. By preventing per oxidation it keeps the structural and functional integrity of all normal cells. Vitamin E also boosts immunity.

In saturated fatty acids PUFA are essentially fatty acids which carrying medicament micelle form to penetrate in any normal cell after that Betaoxidation occurs and medicament release to the target cell to shows their effect. Its digestibility co-efficient and the rate of absorption is 96% which is highest of all oils and food.

Vitamin A and E are antioxidant and help in preventing oxidative injury to the body. [23,28]

Scientific Facts about *Goghrita*:-

The use of *Goghrita* does not increase cholesterol. It gives no bad effect on heart. Recent studies have shown that traditional cooking fats like pure *ghrita*; is healthier due to an ideal ratio of omega 6 to omega 3 fattyacids. It is not advisable to restrict all forms of fats as severe restriction results in mental and physical depression.

According to Russian Scientist Servos, *Goghrita* has immense power to protect human body from the ill effect of radioactive waves. The melting point of ghrita is 35°C which is less than the normal temperature of the human body.

Recently some studies have shown that *Goghrita* contain various anticarcinogen, such as conjugated linoleic acid (CLA), butyric acid, sphinogomyelinn, lipid, vitamin CLA content is generally 0.6% in cow ghee CLA inhibits growth of melanoma, leukemia, mesothelioma, and glioblastoma showing their anti carcinogenic activity. The value of sphingomyeline in *Goghrita* is 9.31 mg/100 g has stated that the anticarcinogenic effect of *ghrita* is mainly attributed to its biologically active metabolites ceramide and sphigosine. This may contribute to the suppression of oncogenesis.

Kumar et al. (2000) suggest that hypocholesterolemic effect of *ghrita* is mediated by increasing the secretion of biliary lipids. *Ghrita* is observed to improve the growth rate and digestibility studies.

Ghrita also improves digestibility of other component, mineral absorption from diet, *Goghrita* increases the retention of calcium up to 45% and phosphorus upto 57% *(Kehar Steggarada 1951)*.

As chemically *Ghrita* consists of phospolipids, fatty acids etc. It is helpful in correcting the altered disturbed neurotransmitters. [23,28]

***Go-Dugdha*: गोदुग्ध –**

.....अत्र गव्यं तु जीवनीयं रसायनम्।

क्षतक्षीणहितं मेध्यं बल्यं स्तन्यकरं सरम् ।।

श्रमभ्रममदाललक्ष्मीश्वासक्षसातितृदक्षुधः।

जीर्णज्वरं मूत्रकृच्छ्रं रक्तपित्तं च नाशयेत्।। (अ.सं६/५२,५३)

It is *Jeevaniya*, *Rasayanam*, beneficial for debilitated persons, increases intelligence, *balya*, *stanyavardhak*, It destroys *shrama*, *bhrama*, *mada*, *mutrakricchra*, *raktapitta*. (13)

स्वादु शीतं मृदु स्निग्धं बहुलं श्लक्षण पिच्छिलं।

गुरूमन्दं प्रसन्नम च गव्यम दशगुणं स्मृतम्।। (च.सु२७)

Sweetness, coldness, softness, unctousness, density, smoothness, slimeness, heaviness, slowness, clarity

The above mentioned properties are also properties of *Ojas*. So milk having identical properties is conducive to the promotion of *Ojas*.

Indra, the lord of heaven, has said that cow's milk is nectar. So, one gifting a cow makes a gift of nectar only. (2)

गवां दुग्धं स्निग्धं कफि गुरू सरं जीवनतरं

मरूतपित्तच्छेदि श्रममदविदाह भ्रमहरम्।

विषास्त्रघ्नं जीर्णज्वरविजयिरेतो वितनुते

हिमं बल्यं स्तन्यं प्रचुरयति कृच्छ्र शमयति।। (सिध्दभैषजमणिमाला–दुग्धादिवर्ग)

Cows milk is *snigdha, kaphakarak, guru, sarak, jeevaniya, vatapitta chedak, mada, vidahanashak, veerya vardhak, visha, rakta vicar* and *jeerna jwara nashak, sheetal, balya, stanyakarak* and *mutrakricchrashamak.*

***RASA PANCAKA* :**

Rasa *– Madhura*

Guna - *Guru*, *Snigdha*

Virya - *Sita*

Vipaka - *Madhura*

Prabhava - Not specified

In *Ayurveda*, descriptions are available regarding the quality of the milk of the cows of various colours. This is shown in Table.

No.	Colour of the Cow	Therapeutic properties
1	Black Cow's milk	*Vatahara*
2	Yellow Cow's milk	*Vata Pittahara*
3	White Cow's milk	Heavy for digestion, *Kapha Vardhaka*
4	Red Cow's milk	*Vatahara*
5	Small hill Cow's milk	Oily and heavy
6	Milk of Cow's with calves	Not good for use
7	Scanty eaten Cow's milk	Heavy
8	Milk of Cow's calved longage	Good for all the age groups

Use of Cow's milk

Cow's milk is favourable for heart, Cow's milk increases the Strength of the body. Cow's milk increases the lifespan of human beings and reduces the *Tridoshas*. Cow's milk is also good because this include A.B.C. and D vitamins. When the seeds are cultured in cow's milk and sown the yield got by such seeds is better and more nutritious .

Cow milk has been described as nutritive and good for the vital organs such as the Eyes, Brain and the Heart. It possesses sweet taste and is cooling in nature. Cow Milk promotes immunity and acts as *rasayana* and *ojovardhaka*. Among the *doshas*, it has the capacity to alleviate aggravated *Vata* and *Pitta dosha*.

Cow milk is one of the most important ingredients in several *Ayurvedic* preparations such as *Mahanarayana Taila, Ksheerabala Taila, Panchagavya Ghrita, Amrtaprasha ghrith* etc. [37]

Modern view:

Cow's milk is an opaque fluid in which fat is present as an emulsion; protein and some minerals in colloidal suspension and lactose together with some mineral and soluble protein in true solution.

The yellowish white colour of the milk is due to suspended fat globules.

Milk is little more viscous than the water, taste is sweet and bland, odour is faint and characteristic. Cow's milk possesses all the elements necessary for the growth and nutrition of various tissues of our body. As the calcium in the milk is readily absorbable, it is a most valuable food in the formation of bone.

The ratio in which the calcium and phosphorus present in the milk made it ideal for their proper absorption and assimilation and consequently for Bone formation along with Vit D.

Chemical and physiological constituents of Cow's milk composition/100ml. are shown in Table

No.	Parameters	Values
1	Specific gravity	1.032
2	pH	6.6-6.8
3	Titrable Acids	0.12-0.15%
4	Fat	4.14 %
5	Total solids	13.39%
6	Solids Not Fat (S.N.F.)	9.25%
7	Lactose	4.96%
8	Ash	0.71%

Proteins: The casein is the principle protein and it constitutes 80% of the totalproteins present in milk.

Casein is a mixture of 3 proteins.

α - Casein 54.5%

β - Casein 39.1%

γ - Casein 6.4%

The other 20% will be made up of Serum proteins, Lactalbumin and Lactoglobulin present in the Whey. Whey is the liquid portion of milk left over after the removal of casein.

Lactalbumin consists of three distinct proteins:

α - Lactalbumin 22%

β - Lactalbumin 59%

γ - Lactalbumin 6%

The lactoglobulin is composed of two immunoglobulins – euglobulin and pseudoglobulin, which account for the remaining 13% of the total serum proteins.Besides the above proteins, Cow's milk contains proteose – peptone fraction ofabout 308.7 mg/100ml.

Milk proteins contain all the essential amino acids in marked quantity and rich in Lysine, Valine, Isoleucine and Leucine.

Essential amino acids make up of the proteins of Cow's milk (g/16 g.N).

Leucine	11.3%
Isoleucine	8.5%
Valine	8.4%
Lysine	7.5%
Phenyl alanine	5.7%
Threonine	4.5%
Arginine	4.3%
`11Methionine	3.4%
Histidine	2.6%

Tryptophan	1.6%

Non-protein Nitrogen substances:

Besides proteins, milk also contains non-protein Nitrogen substances. It makes 5% of total nitrogen in milk.

Milk Fat:

The milk fat contains numerous triglycerides and as many as 64 fattyacids. The mixed glycerides make up about 98% of the milk fat.

Carbohydrates:

Lactose is the predominant sugar present in milk. Along with that, free glucose and galactose are present in traces in fresh milk.

Minerals:

Mineral composition of Cow's milk (per 100gm)

1. Ash	0.77 %
2. Calcium	136.33 mg
3. Phosphorus	99.85 mg
4. Iron	111.00 µg
5. Chloride	120.00 mg
6. Citrate	210.00 mg
7. Sulphate	16.52 mg
8. Sodium	43.12 mg
9. Potassium	131.98 mg

10. Magnesium	13.67 mg
11. Copper	20.00 µg
12. Zinc	1124.00 µg

Enzymes:

Cow's Milk contains multiple enzymes like lipase, aryl esterase, choline esterase, alkaline phosphatase, acid phosphatase, xanthine oxidase, lactoperoxidase, protease, α and β amylase, catalase, aldolase, carbonic anhydrase, salolase, rhodonase and lactase.

Vitamins:

Milk is also a good source of Vitamins.

Vitamin contents of Milk (per litre) is:

1. Vitamin A	1560.00 IU
2. Thiamine	0.42 mg
3. Riboflavin	1.57 mg
4. Nicotinic acid	0.85 mg
5. Vitamin B6	0.48 mg
6. Pantothenic acid	3.50 mg
7. Biotin	35.00 µg
8. Folic acid	2.30 µg
9. Vitamin B	12 5.60 µg
10. Vitamin C	16.00 mg

Thus multifactorial components of milk made it suitable for the body and hence a good nutritive even. [23,27]

Materials and Methods:

सिद्धान्तो नाम स यः परिक्षकेबर्हुविधं हेतुभिश्च साधयित्वा स्थाप्यत्ते निर्णयः ।।

(Ch.Vi.8/41)

The aim of research is to find a new vision in the old theories by honest and sincere efforts then and then only a principle may be formulated as quoted by *Acharya Charaka*. [2]

I.e. for a theory to become a principle a number of experimentations by a number of examiners through multiple way and multiple times need to be conducted. The concept is thus proved practically on the basis of obtained data with fruitful discussion and proper reasoning to draw some conclusions beneficial for the humanity and posterity.

Clinical study has its own importance in assessing the infrastructure of the disease and also assessing the efficacy of the drugs. The pioneer Sir Thomas Lewis emphasizes, “Alone is true which is proved clinically and that which is clinically proved needs no other evidence”.

Clinical study can be defined as trials to evaluate the effectiveness and safety of medications or medical devices by monitoring their effects on large groups of people. It is practical implication of theoretical knowledge. Clinical trials have been a part of the history of medical research since ancient periods. Drugs or devices or procedures are tested by enlisting patients with fixed characteristics, dispensing treatment and assembling the data for a set period of time. The results obtained are crucial for the advancement of medical knowledge. It is a powerful tool to establish the validation of a drug or a procedure.

Research is a process of finding out the old hidden facts from the old theories and concepts as well as discovery of new facts. The aim of *Ayurveda* is “To maintain the health in the healthy and the treating of disorders in the ailing” *(Ch. Su. 30/26).*

This supports the fact that any research taking place in the field of *Ayurveda* must be having its impact or role in the clinical field.

The diseases of eye have got almost equal importance, as compared to other bodily diseases. The most disastrous termination of ocular diseases is blindness. Myopia is the commonest cause of gradual blindness in the younger age groups.

Refractive errors including myopia account for more than 7 % of the total causes of blindness in India. The condition usually begins to be noticed during the school years and the percentage rises steadily with increasing age group. The majority of cases merely result as variants in the axial length and curvature, the former being most important.

Myopia creates a great problem among the student community. The spectacles, which are used to correct the errors, neither cure nor prevent the progression of the pathology; instead they create a lot of everyday inconvenience. Moreover, the spectacles are serious hindrance for an individual to participate in many sports and professions.

Sushruta, the father of ancient Indian Surgery, has recommended *'Kriyakalpa'* for the management of *Timir*, along with other forms of treatment. Nutritive factors also have a vital role in the management of *Timir*. As far as modern medical science is concerned, no medical treatment is available till date, for myopia.

In *Ayurveda*, the *Chakshushya* properties of certain drugs like *Triphala, shatawari, Ghrita, Yasada Bhasma*, etc. are proven. So a combination of the above said drugs, in the form of oral supplement or *Tarpan* procedure will play a definite role in the management of refractive errors.

So keeping all these facts here, the present clinical study has been undertaken with following aims and objectives.

Aim and Objectives:

Aim: To evaluate the role of systemic use of *Shatawari Ghrita* and *Shatawari Ghrita Akshi Tarpan* in *Pratham Patalgata Timir* w.s.r.to Simple myopia.

Materials: Drug used - *Shatawari Ghrita*

In *Charak Samhita Kalpasthana* chapter 12, in *Sushruta Samhita Chikitsasthana* chapter 31, in *Ashtang Samgraha kalpasthana* chapter 8 and in *Sharangdhara Madyama Khanda* chapter 9, there is detail description regarding *Snehapaka Kalpana*. *Shatawari Ghrita* was prepared by using this method. In *Bhaisajya Ratnawali*, chapter 27, method of preparation of *Shatawari Ghrita* was given and it was used in the present study.

Shatawari Ghrita was prepared by classical method of *Ghritapaka*. One part of *Shatawari Kalka*, four parts of *Goghrita* and sixteen parts of *Godugdha* were taken and all the contents were heated on the constant heat with continuous stirring the contents. *Madyama paka* of *Shatawari Ghrita* was prepared by applying suitable methods. *Shatawari Ghrita* was used as *Shaman Sneha* for systemic use and for *Akshitarpana*.

Prepared *Shatawari Ghrita* was standardized first by various suitable methods in laboratory and then only it was used for the study.

Instruments used **-** Snellen's chart , Autorefractometer, Retinoscope, Fundoscope , *Tarpan* Goggle etc.

Approval from Institutional ethics committee was taken for the study.

Clinical study is carried out in three phases -

1) Diagnosis or Identification phase
2) Interventional phase
3) Assessment phase

1) Diagnosis or Identification phase:

Patients attending the O.P.D. and I.P.D. of Department of Shalakya Tantra with signs and symptoms of *Timira* – Myopia were selected for the present study.

The diagnosis of *Timira* – Myopia was done on both the modern and *Ayurvedic* basis. For this purpose a special case record pro forma was prepared. After taking ophthalmic and systemic history and with the help of various instruments the vision was recorded.

Inclusion criteria:

1) Patient between 7-25 years of age group irrespective of gender.
2) Patient having Simple Myopia up to -6.0 D.
3) Patient having *lakshanas* of *Pratham patalgata dosha dushti*.

Exclusion criteria:

1) Patient having myopia more than -6.0D.
2) Patient having ocular diseases other than simple myopia.
3) Patient having any systemic diseases.
4) Patient having post operative myopia.

2) Interventional phase:

Method of work:

1) Total 360 patients were selected randomly for study on the basis of clinical presentation and diagnostic criteria.
2) Detail case pro forma was prepared and used accordingly.
3) Written consent of the patient as well as his parents or guardians was taken in his own language and in English.
4) Clinical study was conducted in three groups after thorough examination of patient's ocular condition.
5) Group A - In 120 patient's optical correction with appropriate concave lenses will be prescribed.
6) Group B - In 120 patient's optical correction with concave lenses was prescribed along with systemic use of *Shatawari Ghrita*. It was given for 30 days.

According to *Sharangdhar* adult dose of *Ghrita* is one *pala* i.e. 40 gm. In 17-25 year age group *Shatawari Ghrita* was given 20

gm in the morning and 20 gm in the evening with Luke warm water as it was used as *Shaman Sneha*. In 7-16 year age group *Shatawari Ghrita* was given *according to Young's Rule i.e. Age of the child in years /age of child + 12 X Adult dose.* [17, 27]

7) Group C - In 120 patient's optical correction with concave lenses was prescribed along with *Shatawari Ghrita Akshi Tarpan*. *Shatawari Ghrita Akshi Tarpan* was done 1 *X* 7 days in 3 sittings each with 7 days intervals i. e. total 21 days. [38]

Procedure for *Tarpana*:

1. The procedure was performed only in morning hours.
2. The procedure was carried out in a neat, quiet and dark room where there was no direct entry of air or Sunlight.
3. The position was kept supine as mentioned in the texts.
4. Eyes were cleaned with cotton soaked in Luke warm water before the procedure.
5. A specially designed *Tarpana* goggle was taken and it was used *Tarpana* Procedure. There was no chance of leaking of the medicine in this method. This gives best results and more comfort to the patient in less time.
6. Boundaries were made by keeping the orbital margins as anatomical landmarks. Dimensions of the boundary were kept as mentioned in the text (02 *Angula* heights).
7. *Ghrita* was melted by keeping in Luke warm water.
8. *Ghrita* was poured in the amount sufficient to immerse the eyelashes.

   Patients were instructed to keep the eyes blinking at their comfort level and the blinking rates were recorded.
9. The retention period was kept the maximum time limit as constant (25 minutes) as per the reference of *Ayurvedic* Pharmacopoeia of India-Part-I, Vol.-VI (1000 *Matras* -25min.9sec.).

10. Removal of *Ghrita* was tried with cotton.
11. *Swedana* after the procedure was carried out with cotton soaked in Luke warm water.

Follow up: 1st - On 30th day, 2nd - After 3 months, 3rd -After 6 months

Criteria for assessment:

Subjective:

Subjective symptoms were assessed with the help of following scoring pattern:

1) Visual Acuity:

A) Distant visual acuity was recorded with the help of Snellen's test type chart.

6/6	_____	0
6/6(P) to 6/9	_____	+
6/9 (P) to 6/12	_____	+ +
6/12(P) to 6/18	_____	+ + +
6/18(P) to 6/24	_____	+ + + +
6/24(P) to 6/36	_____	+ + + + +
6/36(P) to 6/60	_____	+ + + + + +
< 6/60	_____	+ + + + + + +

2) Indistinct Vision:

0 – No feeling of indistinct vision.

1 – Occasional indistinct vision.

2 – Regular indistinct vision without disturbing routine work.

3 – Regular indistinct vision disturbing day to day work.

3) Blurred vision:

0 – No such problem

1 – Occasional blurring or disturbance of vision.

2 – Regular blurring without disturbing routine work.

3 – Regular blurring disturbing day to day work.

4) Eye Strain:

0 – After >6 hours of near work.

1 – After 4 – 6 hours of near work.

2 – After 2 – 4 hours of near work.

3 – Before 2 hours of near work.

5) Headache:

0 – No headache

1 – Very occasional headache.

2 – Irregular attacks of frequent headache.

3 – Regular headache.

6) Watering of eyes:

0 – No watery discharge

1 – Mild watery discharge

2 – Moderate watery discharge

3 – Severe watery discharge

7) Redness of Eyes:

0 – No redness in eyes

1 – Occasional redness in eyes

2 – Regular redness in eyes

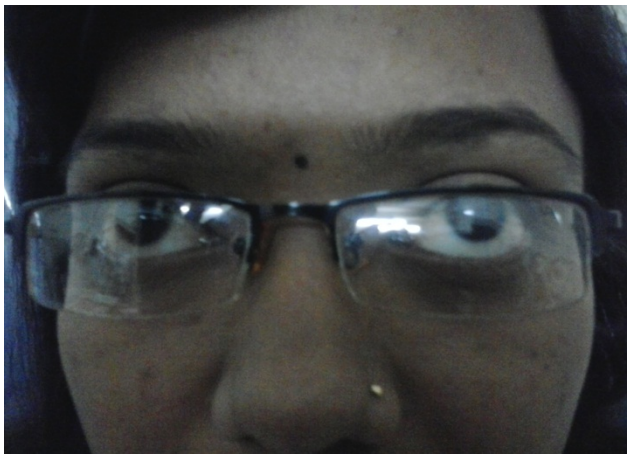
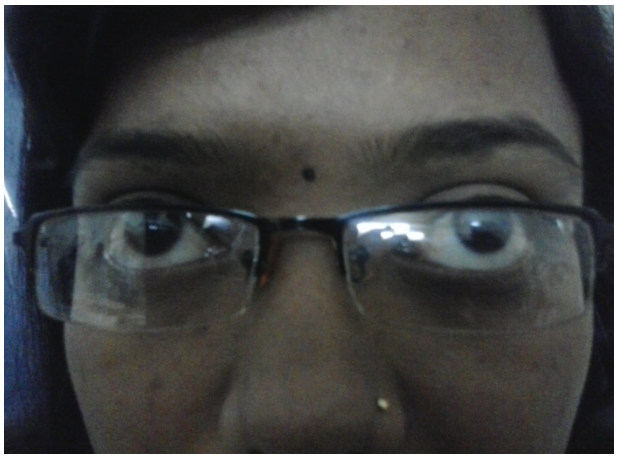
The results will be drawn strictly on the basis of data collected & after statistical analysis.

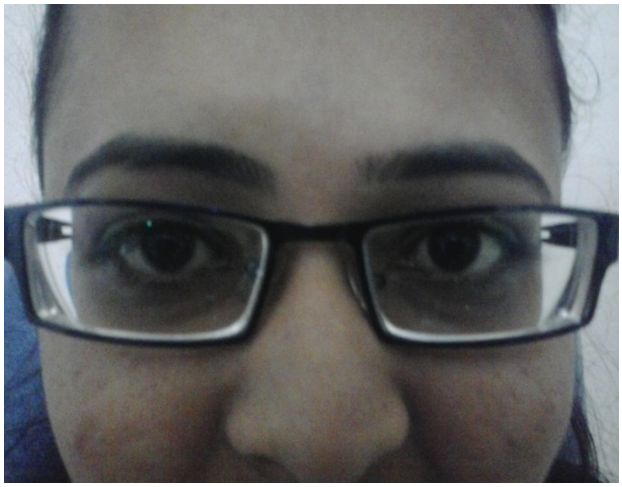
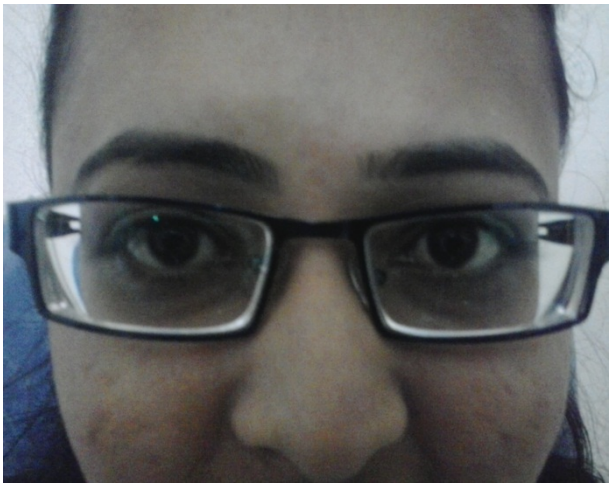
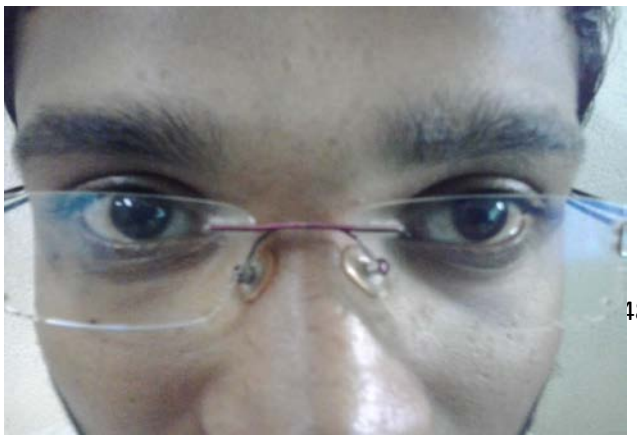
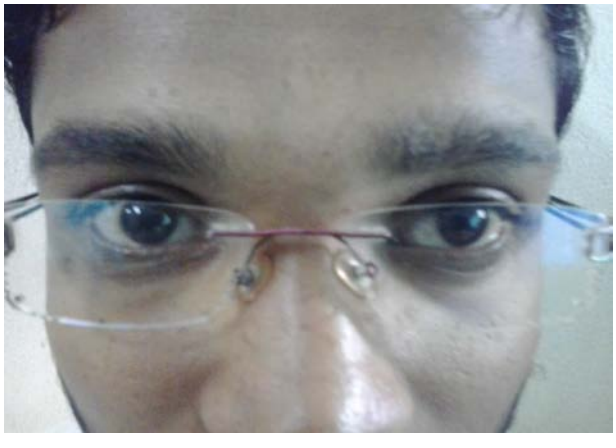
1) Ineffective – Vision remains same.
2) Slightly effective – Vision improved by less than one line.
3) Moderately effective – Vision improved by one line.
4) Effective – Vision improved by two or more than two lines.

SHATAWARI GHRITA

TARPANA G0GGLE

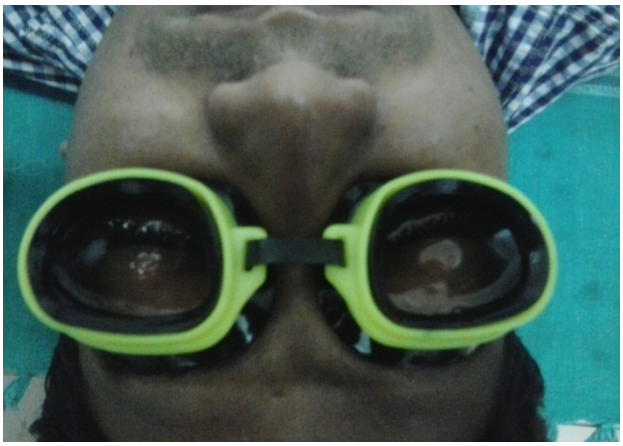
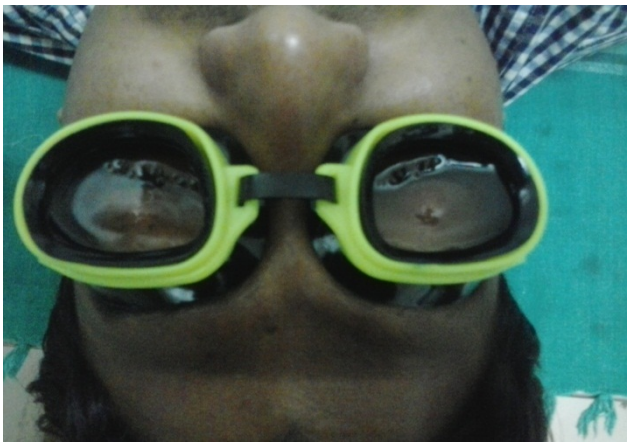
OPTICAL CORRECTION

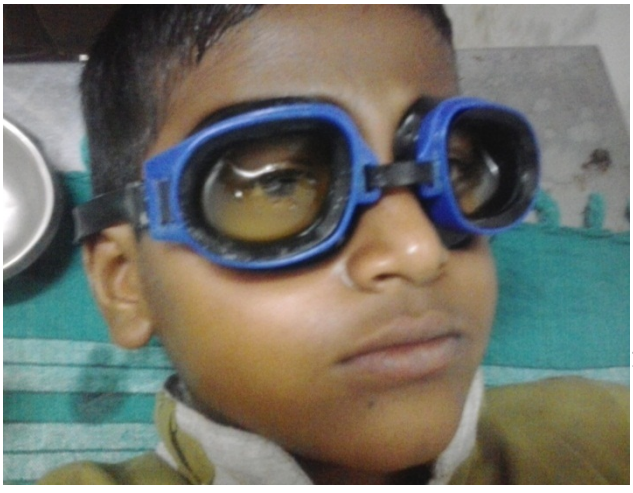
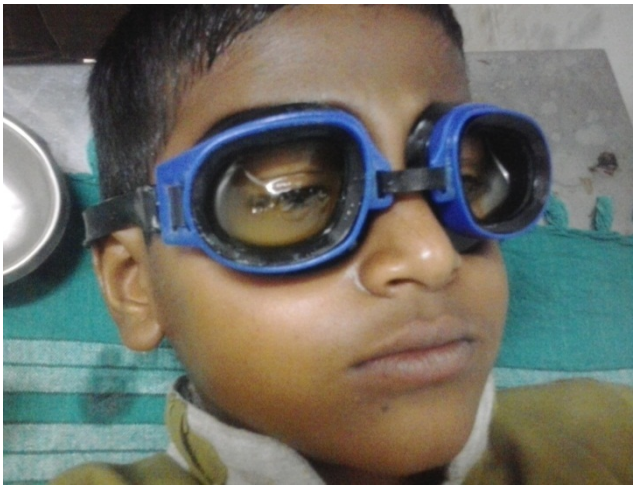



SHATAWARI GHRITA TARPANA



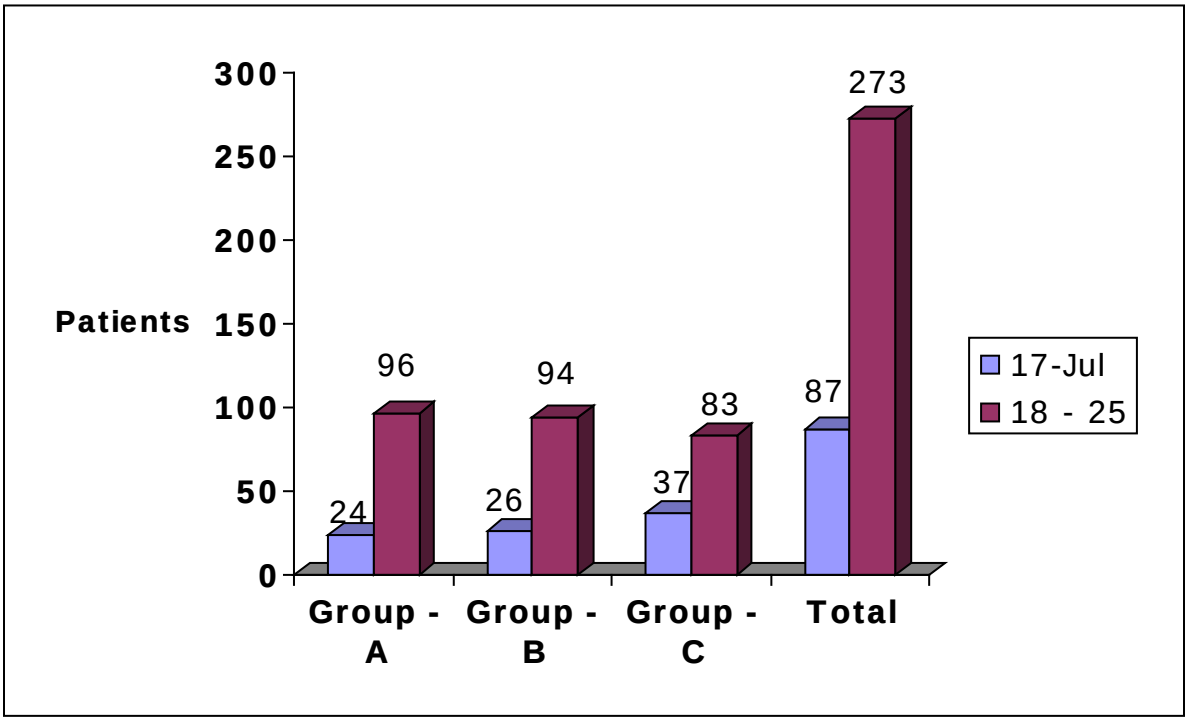
OBSERVATIONS AND RESULTS

1: Age

Table 1: Distribution of 360 patients according to age:

Age	Group – A	Group - B	Group - C	Total	Percentage
7 – 17	24	26	37	87	24.16
18 – 25	96	94	83	273	75.83

Chart 1:



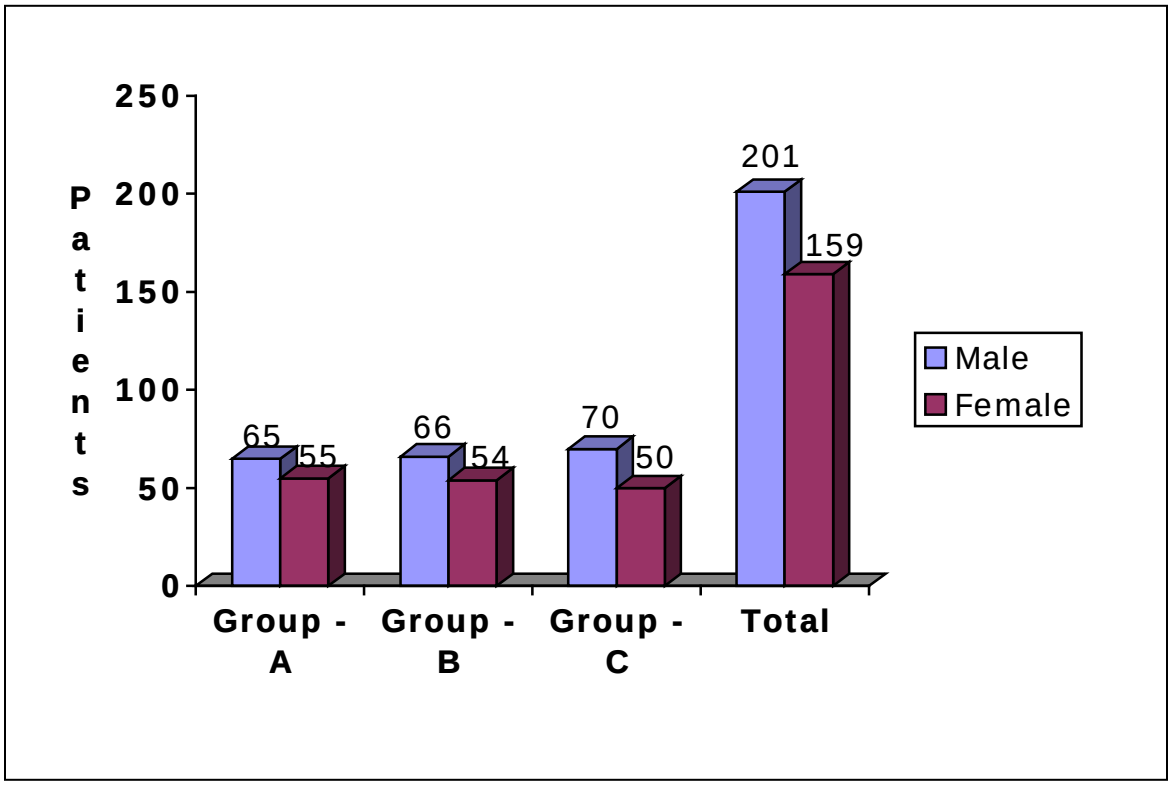
In the present study the number of patients in 7 -17 age group were 87 i. e. 24.16% and the number of patients in 18 -25 age group were 273 i. e. 75.83%.

2: Gender:

Table 2: Distribution of 360 Patients according to Gender

Gender	Group -A	Group -B	Group - C	Total	Percentage
Male	65	66	70	201	55.83
Female	55	54	50	159	44.16

Chart 2:



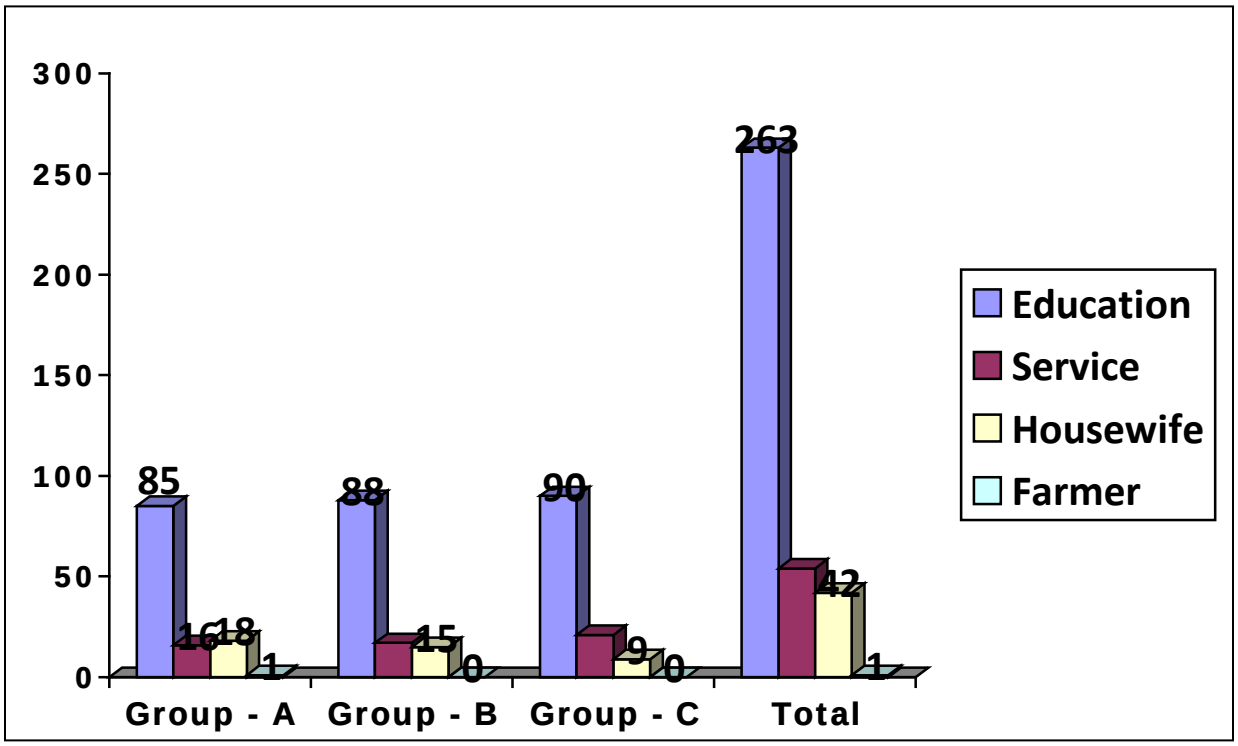
In the present study the number of males were 201 i. e.55.83% and the number of females were 159 i. e. 44.16%. The percentage of males was higher than the females.

3: Occupation

Table 3: Distribution of 360 Patients according to Occupation:

Occupation	Group - A	Group - B	Group - C	Total	%
Education	85	88	90	263	73.05
Service	16	17	21	54	15
Housewife	18	15	09	42	11.66
Farmer	01	00	00	01	0.27

Chart 3:



In the present study 73.05% patients were taking education, 15% patients were in the service, 11.66% were housewives.

4: Etiological factors

Table 4: Distribution of 360 patients according to *Nidana*

Nidana	Group-A	Group-B	Group-C	Total	%
Ushnabhitaptasya Jalapraveshata	36	49	54	139	38.61
Durekshanata	44	25	22	91	25.27
Swapnaviparyaya	16	20	20	56	15.55
Atiatapa sevana	00	00	00	00	00
Dhumanishevanam	05	00	00	05	1.38
Rajosevana	00	00	00	00	00
Chhardivighatada	00	00	00	00	00
Vamanaatiyogata	00	00	00	00	00
Atiratribhojana	00	00	00	00	00
Ratri atyambupana	08	00	00	08	2.22
Malavarodha	31	25	26	82	22.77
Mutravarodha	00	00	00	00	00
Krodha	91	71	63	225	62.5
Chinta / Shoka	55	09	15	79	21.94
Shirobhighata	00	00	00	00	00
Rituviparyaya	00	00	00	00	00
Atimaithuna	12	01	14	27	7.5
Vashpagrahata	00	00	00	00	00
Sukshmanirikshanata	47	76	45	168	46.66
Shukta arnala Amlanishevanam	26	80	70	176	48.88
Kulattha Sevana	00	00	00	00	00
Masha Sevana	00	00	00	00	00
Seeing running vehicles	00	00	00	00	00
Atisantapa	00	00	00	00	00
Shirobhitapa	17	01	13	31	8.61

In this series 46.66 % were having *Sukshmanirikshana*, 8.61% *Shirobhitapa*, 62.5 % *Krodha* , 15.55 % were having *Swapnaviparyaya* & 21.94% were having *Shoka* as *Nidana*, *Durekshanat* 25.27 % patients, 02.22 % patients were doing *Ratri atyambupana*, 38.61 % *Ushnabhitaptasya Jalapraveshata*, 8.61 % *Shirobhighata*, 22.77% *Malavarodha*, 1.38% *Dhumanishevanam*, & 07.5 % were having *Atimaithuna* as *nidana sevana* & none of the patients were having, *Chhardivighatada*, *Vamanaatiyogata*, *Rituviparyaya*, *Mutravarodha*, *Vashpagrahata*, *Atisantapa Rajosevana*, *Atiratribhojana*.

None of the patients were having *Kulattha* and *Masha sevena* in the present study. None of the patients were seeing the running vehicles.

In the present study all the patients were having the various different causes for developing the disease *Timir*.

5: Chief Complaints

Table 5: Complaints wise distribution of 360 patients:

Chief complaints	Group-A	Group-B	Group-C	Total	%
Indistinct Distant Vision	50	62	73	185	51.38
Blurred vision	06	01	00	07	1.94
Eyestrain	49	79	78	206	57.22
Headche	82	99	100	281	78.05
Watering of eyes	51	24	34	109	30.27
Redness of eyes	07	05	10	22	6.11

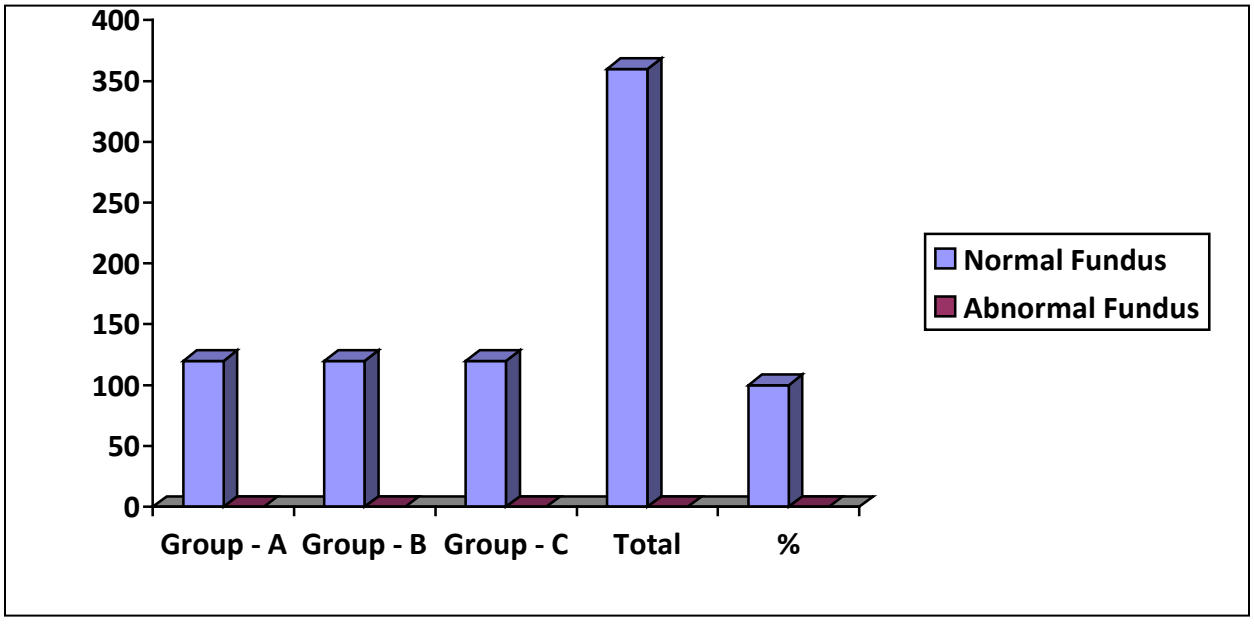
In the present study the maximum 78.05% patients were having Headache, 57.22% patients were having Eyestrain, 51.38% patients were having Diminished distant vision, 30.27% patients were having Watering, 1.94% patients were having Blurred vision and no one patients were having the symptoms like Diplopia and Burning of Eyes.

6: Fundus Examination

Table 6: Distribution of 360 patients according to Fundus examination

Fundus Examination	Group – A	Group - B	Group - C	Total	%
Normal Fundus	120	120	120	360	100
Abnormal Fundus	00	00	00	00	00

Chart 6:



In the present study all the patients were having normal fundus picture.

7: Visual Acuity

Table 7: Distribution of 360 Patients (720 eyes) according to Visual Acuity:

Visual Acuity	Group – A		Group - B		Group - C		Total	%
	RE	LE	RE	LE	RE	LE		
6/6 – 6/9	74	74	65	64	55	55	387	53.75
6/12 – 6/18	30	30	45	45	55	54	259	35.97
6/24 – 6/36	09	09	05	05	05	06	39	5.41
6/60 or Less	07	07	05	06	05	05	35	4.86

In the present study maximum 53.75% patients eyes were having visual acuity in between 6/6 – 6/9, 35.97% eyes were having visual acuity in between 6/12 – 6/18. The 5.41% patients eyes were having visual acuity in between 6/24 – 6/36 and 4.86% eyes were having visual acuity 6/60.

8: Dioptric Power

Table 8: Distribution of 360 patients (720 eyes) according to Dioptric Power

Dioptric Power	Group – A		Group - B		Group - C		Total	%
	RE	LE	RE	LE	RE	LE		
0.00 – 1.00	105	105	106	105	95	96	612	85
1.25 – 2.00	08	08	11	12	20	18	77	10.69
2.25 – 3.00	04	04	02	02	02	03	17	2.36
3.25 – 4.00	03	03	01	01	03	03	14	1.94

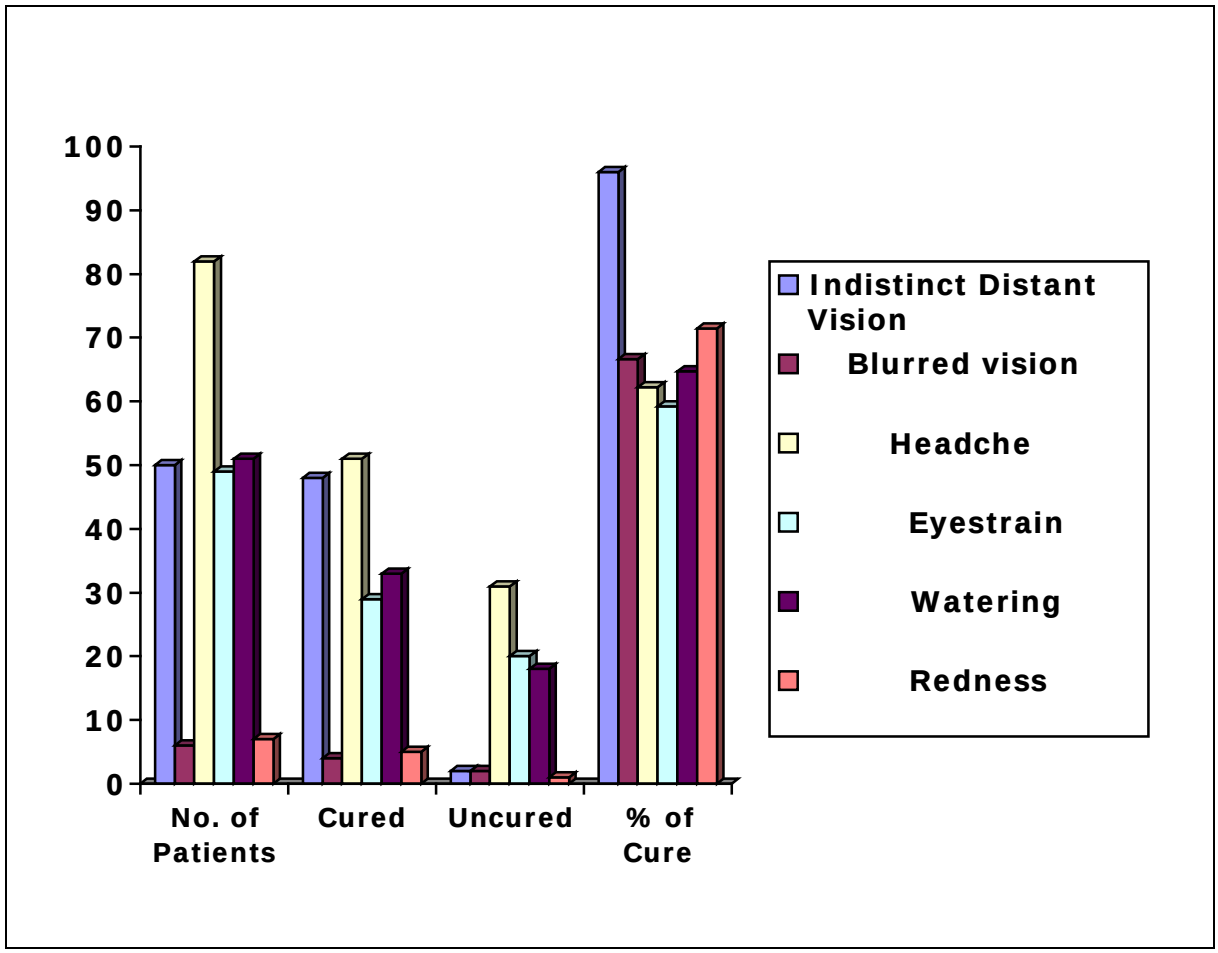
In the present study the Dioptric power of 85% patients were lie in 0.00 – 1.00, 10.69% patients were lie in -1.25 – 2.00, 2.36% patients were lie in -2.25 – 3.00 and 1.94% patients dioptric power was lie in -3.25 – 4.00.

Table: 9

Group – A: (Optical Correction) - Effect of treatment on chief complaints in 120 patients after 30 days:

Chief Complaints	No. of Patients	Cured	Uncured	% of Cure
Indistinct Distant Vision	50	48	02	96
Blurred vision	06	04	02	66.66
Headche	82	51	31	62.19
Eyestrain	49	29	20	59.18
Watering of eyes	51	33	18	64.70
Redness of eyes	07	05	01	71.42

Chart: 7



After 30 days the effect of treatment on Chief complaints shows various results. Optical correction gave 96% cure rate in Indistinct Distant Vision 66.66% in Blurred vision, 62.19% in Headache, 59.18% in Eyestrain, 64.70% in Watering and the percentage of cure in Redness was 71.42%.

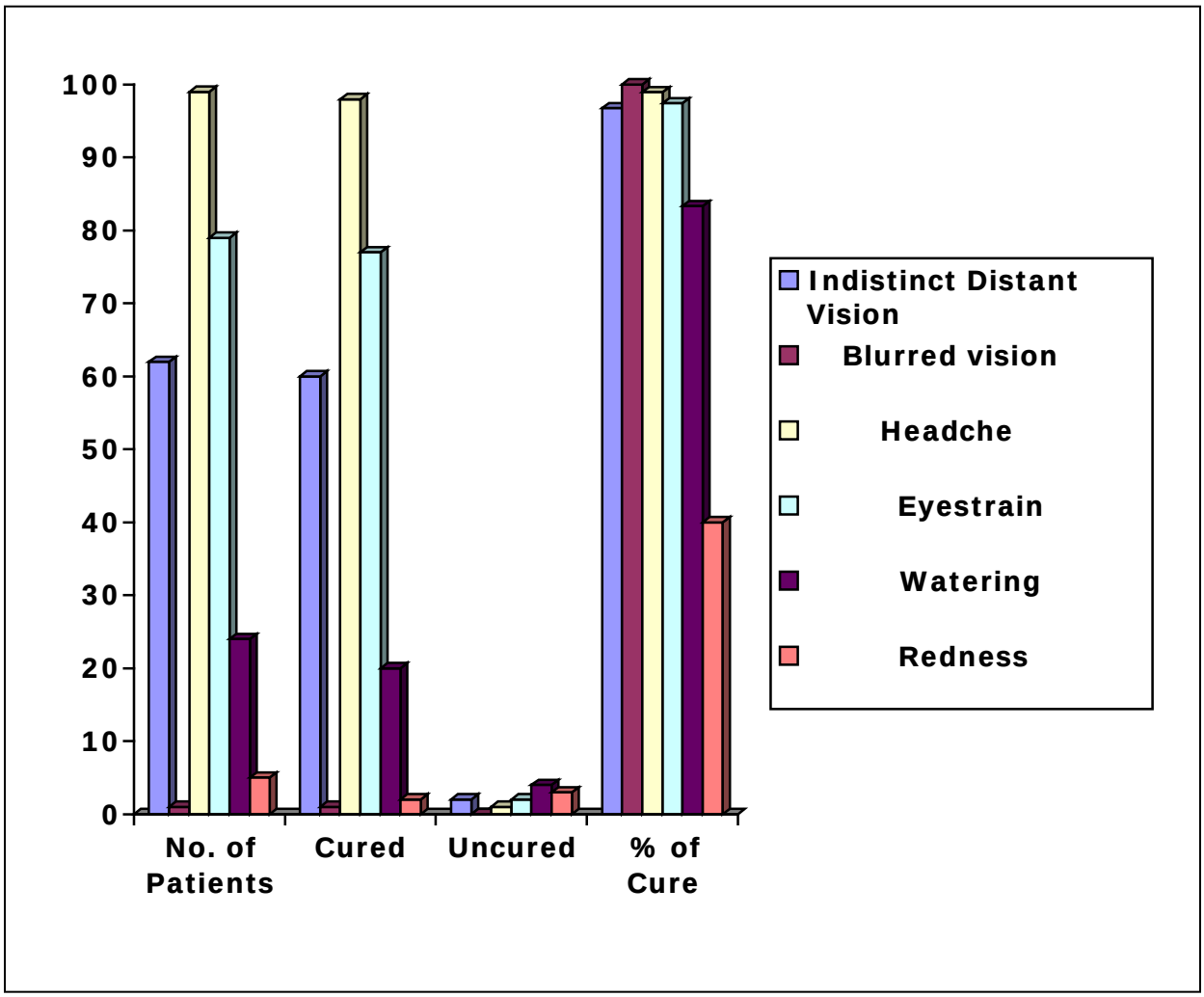
Table: 10

Group – B (Optical correction with Oral *Shatawari Ghrita)* -

Effect of treatment on chief complaints in 120 patients after 30 days:

Chief Complaints	No. of Patients	Cured	Uncured	% of Cure
Indistinct Distant Vision	62	60	02	96.77
Blurred vision	01	01	00	100
Headche	99	98	01	98.98
Eyestrain	79	77	02	97.46
Watering of eyes	24	20	04	83.33
Redness of eyes	05	02	03	40

Chart: 8



After 30 days the effect of treatment on Chief complaints shows various results. Optical correction with Oral *Shatawari Ghrita* gave 96.77% cure rate in Indistinct distant vision, 100% in Blurred vision, 98.98% in Headache, 97.46% in Eyestrain, 83.33% in Watering of eyes and the percentage of cure in Redness of eyes was 40%.

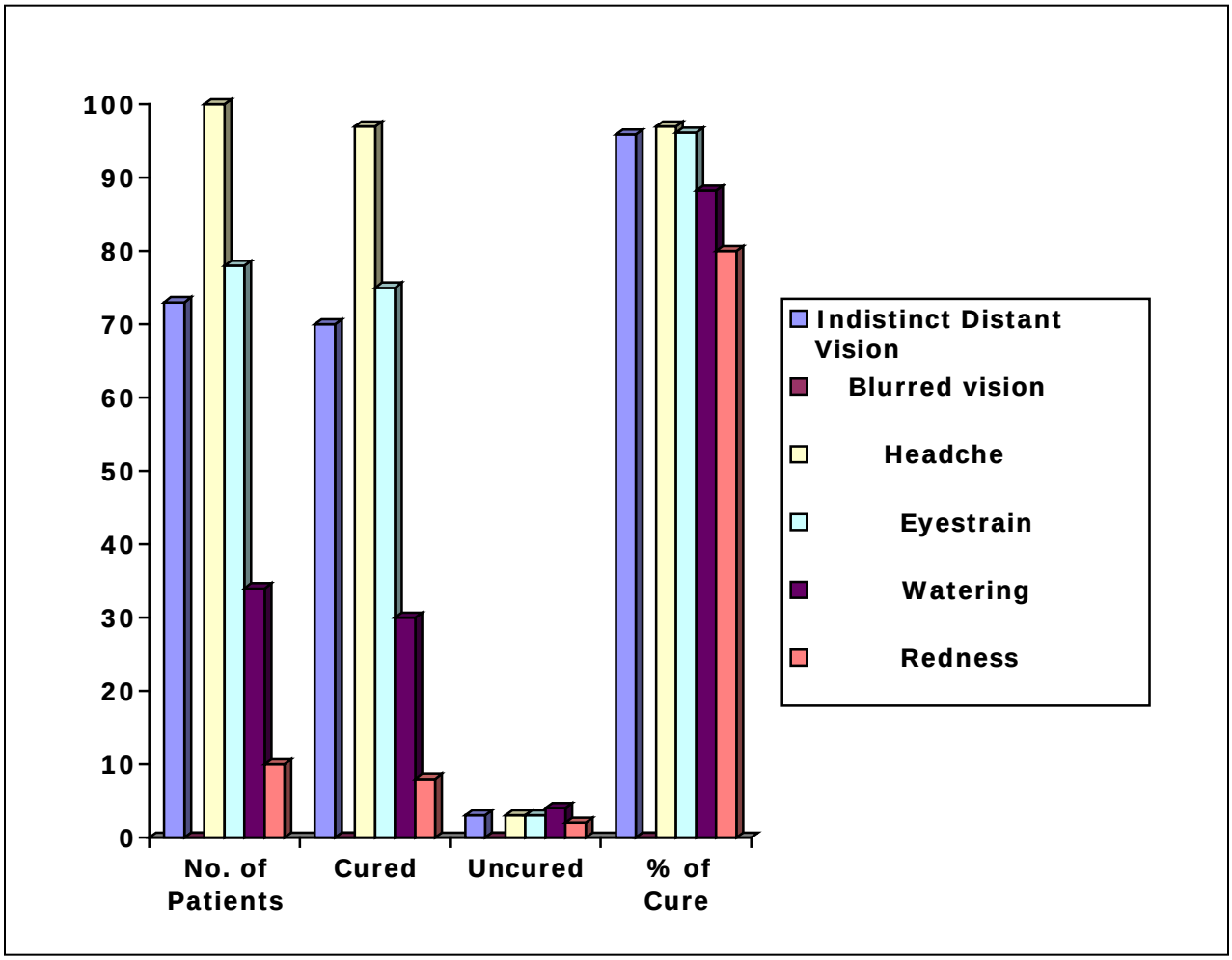
Table: 11

Group – C (Optical correction with *Shatawari Ghrita Tarpana*)

Effect of treatment on chief complaints in 120 patients after 30 days:

Chief Complaints	No. of Patients	Cured	Uncured	% of Cure
Indistinct Distant Vision	73	70	03	95.89
Blurred vision	00	00	00	00
Headche	100	97	03	97
Eyestrain	78	75	03	96.15
Watering of eyes	34	30	04	88.23
Redness of eyes	10	08	02	80

Chart: 9



After 30 days the effect of treatment on Chief complaints shows various results. Optical correction and *Shatawari Ghrita Tarpana* gave 95.89% cure rate in Indistinct distant vision, 97% in Headache, 96.15% in Eyestrain, 88.33% in Watering of eyes and the percentage of cure in Redness of eyes was 80%. In Group – C no one patient was suffering from Blurred vision.

Table: 12 - Indistinct distant vision (30th Day)

Comparison between the effects of treatment in three groups on indistinct distant vision after 30 days.

Test applied: Fisher's Exact Test (Level of significance - 5%, P<0.05)

Group	Relief		No relief		'P' Value	Inference
A & B	48	60	2	2	P=1.0000	Not Significant P>0.05
A & C	48	70	2	3	P=1.0000	Not Significant P>0.05
B & C	60	70	2	3	P=1.0000	Not Significant P>0.05

After 30 days the comparison between the effects of treatment on indistinct distant vision between Group – A (Optical correction) & Group – B (Optical correction & oral *Shatawari Ghrita*) shows no significant results. The 'P' value was P=1.0000. It means that the Oral treatment with *Shatawari Ghrita* and Optical correction shows similar effect on indistinct distant vision.

The effect of treatment on indistinct distant vision between Group – A & Group – C shows no significant results. The 'P' value was P=1.0000. It means that the *Shatawari Ghrita Tarpana* and Optical correction shows similar effect on indistinct distant vision.

The effect of treatment between the Group – B & Group – C was not significant & the 'P' value was 1.0000. The treatment in Group – B and in Group – C shows relatively similar effects i.e. the difference observed between the results of two groups was by chance only.

Table: 13 - Indistinct distant vision (30th Day)

Overall Comparison between the effects of treatment in three groups on indistinct distant vision after 30 days.

Test applied: Chi Square Test (Level of significance - 5%, P<0.05)

Group	Relief	No relief	D/F	Table value	Chi square value	Inference
A	48	2	2	5.99	0.0795	5.99>0.0795 Not Significant
B	60	2				
C	70	3				

After 30 days the overall effect of treatment on indistinct distant vision between the three groups shows no significant results. The Chi square value was 0.0795 (P>0.05). It means that the treatments show similar effect on indistinct distant vision.

Table: 14 – Eyestrain (30th Day)

Comparison between the effects of treatment in three groups on Eyestrain after 30 days.

Test applied: Fisher's Exact Test (Level of significance - 5%, P<0.05)

Group	Relief		No relief		'P' Value	Inference
A & B	29	77	20	2	P<0.0001	Extremely Significant
A & C	29	75	20	3	P<0.0001	Extremely Significant
B & C	77	75	2	3	P=0.681	Not Significant

After 30 days the comparison between the effects of treatment on Eyestrain between Group – A (Optical correction) & Group – B (Optical correction & oral *Shatawari Ghrita*) shows extremely significant results. The 'P' value was P<0.0001. It means that the difference observed in the results of two groups was because of difference in treatment.

The effect of treatment on Eyestrain between Group – A (Optical correction) & Group – C (Optical correction and *Shatawari Ghrita Tarpana*) shows extremely significant results. The 'P' value was P<0.0001. It suggests that the difference observed in the results of two groups was because of difference in treatment.

The effect of treatment between the Group – B & Group – C was not significant & the 'P' value was 0.681. The treatment in Group – B and in Group – C shows relatively similar effects i.e. the difference observed between the results of two groups was by chance only.

Table: 15 – Eyestrain (30th Day)

Overall Comparison between the effects of treatment in three groups on Eyestrain after 30 days.

Test applied: Chi Square Test (Level of significance - 5%, P<0.05)

Group	Relief	No relief	D/F	Table value	Chi Square value	Inference
A	29	20	2	5.99	50.248	5.99<50.248 Extremely Significant
B	77	2				
C	75	3				

After 30 days the overall effect of treatment on Eyestrain between the three groups shows extremely significant results. The Chi square value was 50.248 (P<0.05). It means that the difference in results was because of treatments.

Table: 16 – Headache (30th Day)

Comparison between the effects of treatment in three groups on Headache after 30 days.

Test applied: Fisher's Exact Test (Level of significance - 5%, P<0.05)

Group	Relief		No relief		'P' Value	Inference
A & B	51	98	31	1	P<0.0001	Extremely Significant
A & C	51	97	31	3	P<0.0001	Extremely Significant
B & C	98	97	1	3	P=0.6212	Not Significant

After 30 days the comparison between the effects of treatment on Headache between Group – A (Optical correction) & Group – B (Optical correction & oral *Shatawari Ghrita*) shows extremely significant results. The 'P' value was P<0.0001. It means that the difference observed in the results of two groups was because of difference in treatment.

The effect of treatment on Headache between Group – A (Optical correction) & Group – C (Optical correction and *Shatawari Ghrita Tarpana*) shows extremely significant results. The 'P' value was P<0.0001. It suggests that the difference observed in the results of two groups was because of difference in treatment.

The effect of treatment between the Group – B & Group – C was not significant & the 'P' value was 0.6212. The treatment in Group – B and in Group – C shows relatively similar effects i.e. the difference observed between the results of two groups was by chance only.

Table: 17 – Headache (30th Day)

Overall Comparison between the effects of treatment in three groups on Headache after 30 days.

Test applied: Chi Square Test (Level of significance - 5%, P<0.05)

Group	Relief	No relief	D/F	Table Value	Chi Square Value	Inference
A	51	31	2	5.99	68.415	5.99<68.415 Extremely Significant
B	98	1				
C	97	3				

After 30 days the overall effect of treatment on Headache between the three groups shows extremely significant results. The Chi Square value was 68.4159 (P<0.05). It means that the difference in results was because of treatments.

Table: 18 – Redness of eyes (30th Day)

Comparison between the effects of treatment in three groups on Redness of eyes after 30 days.

Test applied: Fisher's Exact Test (Level of significance - 5%, P<0.05)

Group	Relief		No relief		'P' Value	Inference
A & B	2	2	5	3	P=1.0000	Not Significant
A & C	2	8	5	2	P=0.0584	Not Significant
B & C	2	8	3	2	P=0.2507	Not Significant

After 30 days the comparison between the effects of treatment on Redness of eyes between Group – A (Optical correction) & Group – B (Optical correction & oral *Shatawari Ghrita*) shows no significant results. The 'P' value was P=1.0000. It means that the Oral treatment with *Shatawari Ghrita* and Optical correction shows similar effect on Redness of eyes.

The effect of treatment on Redness between Group – A & Group – C shows no significant results. The 'P' value was P=0.0584. It means that the *Shatawari Ghrita Tarpana* and Optical correction shows similar effect on Redness of eyes.

The effect of treatment between the Group – B & Group – C was not significant & the 'P' value was 0.2507. The treatment in Group – B and in Group – C shows relatively similar effects i.e. the difference observed between the results of two groups was by chance only.

Table: 19 – Redness of eyes (30th Day)

Overall Comparison between the effects of treatment in three groups on Redness of eyes after 30 days.

Test applied: Chi Square Test (Level of significance - 5%, P<0.05)

Group	Relief	No relief	D/F	Table Value	Chi Square Value	Inference
A	2	5	2	5.99	4.9445	5.99>4.9445 Not Significant
B	2	3				
C	8	2				

After 30 days the overall effect of treatment on Redness of eyes between the three groups shows no significant results. The Chi Square value was 4.9445 (P>0.05). It means that the treatments show similar effect on Redness of eyes.

Table: 20 – Watering of eyes (30th Day)

Comparison between the effects of treatment in three groups on Watering of eyes after 30 days.

Test applied: Fisher's Exact Test (Level of significance - 5%, P<0.05)

Group	Relief		No relief		'P' Value	Inference
A & B	33	20	18	4	P=0.1126	Not Significant
A & C	33	30	18	4	P=0.0220	Not Significant
B & C	20	30	4	4	P=0.7062	Not Significant

After 30 days the comparison between the effects of treatment on Watering between Group – A (Optical correction) & Group – B (Optical correction & oral *Shatawari Ghrita*) shows no significant results. The 'P' value was P=0.1126. It means that the Oral treatment with *Shatawari Ghrita* and Optical correction shows similar effect on Watering of eyes.

The effect of treatment on Watering between Group – A & Group – C shows no significant results. The 'P' value was P=0.0220. It means that the *Shatawari Ghrita Tarpana* and Optical correction shows similar effect on Watering of eyes.

The effect of treatment between the Group – B & Group – C was not significant & the 'P' value was 0.7062. The treatment in Group – B and in Group – C shows relatively similar effects i.e. the difference observed between the results of two groups was by chance only.

Table: 21 - Watering of eyes (30th Day)

Overall Comparison between the effects of treatment in three groups on Watering of eyes after 30 days.

Test applied: Chi Square Test (Level of significance - 5%, P<0.05)

Group	Relief	No relief	D/F	Table Value	Chi Square Value	Inference
A	33	18	2	5.99	7.4142	5.99<7.4142 Significant
B	20	4				
C	30	4				

After 30 days the overall effect of treatment on Watering of eyes between the three groups shows significant results. The chi Square value was 7.4142 (P<0.05). It means that the difference in results was because of treatments.

Table: 22 - Optical correction (30th Day)

Effect of treatment on optical correction in three groups on 30th day in 120 patients (right + left eye).

Test applied – Mann – Whitney Test (Level of significance - 5%, P<0.05)

Group	Mean		Standard Deviation		Standard error		'p' value	Inference
A & B	0.05417	0.2750	0.1561	0.3586	0.01425	0.03273	P<0.0001	Extremely Significant
A & C	0.05417	0.3375	0.1561	0.3235	0.01425	0.02953	P<0.0001	Extremely Significant
B & C	0.2750	0.3375	0.3586	0.3235	0.03273	0.02953	P=0.1203	Not significant

On first follow – up (30th day) the effect of treatment in 120 patients in each group on Optical correction between Group – A (Optical correction) & Group – B (Optical correction & oral *Shatawari Ghrita*) shows extremely significant results. The difference between the means of Group – A and Group – B was higher and 'P' value was P<0.0001. It means that the difference observed in the results of two groups was because of difference in treatment i.e. Oral treatment with *Shatawari Ghrita* gives excellent results over Optical correction.

The effect of treatment in 120 patients on Optical correction between Group – A (Optical correction) & Group – C (Optical correction and *Shatawari Ghrita Tarpana*) shows extremely significant results. The difference between the means of Group – A & Group – C was

higher & 'P' value was P<0.0001. It suggests that the difference observed in the results of two groups was because of difference in treatment i.e. Optical correction & *Shatawari Ghrita Tarpana* gives excellent results over Optical correction.

The difference between the means of Group – B & Group – C was not significant & the 'P' value was 0.1203. The treatment in Group – B and in Group – C shows relatively similar effects i.e. the difference observed between the results of two groups was by chance only.

Table: 23 - Optical correction (30th Day)

Overall effect of treatment on optical correction in three groups on 30th day in 120 patients (right + left eye) of each group**.**

Test applied – Kruskal – Wallis Test (Nonparametric Anova) (Level of significance - 5%, P<0.05)

Group	Mean	Difference between mean		'p' value	Inference
A	231.19	A vs. B	66.000	P<0.0001	Extremely Significant
B	165.19	A vs. C	86.075		
C	145.12	B vs. C	20.075		

On first follow – up (30th day) the overall effect of treatment on Optical correction between the three groups in 120 patients in each group shows extremely significant results. The 'P' value was P<0.0001.

The variations between the means of three groups were significantly greater than expected by chance.

The Optical correction and oral *Shatawari Ghrita* gives good results than only Optical correction and Optical correction with *Shatawari Ghrita Tarpana* gives good results over Optical correction and oral *Shatawari Ghrita*.

Table: 24 - Optical correction (90th Day)

Effect of treatment on optical correction in three groups on 90th day in 120 patients (right + left eye).

Test applied – Mann – Whitney Test (Level of significance - 5%, P<0.05).

Group	Mean		Standard deviation		Standard error		'p' value	Inference
A & B	0.05417	0.2833	0.1561	0.3579	0.01425	0.03267	P<0.0001	Extremely Significant
A & C	0.05417	0.3375	0.1561	0.3235	0.01425	0.02953	P<0.0001	Extremely Significant
B & C	0.2833	0.3375	0.3579	0.3235	0.03267	0.02953	P=0.1843	Not significant

On second follow – up (90th day) the effect of treatment in 120 patients in each group on Optical correction between Group – A (Optical correction) & Group – B (Optical correction & oral *Shatawari Ghrita*) shows extremely significant results. The difference between the means of Group – A and Group – B was higher and 'P' value was P<0.0001. It means that the difference observed in the results of two groups was because of difference in treatment i.e. Oral treatment with *Shatawari Ghrita* gives excellent results over Optical correction.

The effect of treatment in 120 patients on Optical correction between Group – A (Optical correction) & Group – C (Optical correction and *Shatawari Ghrita Tarpana*) shows extremely significant results. The difference between the means of Group – A & Group – C was

higher & 'P' value was P<0.0001. It suggests that the difference observed in the results of two groups was because of difference in treatment i.e. Optical correction & *Shatawari Ghrita Tarpana* gives excellent results over Optical correction.

The difference between the means of Group – B & Group – C was not much higher and the 'P' value was 0.1843. It means both groups shows no significant results. The treatment in Group – B and in Group – C shows relatively similar effects i.e. the difference observed between the results of two groups was by chance only.

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Table: 25 - Optical correction (90th Day)

Overall effect of treatment on optical correction in three groups on 90th day in 120 patients (right + left eye) of each group.

Test applied – Kruskal – Wallis Test (Nonparametric Anova) (Level of significance - 5%, P<0.05).

Group	Mean	Difference between mean		'p' value	Inference
A	232.19	A vs. B	68.917	P<0.001	Extremely Significant
B	163.28	A vs. C	86.158		
C	146.03	B vs. C	17.242		

On second follow – up (90th day) the overall effect of treatment on Optical correction between the three groups in 120 patients in each group shows extremely significant results. The 'P' value was P<0.0001.

The variations between the means of three groups were significantly greater than expected by chance.

The Optical correction and oral *Shatawari Ghrita* gives good results than only Optical correction and Optical correction with *Shatawari Ghrita Tarpana* gives good results over Optical correction and oral *Shatawari Ghrita*.

Table: 26 - Optical correction (180th Day)

Effect of treatment on optical correction in three groups on 180th day in 120 patients (right + left eye).

Test applied – Mann – Whitney Test (Level of significance - 5%, P<0.05).

Group	Mean		Standard deviation		Standard error		'p' value	Inference
A & B	0.1000	0.1875	0.2008	0.2957	0.01833	0.02699	P=0.0056	Very significant
A & C	0.1000	0.3375	0.2008	0.3235	0.01833	0.02953	P<0.0001	Extremely significant
B & C	0.1875	0.3375	0.2957	0.3235	0.02699	0.02953	P=0.0003	Extremely significant

On third follow – up (180th day) the effect of treatment in 120 patients in each group on Optical correction between Group – A (Optical correction) & Group – B (Optical correction & oral *Shatawari Ghrita*) shows very significant results. The difference between the means of Group – A and Group – B was higher and 'P' value was P=0.0056. It means that the difference observed in the results of two groups was because of difference in treatment i.e. Oral treatment with *Shatawari Ghrita* gives excellent results over Optical correction.

The effect of treatment in 120 patients on Optical correction between Group – A (Optical correction) & Group – C (Optical correction and *Shatawari Ghrita Tarpana*) shows extremely significant results. The difference between the means of Group – A & Group – C was

higher & ‘P’ value was P<0.0001. It suggests that the difference observed in the results of two groups was because of difference in treatment i.e. Optical correction & *Shatawari Ghrita Tarpana* gives excellent results over Optical correction.

The difference between the means of Group – B & Group – C was higher and the ‘P’ value was 0.0003. . It suggests that the difference observed in the results of two groups was because of difference in treatment i.e. Optical correction & *Shatawari Ghrita Tarpana* gives excellent results.

Table: 27 - Optical correction (180th Day)

Overall effect of treatment on optical correction in three groups on 180th day in 120 patients (right + left eye) of each group.

Test applied – Kruskal – Wallis Test (Nonparametric Anova) (Level of significance - 5%, P<0.05).

Group	Mean	Difference between mean		'p' value	Inference
A	214.30	A vs. B	29.208	P<0.0001	Extremely significant
B	185.09	A vs. C	72.192		
C	142.11	B vs. C	42.983		

On third follow – up (180th day) the overall effect of treatment on Optical correction between the three groups in 120 patients in each group shows extremely significant results. The 'P' value was P<0.0001.

The variations between the means of three groups were significantly greater than expected by chance.

The Optical correction and oral *Shatawari Ghrita* gives good results than only Optical correction and Optical correction with *Shatawari Ghrita Tarpana* gives good results over Optical correction and oral *Shatawari Ghrita*.

Table: 28 - Visual acuity (30th Day)

Effect of treatment on visual acuity in three groups on 30th day in 120 patients (right + left eye).

Test applied – Mann – Whitney Test (Level of significance - 5%, P<0.05).

Group	Mean		Standard deviation		Standard error		'p' value	Inference
A & B	0.2167	0.7583	0.6242	0.9614	0.05698	0.08776	P<0.0001	Extremely significant
A & C	0.2167	0.8333	0.6242	1.015	0.05698	0.09268	P<0.0001	Extremely significant
B & C	0.7583	0.8333	0.9614	1.015	0.08776	0.09268	P=0.6184	Not significant

On first follow – up (30th day) the effect of treatment in 120 patients in each group on Visual acuity between Group – A (Optical correction) & Group – B (Optical correction & oral *Shatawari Ghrita*) shows extremely significant results. The difference between the means of Group – A and Group – B was higher and 'P' value was P<0.0001. It means that the difference observed in the results of two groups was because of difference in treatment i.e. Oral treatment with *Shatawari Ghrita* gives excellent results over Optical correction.

The effect of treatment in 120 patients on Visual acuity between Group – A (Optical correction) & Group – C (Optical correction and *Shatawari Ghrita Tarpana*) shows extremely significant results. The difference between the means of Group – A & Group – C was

higher & 'P' value was P<0.0001. It suggests that the difference observed in the results of two groups was because of difference in treatment i.e. Optical correction & *Shatawari Ghrita Tarpana* gives excellent results over Optical correction.

The difference between the means of Group – B & Group – C is not higher and the 'P' value was 0.6184. It means both groups shows no significant results. The treatment in Group – B and in Group – C shows relatively similar effects i.e. the difference observed between the results of two groups was by chance only.

Table: 29 - Visual acuity (30th Day)

Overall effect of treatment on visual acuity in three groups on 30th day in 120 patients (right + left eye) of each group. **.**

Test applied – Kruskal – Wallis Test (Nonparametric Anova) (Level of significance - 5%, P<0.05).

Group	**Mean**	**Difference between mean**		**'p' value**	**Inference**
A	145.22	A vs. B	50.204	P<0.0001	Extremely significant
B	195.42	A vs. C	55.646		
C	200.86	B vs. C	5.442		

On first follow – up (30th day) the overall effect of treatment on Visual acuity between the three groups in 120 patients in each group shows extremely significant results. The 'P' value is P<0.0001.

The variations between the means of three groups were significantly greater than expected by chance.

The Optical correction and oral *Shatawari Ghrita* gives good results than only Optical correction and Optical correction with *Shatawari Ghrita Tarpana* gives good results over Optical correction and oral *Shatawari Ghrita*.

Table: 30 - Visual acuity (90th Day)

Effect of treatment on visual acuity in three groups on 90th day in 120 patients (right + left eye).

Test applied – Mann – Whitney Test (Level of significance - 5%, P<0.05).

Group	Mean		Standard deviation		Standard error		'p' value	Inference
A & B	0.2167	0.8167	0.6242	0.9613	0.05698	0.08775	P<0.0001	Extremely significant
A & C	0.2167	0.8333	0.6242	1.015	0.05698	0.09268	P<0.0001	Extremely significant
B & C	0.8167	0.8333	0.9613	1.015	0.08775	0.09268	P=0.9991	Not significant

On second follow – up (90th day) the effect of treatment in 120 patients in each group on Visual acuity between Group – A (Optical correction) & Group – B (Optical correction & oral *Shatawari Ghrita*) shows extremely significant results. The difference between the means of Group – A and Group – B was higher and 'P' value was P<0.0001. It means that the difference observed in the results of two groups was because of difference in treatment i.e. Oral treatment with *Shatawari Ghrita* gives excellent results over Optical correction.

The effect of treatment in 120 patients on Visual acuity between Group – A (Optical correction) & Group – C (Optical correction and *Shatawari Ghrita Tarpana*) shows extremely significant results. The difference between the means of Group – A & Group – C was

higher & 'P' value was P<0.0001. It suggests that the difference observed in the results of two groups was because of difference in treatment i.e. Optical correction & *Shatawari Ghrita Tarpana* gives excellent results over Optical correction.

The difference between the means of Group – B & Group – C is not higher and the 'P' value is 0.9991. It means both groups shows no significant results. The treatment in Group – B and in Group – C shows relatively similar effects i.e. the difference observed between the results of two groups was by chance only.

Table: 31 - Visual acuity (90th Day)

Overall effect of treatment on visual acuity in three groups on 90th day in 120 patients (right + left eye) of each group**.**

Test applied – Kruskal – Wallis Test (Nonparametric Anova) (Level of significance - 5%, P<0.05).

Group	Mean	Difference between mean		'p' value	Inference
A	142.88	A vs. B	56.788	P<0.0001	Extremely significant
B	199.67	A vs. C	56.075		
C	198.95	B vs. C	0.7125		

On second follow – up (90th day) the overall effect of treatment on Visual acuity between the three groups in 120 patients in each group shows extremely significant results. The 'P' value was P<0.0001.

The variations between the means of three groups were significantly greater than expected by chance.

The Optical correction and oral *Shatawari Ghrita* gives good results than only Optical correction and Optical correction with *Shatawari Ghrita Tarpana* gives good results over Optical correction and oral *Shatawari Ghrita*.

Table: 32 - Visual acuity (180th Day)

Effect of treatment on visual acuity in three groups on 180th day in 120 patients (right + left eye).

Test applied – Mann – Whitney Test (Level of significance - 5%, P<0.05).

Group	Mean		Standard deviation		Standard error		'p' value	Inference
A & B	0.4167	0.5917	0.8156	0.9028	0.07446	0.08241	P=0.0951	Not quite significant
A & C	0.4167	0.8333	0.8156	1.015	0.07446	0.09268	P=0.0006	Extremely significant
B & C	0.5917	0.8333	0.9028	1.015	0.08241	0.09268	P=0.0642	Not quite significant

On third follow – up (180th day) the effect of treatment in 120 patients in each group on Visual acuity between Group – A (Optical correction) & Group – B (Optical correction & oral *Shatawari Ghrita*) shows not quite significant results. The difference between the means of Group – A and Group – B was not much higher and 'P' value was P<0.0951. It means that Oral treatment with *Shatawari Ghrita* gives similar results over Optical correction i.e. the difference observed between the results of two groups was by chance only.

The effect of treatment in 120 patients on Visual acuity between Group – A (Optical correction) & Group – C (Optical correction and *Shatawari Ghrita Tarpana*) shows extremely significant results. The difference between the means of Group – A & Group – C was

higher & 'P' value was P=0.0006. It suggests that the difference observed in the results of two groups was because of difference in treatment i.e. Optical correction & *Shatawari Ghrita Tarpana* gives excellent results over Optical correction.

The difference between the means of Group – B & Group – C was not higher and the 'P' value was 0.6184. It means both groups shows no significant results. The treatment in Group – B and in Group – C shows relatively similar effects i.e. the difference observed between the results of two groups was by chance only.

Table: 33 - Visual acuity (180th Day)

Overall effect of treatment on visual acuity in three groups on 180th day in 120 patients (right + left eye) of each group.

Test applied – Kruskal – Wallis Test (Nonparametric Anova) (Level of significance - 5%, P<0.05).

Group	Mean	Difference between mean		'p' value	Inference
A	162.42	A vs. B	16.813	P<0.0024	Very significant
B	179.23	A vs. C	37.438		
C	199.85	B vs. C	20.625		

On third follow – up (180th day) the overall effect of treatment on Visual acuity between the three groups in 120 patients in each group shows very significant results. The 'P' value was P<0.0024.

The variations between the means of three groups were significantly greater than expected by chance.

The Optical correction and oral *Shatawari Ghrita* gives good results than only Optical correction and Optical correction with *Shatawari Ghrita Tarpana* gives good results over Optical correction and oral *Shatawari Ghrita*.

Table: 34 - Visual acuity (180th Day)

Overall effect of treatment on visual acuity in 120 patients (240 eyes) after 180 days:

Effect	Group - A		Group - B		Group – C	
	No. of eyes	%	No. of eyes	%	No. of eyes	%
Ineffective	192	80	171	71.25	142	59.16
Slightly Effective	48	20	35	14.58	30	12.5
Moderately Effective	00	00	34	14.16	68	28.33
Effective	00	00	00	00	00	00

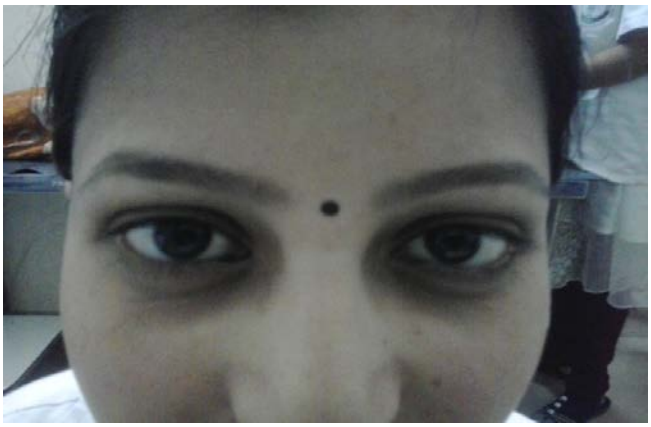
In Group – A (Optical correction) vision remains same in 80% eyes and in 20% eyes vision was improved by less than one line. There was no improvement of vision by one or two lines with optical correction after 180 days.

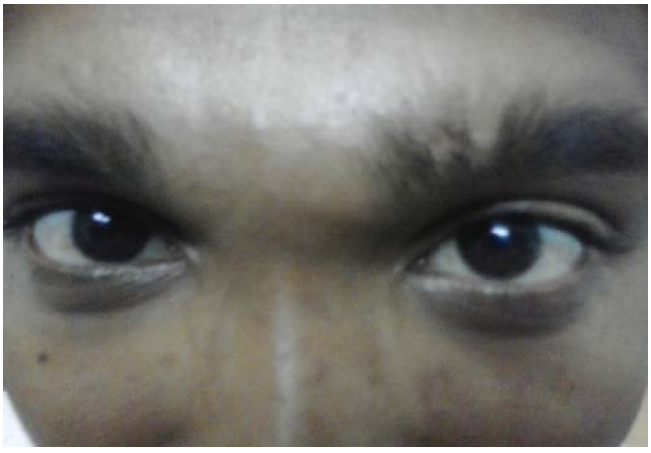
In Group – B (Optical correction & oral *Shatawari Ghrita*) vision was improved by one line in 14.16% eyes while in 14.58% eyes vision was improved by less than one line and in 71.25% eyes vision remains same.

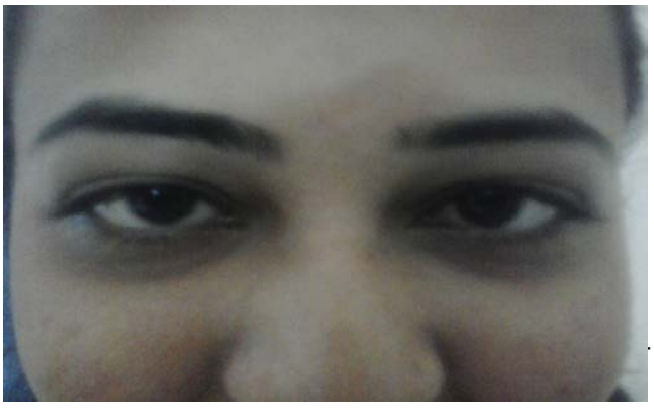
In Group – C (Optical correction & *Shatawari Ghrita Tarpana*) vision was improved by one line in 28.33% eyes while in 12.5% eyes vision was improved by less than one line and in 59.16% eyes vision remains same.

Systemic and Topical use of *Shatawari Ghrita* with Optical correction gives good results in *Timir* (Simple myopia).

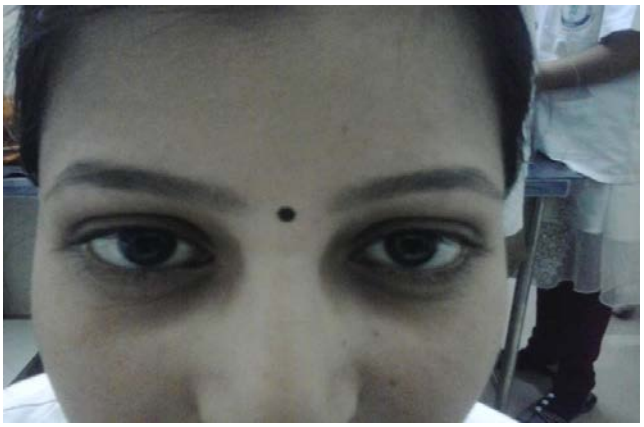
BEFORE TREATMENT

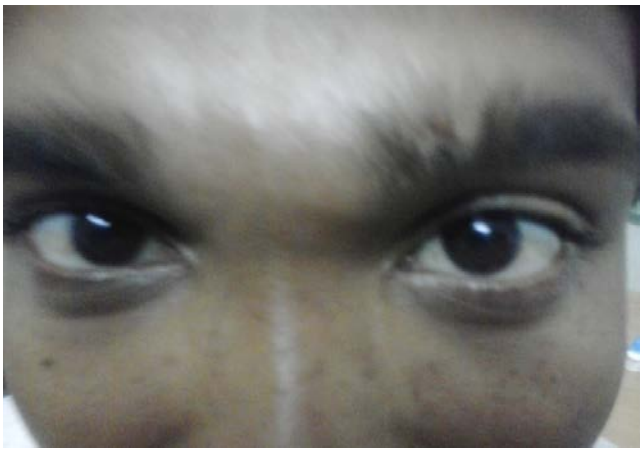


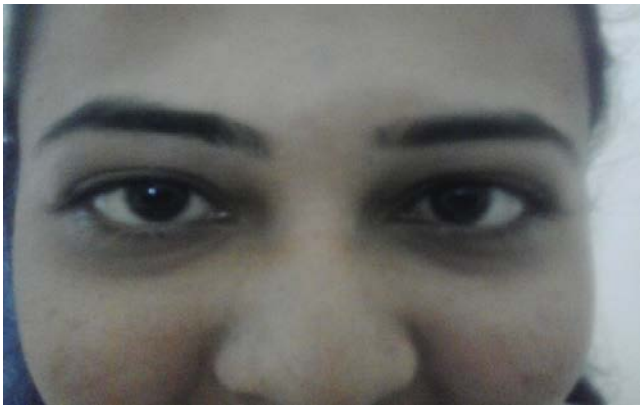




AFTER TREATMENT







DISCUSSION

According to ancient research methodology, before establishing any theory, the findings should be subjected through some sequential steps. The research work is done to draw some conclusions (*Nigamana*) from the observations and results. To correlate the findings with the results, discussion (*Upanaya*) is needed. Hence, this is the most important part of any research work. It comprises the discussion of important points from Conceptual Study as well as the results obtained from Clinical Study. Discussion is nothing but the logical reasoning of observations.

If all the points are discussed with proper reasoning, then they help to draw proper conclusions. It is a bridge which connects the findings with conclusions. It is the step which helps in understanding and interpreting the subject with reference to its merits and demerits, and guides to the conclusive judgment. In this aspect the, *Uha* or discussion becomes a necessary part of any research work. It is the exercise of churning of milk in order to draw the butter of conclusion. It is the step which helps in understanding and interpreting the subject with reference to its merits and demerits, and guides to the conclusive judgment.

Selection of the problem:

Myopia means the patient cannot focus on distant objects without an optical device like glasses or contact lenses and without these devices distant objects are blurred. Some people might consider glasses or contact lenses to be at the most a minor inconvenience. Children however often feel really handicapped and people doing sports feel the same. In any case, if there is a higher grade of Myopia, the loss of the optical device leaves the

person feeling helpless. As long as there is complete vision achieved with optical devices, there might be a substantial psychological problem, but not a real medical problem. Contact lenses are usually cleaned by & stored in solution containing preservatives with varying degrees of antibacterial activity so hygiene is the major problem of the contact lens.

Refractive surgery is a last treatment alternative. These are Radial Keratotomy (RK), Photo Refractive Keratectomy (PRK) and Laser in-situ Keratomileusis (LASIK) but all of these surgical procedures carry risks. Possible Lasik complications are ectasia, poor night vision, dry eye etc. No medicine is available to preserve the sight of patient with myopia in modern medicine and no surgical measure can be considered as fully safe and without side effects.

Children's with even low degrees of uncorrected Myopia cannot be expected to take normal interest in their surroundings, since they cannot see distant objects as clearly as their fellows. Their mental horizon is constricted, they tend to become unduly introspective and they are thrown more and more into finding their interest in reading and near work only and this is the dangerous thing for them.

People with higher grades of Myopia however are threatened by a permanent degradation of their vision or even blindness. This should be enough reason to find out the ways to minimize it. Like for every problem in life prevention is the best remedy and in spite of this known fact, most often people will take action only when the damage has already happened. There is a German proverb saying "damage makes you wise" – but it is better to get wise without too much damage.

Old text books of medicine stated that Myopia is an inherited condition and the only solution is to prescribe glasses. In many papers, however it was reported that today so many people are becoming myopic, even though their parents or grandparents were not. On the other hand, life today is very

different from that of our ancestors – just to mention the changed working environment and changed nutrition.

Myopia has become more prevalent in recent years. Its prevalence rate increases from 2-15 % up to 18 years of age. Simple or Developmental Myopia is the commonest variety. It is also called as Physiological or School Myopia.

Nutritive factors also have a vital role in the manifestation of Simple Myopia. Myopia in children's is also significantly related to lower consumption of Protein, Fat, Vitamins like B1, B2 and C, Phosphorus, Iron and Cholesterol as well as less exposure to the Sun.

Therefore it is obvious that these changes in the environment have an impact on the incidence of myopia. Definitely some people are more sensitive to these changes than others – by heredity. If we can map all these negative influences and understand how they are affecting myopia, then we have a chance of minimizing myopia in some, decreasing its progression in others and in some cases, preventing it altogether.

The idea of finding just one mechanism for myopia and solving this problem once and forever is very tempting, and some authors give the impression that they are close to this goal, and that all the other researchers, optometrists and ophthalmologists are wrong. The conclusion is not that some researchers are right, and rests of the researchers are wrong – all of them are right in their specific view of their experiments and experiences. Clearly, various different mechanisms exist that can lead to myopia. It is more important to find similarities in the results than the contradictions.

SELECTION OF DRUG:

No remedial measures for the prevention and care of this pathology prevails in the domain of modern ophthalmology; opening the door to the other systems of medicine to suggest, experiment and contribute the drugs

to alleviate or to check the deterioration. This challenge of the time was accepted by the *Ayurvedic* scholars, as they believed that nature provides both the diseases and drugs together. Eyes were greatly valued by ancient Indians and much importance have been accorded to their protection. The response of the medications can be easily assessed with the help of modern science.

Chakshushya, the term indicating regeneration of eye sight was in practice in India since centuries. The classics of ancient Indian's wisdom have invented and practiced many drugs like *Triphala*, *Shatawari*, *Ghrita Saptamrita lauha* etc., diets, procedures (i. e. *Tarpana*) and regimen for the benefit of the weak eyes.

Promotion of the visual acuity is considered as one of the priorities in the branch of *Shalakya* of *Ayurveda*. *Tarpana karma* has been indicated in several eye diseases by various *Acharyas* but the main emphasis has been given on *Timir*.

Hence, here *Timir – Myopia* selected for present study to assess the efficacy of *Shatawari Ghrita.*

Concept of *Timir*:

Timir is a disease, which is included under *Drishtigata Vikaras* by all *Acharyas*. The number of *Drishtigata Rogas* is 12 according to *Sushruta*; while it is 27 as per the opinion of *Vagbhatta*. This difference in the number may be because according to *Sushruta*, *Timir*, *Kacha* & *Linganasha* are the progressive stages of the same disease. But *Vagbhatta* considers *Timir*, *Kacha* and *Linganasha* as separate clinical entities. So there are six *Timir*, six *Kacha* and six *Linganasha* according to *Vagbhatta*; while *Sushruta* considers only six *Linganasha* as disease.

When vitiated *Doshas* reach inside the eye through blood vessels and get located in the first *Patala*, there is indistinct vision of all objects. Vision becomes more disturbed when *Doshas* reach the second *Patala*, When

vitiated *Doshas* are situated in first and second *Patala*, the disease is termed as *Timir* but when the vitiated *Doshas* affect the third *Patala*, it is termed as *Kacha*; and when it involves the fourth *Patala*, it is termed as *Linganasha*. The meaning of the word *Timir* is darkness. But when the *Doshas* are in the 4th *Patala*, there is absolute darkness. (Su. Ut. 7/4).

Involvement of *Patala* in *Timir* – Myopia:

A part of clinical features of *Timir*, *Kacha*, *Linganasha* complex can be correlated with myopia, the most important refractive error.

1. Diminution of vision for distance is a symptom produced due to affliction of first *Patala* which occurs in myopia of low degree. Cardinal symptom of myopia i.e. difficulty in distant vision when the vitiated *Doshas* are lodged in the upper part of the *Drishti*.

2. *Vihwala Darshana* symptom is produced due to affliction of second *Patala* occurs due to progressive Myopia, which results into vitreous degeneration, retinal degeneration and ultimately retinal detachment in advanced stage.

3. The confused visual perception and appearance of bees, flies, hairs etc. are presents when the vitiated Doshas are situated in the second Patala. These symptoms are present in high myopia also, where degenerative changes occur.

4. The end result of myopia particularly high myopia is total blindness & *Timir* also leads to *Linganasha* i.e. loss of vision ultimately.

CAUSATIVE FACTORS:

In Ayurvedic texts one finds general causative factors of eye diseases in elaborate manner. No separate *Nidanas* are found mentioned for most of the disease including *Timir*. Hence general causative factors are to be taken as causative factors for *Timir* also. These *Nidanas* include *Aharaja*, *Viharaja* as well as mental factors.

Among all the three most important factors is *Ahara*, as it is the basis of all functions of the body. The *Doshas* and *Dhatus* of the body are created,

maintained and destroyed mainly by *Ahara*. The directly factors which adversely *Amla* and *Katu* particularly harmful for eyes. So food items with excessive *Amla* i.e. curds, prickles etc. and items of *Katu Rasa* i.e. red chilly and having *Ruksha*, *Ushna*, *Vidahi Guna* etc., which can result into aggravation of *Vata* and *Pitta Dosha*, which is one of the important factor for causation of the disease *Timir*.

Cold water bath, when the body is hot-sudden variation in the body temperature causes in general and eye diseases in particular. When body is too hot, the vessels are dilated and the volume of fluids will be increased. Then if body temperature is suddenly dropped, the vessels constrict and the vasculature is damaged. This cause circulatory disturbances; which in turn affects the mechanism of nutrition and it leads to eye diseases.

Smoking is considered as harmful for eyes by both i.e. *Ayurveda* and modern medicines. As per *Ayurveda*, smoking may vitiate *Pitta* and *Vata* by increasing its *Tikshna*, *Ushna* and *Ruksha Gunas*, hence it can be considered as one of the important factors in the causation of *Timir*. The use of cheap cooking fuel such as firewood is linked to an increased risk of *Timir*, especially in case of female. Cigarette smoking leads to an earlier onset of *Timir*, especially in male.

Suppression of urges directly vitiates *Vata*, which in turn develops various types of diseases. Among these 14 urges *Nidra* and *Ashru* are directly connected with the eye. The role of sleep in developing eye diseases has already been described.

Suppression of lacrimation will affect the normal function of lacrimal glands and thereby moistening the eyes. *Jrumbha*, *Kasa*, *Kshavathu* etc. are also capable of developing eye diseases. All these increase the pressure inside the eye and will dilate the vessels. Sometimes there may be haemorrhages, from the vessels of the *Shleshmika Kala* of *Shuklamandala* (conjunctiva) or *Drishtipatala*. Among the five *Vata*, *Prana Vayu* and *Udana*

Vayu are associated with these urges. By the suppression of these urges action of these *Vatas* become *Pratiloma*, which affects the normal functioning of the organ.

Watching moving objects for a long time develops eyestrain, which may leads to certain eye diseases. Continuous watching of moving picture brings 8 times more than normal work load to the eyes (*Ati* and *Mithya Yoga*). Similarly reading in the moving vehicle brings eyestrain and headache (*Mithya Yoga*). Welding work and work in furnaces etc. may increase *Pitta* and gradually vitiate it. Taking heavy load on head also precipitates eye diseases. Work in cold atmosphere (e.g. A.C. room) for a long time, may aggravate the *Kapha* and in turn decrease the *Pitta* and also may cause aggravation of *Vata* due to *Sheeta Guna* and may result into eye diseases.

Swapnaviparyaya, *Chinta*, *Shoka*, *Atimaithuna*, *Kulatthamasha sevana* are also Vitiate *Vata Dosha* mainly, which is one of the important factor for causation of the disease *Timir*.

Other occupational factors, in which the person indulged in more near work i. e. Tailoring work, working on computer, microscope for long time etc. may bring fatigue to the eyes, which may develops Myopia at an early age.

***Samprapti*:**

Samprapti can be explained as the pathological changes evoked by the etiological factors, leading to the manifestation of signs and symptoms of the diseases. In other words *Samprapti* is the action of *Doshas* in the *Dhatus* via *Srotas*, which in turn manifests signs and symptoms.

The pathological events of *Timir* begin with the increment of *Doshas* at their respective sites. The *Vimarga Gamana* of these increased *Doshas* through *Siras* towards *Drishti* & localization in *Patalas* is said to be the *Samprapti* of *Timir*.

Dalhana opines that the word '*Sira'* here denotes *Rupavaha Sira* and *Drishti* indicate inner part of *Drishti*. As already described, the progress of pathogenesis includes involvement of successive *Patalas*. The localization of *Doshas* in the *Patalas* further prevents the functional capacities of *Patalas* and leads to blurred vision or *Avyakta Darshana*. It further inhibits the nutritional supply by obstructing the channels responsible for it. The further progression leads to *Vihwala Darshana* due to the involvement of *Pishitashrita* and *Medoashrita Patalas*. The disease terminates into *Linganasha*, or the stage of absolute blindness. The *Ashraya* of the *Malas* in *Indriya* thus produces both *Upaghata* [*Nasha* or destruction] and *Upatapa* [*Vikriti* or disease] in *Chakshurendriya*. (8)

Acharya Charaka states that when humors get provoked in the seats of the sense organs, they cause either the impairment or the irritation of the senses concerned. (Ch. Su. 28/20). (2)

Prognosis:

Acharya Sushruta explained that *Timir* is *Sadhya* with the proper medication when *Doshas* are limited to first *Patala*, when *Doshas* are situated in second *Patala* then it is *Krichhasadhya*. It gets the stage of chronicity and becomes *Yapya* by the involvement of third *Patala*. *Timir* attains the incurability when the *Doshas* reach fourth *Patala* where in surgical intervention is advocated in case of *Kaphaja Linganasha* (Su.Ut.17/53). (9)

Selection of *Tarpana*:

According to *Acharya Charaka*, *Timir* is *Vata Nanatmajaa Vyadhi*, so mainly *Vata* predominant causative factors are responsible for *Timir*.

श्रोत्रादिष्विन्द्रियवधं कुर्याद दुष्तसमिरण।। Ch.Chi. 28/29

When aggravated *Vata Dosha* is situated in *Indriyasthana* i.e. eye then it will distract the normal function of the *Indriya* i.e. *Drishtinasha*. (5)

अव्यक्तं लक्षणं तेषां पुर्वरुपमिति स्म्रुतम्।। Ch. Chi.28/29

Acharya also said that *Avyaktavastha* is prodromal sign of *Nanatmaja Vyadhi*. It means that there is no specific *Rupa* of the disease.

The only clinical feature of first *Patala* pathology is blurred / indistinct vision which becomes clear sometimes without any reason. As the *Doshas* vitiate the superficial *Dhatus* only, the prognosis is good.

In *Ayurvedic* classics various therapeutic procedures are explained which are said to improve or enhance the visual acuity as well as improve the health of the eye. *Kriyakalpa* is one such group of special methods of drug administration locally into the eye for the treatment for eye diseases, in which *Tarpana* is foremost procedure for *Timir* and provides *Vatashamaka* effect and nourishment to the eyes and improves visual acuity. [(5)]

Discussion on drug under trial:

Many formulations of medicated *Ghrita* are advised by *Chakradatta* in context of *Chakradatta – Netraroga Chikitsa Prakarnam* 59/165-172.
The ingredients of *Shatawari Ghrita* are *Shatawari*, *Godugdha* and *Goghrita*.
The *Shatawari Ghrita* was prepared by classical method of *Ghrita Paka*. [(21)]

All the ingredients of *Shatawari Ghrita* are having *Chakshushya*, *Rasayana* and *Balya* properties.

Rasayana means ‘the path of juice’ which aims to nourish, restore and balance the body functions. *Rasayana* is generally used to rejuvenate the general health of the body or aims to achieving the body’s maximum potential. The word *Rasayana* refers to nutrition and its transportation in the body. *Rasayana* is actually that which increases the essence of each *Dhatu*, starting with *Rasa*. It helps to promote and preserve the health by promoting the status of *Dhatus*. It increases the optimum strength of physique i. e. *Dehabalam* and optimum strength of the sense organs i. e.

Indriya balam. It nourishes the blood, lymph, muscles, tissue and semen. It improves metabolic process and quality of body tissue.

Shatawari is powerful *Rasayana* capable of improving memory power, intelligence, physical strength and maintaining youthfulness.

Moreover, *Ghrita* due to its *Sansakaranuvartana* quality easily imbibes the properties of other drugs processed with it without leaving its own properties. *Goghrita* is also having above said properties. *Acharyas* have mentioned these ingredients as *Chakshushya* and very effective in treating the eye disorders. Due to above properties, the present combination was selected in the form of *Ghrita* to evaluate its efficacy in patients suffering from *Timir* – Myopia.

PLAN OF STUDY:

The present study has involved 360 patients of Simple Myopia. The diagnosis was made on the basis of signs and symptoms described in *Ayurvedic* and modern texts. Modern parameters were used to confirm the diagnosis. The selected patients were randomly categorized into three groups.

Group A:

Total 120 patients of this group were given optical correction with appropriate concave lenses.

Group B:

Total 120 patients of this group were given optical correction and administered *Shatawari Ghrita* 20 gms in the morning and 20 gms in the evening for adults and in children's according to Young's formula for 30 days.

Group C:

Total 120 patients of this group were given optical correction and *Shatawari Ghrita Tarpana* as local therapeutic application in the dose of 30 gms once a

day for seven days. The treatment was given in total three sittings with interval of seven days for each sitting i. e. total 21 days.

GENERAL DESCRIPTION OF THE PATIENTS

General description of the patients involving in the present study was as follows:

The results were drawn strictly on the basis of data collected & after Statistical analysis.

1) Age: In the present study the number of patients in 7 -17 age group were 87 i. e. 24.16% and the number of patients in 18 -25 age group were 273 i. e. 75.83%. It was a significant observation that the disease manifests in teenagers. It was also a proven fact that simple myopia usually begins in childhood. Since the eyes continue to grow during childhood, myopia almost always occurs before the age of 20 to 25 and then gets stable in adulthood.

2) Gender: In the present study the number of males were 201 i. e.55.83% and the number of females were 159 i. e. 44.16%. The percentage of males was higher than the females. There is no any theoretical description regarding gender predominance in simple myopia. But in the present study male predominance could be by chance only.

3) Occupation: In the present study 73.05% patients were taking education, 15% patients were in the service, 11.66% are housewives. This is a significant finding because simple myopia is prevalent in adolescent age group. It usually commences at around the age of 7, begins to increase rapidly reaching maximum rate of increase at about the age of 13 and reduces its rate until late teens when it usually stabilizes.

4) Etiological Factors: In this series 46.66 % were having *Sukshmanirikshana*, 8.61% *Shirobhitapa*, 62.5 % *Krodha* , 15.55 % were having *Swapnaviparyaya* & 21.94% were having *Shoka* as *Nidana*,

Durekshanat 25.27 % patients, 02.22 % patients were doing *Ratri atyambupana*, 38.61 % *Ushnabhitaptasya Jalapraveshata*, 8.61 % *Shirobhighata*, 22.77% *Malavarodha*, 1.38% *Dhumanishevanam*, & 07.5 % were having *Atimaithuna* as *nidana sevana* & none of the patients were having, *Chhardivighatada*, *Vamanaatiyogata*, *Rituviparyaya*, *Mutravarodha*, *Vashpagrahata*, *Atisantapa Rajosevana*, *Atiratribhojana*. This signifies that most of the etiological factors were present in most of the patients.

5) Chief Complaints: In the present study the maximum 78.05% patients were having Headache, 57.22% patients were having Eyestrain, 51.38% patients were having Diminished distant vision, 30.27% patients were having Watering of eyes, 1.94% patients were having Blurred vision and no one patients were having the symptoms like Diplopia and Burning of Eyes. This signifies that most of the symptoms were present in most of the patients.

6) Fundus Picture: In the present study all the patients were having normal fundus picture. Most of the times pathological fundus may be seen in pathological Myopia.

7) Visual Acuity: In the present study maximum 53.75% patients eyes were having visual acuity in between 6/6 – 6/9, 35.97% eyes were having visual acuity in between 6/12 – 6/18. The 5.41% patients eyes were having visual acuity in between 6/24 – 6/36 and 4.86% eyes were having visual acuity 6/60. Most of the patients were having visual acuity in between 6/6 to 6/9. This signifies nothing.

8) Dioptric Power: In the present study the Dioptric power of 85% patients were lie in 0.00 – 1.00, 10.69% patients were lie in -1.25 – 2.00, 2.36% patients were lie in -2.25 – 3.00 and 1.94% patients dioptric power

was lie in -3.25 – 4.00. It is the evident fact that in simple myopia refractive error is up to the – 6 D.

9) Indistinct distant vision: After 30 days the overall effect of treatment on Indistinct distant vision between the three groups shows no significant results. The Chi square value was 0.0795 (P>0.05). It means that the treatments show similar effect on Indistinct distant vision.

10) Eyestrain: After 30 days the overall effect of treatment on Eyestrain between the three groups shows extremely significant results. The Chi square value was 50.248 (P<0.05). It means that the difference in results was because of treatments.

11) Headache: After 30 days the overall effect of treatment on Headache between the three groups shows extremely significant results. The Chi Square value was 68.4159 (P<0.05). It means that the difference in results was because of treatments.

12) Redness of eyes: After 30 days the overall effect of treatment on Redness of eyes between the three groups shows no significant results. The Chi Square value was 4.9445 (P>0.05). It means that the treatments show similar effect on Redness.

13) Watering of eyes: After 30 days the overall effect of treatment on Watering between the three groups shows significant results. The chi Square value was 7.4142 (P<0.05). It means that the difference in results was because of treatments.

14) Optical correction: On third follow – up (180^{th} day) the overall effect of treatment on Optical correction between the three groups in 120 patients in each group shows extremely significant results. The 'P' value was

P<0.0001.The variations between the means of three groups were significantly greater than expected by chance.

15) Visual Acuity: On third follow – up (180th day) the overall effect of treatment on Visual acuity between the three groups in 120 patients in each group shows very significant results. The 'P' value was P<0.0024. The variations between the means of three groups were significantly greater than expected by chance.

16) Effect of treatment on chief complaints: Comparison between the effects of treatment in three groups on Indistinct distant vision, Redness of eyes and Watering of eyes on 30th day shows no significant results. It means that treatments shows similar effect on these symptoms.

17) Effect of treatment on chief complaints: Comparison between the effects of treatment in three groups on Eyestrain and Headache shows significant results in A & B and A & C groups but in B & C groups shows no significant results. It means that effect of oral *Shatawari Ghrita* and *Shatawari Ghrita Tarpana* shows similar effects on these symptoms on 30th day.

18) Effect of treatment on chief complaints: Comparison between the effects of treatment in three groups on Optical correction and Visual acuity shows significant results in A & B and A & C groups but in B & C groups shows no significant results. It means that effect of oral *Shatawari Ghrita* and *Shatawari Ghrita Tarpana* shows similar effects on these symptoms on 30th day.

19) Overall effect of treatment on Optical correction: On third follow – up (180th day) the overall effect of treatment on Optical correction between the three groups in 120 patients in each group shows extremely significant results. The 'P' value was P<0.0001.

20) Overall effect of treatment on Visual Acuity: The overall effect of treatment on visual acuity after 180 days shows moderately effective results in Group – B (14.16%) and in Group – C (28.33%).

PROBABLE MODE OF ACTION OF *SHATAWARI GHRITA*:

SYSTEMIC EFFECT:

The mechanism of action of any drug mainly depends upon its properties as well as its molecular structure and other associated factors. For explaining the drug action only a particular disease, one should have thorough knowledge about *Samprapti* and pathogenesis of the disease along with the physiology of that particular organ or system and the prepared formulation must have the quality to break down the '*Samprapti'* of the disease.

The *Samprapti* of *Timir*, which is available in our text, is insufficient for explaining the mechanism of drug action, still effort has been made under.

In *Ayurvedic* text the action of the drug is based upon the *Rasapanchaka* of the drug. On the basis of *Rasapanchaka* of the drugs the probable mode of the action of the drug is as follows -

The drug is having *Madhura*, *Amla*, *Katu*, *Tikta* and *Kashaya Rasas*, *Guru*, *Snigdha*, *Mridu*, *Laghu* and *Ruksha Gunas*, *Sheeta* (Mainly) and *Sheeta Veerya*, *Madhura Vipaka* properties. In *Samprapti* of *Timir* due to *Achakshushya nidana sevana*, *Tridosha prakopa* occurs in the body, the ingredients of the drug having *Tridoshashamaka* property. Most of the *Rasas* present in drug are having *Deepana - pachana* property which helps in *Ama pachana*. *Ama* formation is also responsible for *Srotorodha* in *Rupavaha Sira*. *Tikta Rasa* shows its *Chhedana* property; *Katu Rasa* is *Tikshna* and possesses *Marga Vivarana* action. The *Ghrita* has also quality of trespassing into minutest channels of the body. The *Shuddha Srotasa* allow the free movement of *Vata*, *Pitta* and *Kapha* resulting into alleviation of *Kapha*

and *Vata* along with enhancement with *Pitta*. This Pitta performs its normal functions of visual perception.

Sheeta Veerya helps in maintaining the *Sheeta Satmya* of the *Drishti* which is a therapeutic property of the *Drishti*.

The drug having *Madhura Rasa* and *Madhura Vipaka* possess *Rasayana*, *Cakshushya*, *Jeevaniya*, & *Balya*. properties. Because of its *Rasayana* action the substrate *Dhatus* of the poor *Patalas* as well as *Drishti* are nourished, thus by improving the functional capacity of the eye, there is decline in various symptoms. *Madhura Rasa* and *Madhura Vipaka* also pacify the *Vata Dosha*, which is the most important factor responsible for *Timir*.

From the above description of *Shatawari Ghrita*, the formulation seems to be *Tridosha shamaka*, *Sheeta veerya* and *Madhura* in *vipaka*.

Timir roga is *Vata* predominant, *Tridoshaja* disease. The formulation under trial has *Tridoshashamaka* properties due to *Madhura vipaka*. These properties of formulation help to break down the *Samprapti* - pathogenesis of the disease. Apart from these properties all ingredients are *Chakshushya*, *Rasayana*, *Brimhana* and *Balya*, which will strengthen the *Patala* and improve the vision.

Probable Mode of Action of *Tarpana*:

Ghrita is supreme in *Jangama Sneha* and is *Balavardhaka*, *Ojovardhaka*, *Vayasthapana*, *Agni deepana* and *Dhatuposhaka*. By virtue of its *Sankaranuvartana* property, it will attain the properties of ingredients.

Acharya Charaka in *Sutrasthana Snehadhyaya* explained that,"*SNEHOANILAM HANTI*" which means that *Shehana* is the supreme treatment for *Vata Dosha*. He mentioned *AkshiTarpana* as one of the 24 *Snehapravicharana* in *Sutrasthana* 13th chapter.

According to *Charaka* (Ch.Sam.Su. 13/14), *Ghrita* is effective in subsiding *Pittaja* and *Vataja* disorders, it improves *Dhatus* and is overall booster for improving *Ojas*.

The clinical trial drug *Shatawari Ghrita* has predominance of *Madhura* (28.57%), *Tikta Rasa* 25.71%, *Kashaya Rasa* 20%, *Guru Guna* (26%), *Laghu* 20 %, *Ruksha* 21 %, and *Snigdha* 18%, *Sheeta Virya* (63%) & *Ushna Virya* 37 % and *Madhur Vipaka* (75%) & *Katu Vipaka* 25 %. Considering the *Doshakarma*, the trial drug is *Vatashamaka* (36.84%), *Pittashamaka* (34%) and *Kaphashamaka* (29%) by virtue of its *Rasa*, *Guna*, *Virya* and *Vipaka*. Thus, the overall effect of the compound drug is *Tridoshashamaka* and hence it disintegrates the pathology of the disease *Timir*, which is *Tridoshaja* in its manifestation.

In present study, *Shatawari Ghrita* has been used as a topical application in the form of *Tarpana* and in the form of oral medication.

Bhavaprakasha has also described *Ghrita* as *Rasayana*, good for the eyes and protects body from various diseases.

When we look at above said qualities of *Ghrita*, mode of action for *Akshitarpana Kriya* which is mainly done with *Ghrita* can be specified as follows.

The *Ghrita* has the quality of trespassing into minutest channels of the body. Hence when applied in the eye, it enters into deeper layer of *Dhatus* and cleanses every minutest part of them.

Moreover, *Ghrita* due to its *Sansakaranuvartana* quality easily imbibes the properties of other drugs processed with it without leaving its own properties. Drugs used in the *Shatawari Ghrita* are more or less having *Chakshushya* properties. So, *Shatawari* and *Godugdha* processed with *Ghrita* are beneficial for the power of sight.

Also in the description of the *Drishti*, *Sushruta* has mentioned that *Sheeta dravyas* are *Satmya* (Wholesome) for *Drishti*. *Ghrita* is also *Sheeta Virya*, hence the eye being the site of *Alochaka Pitta* can be effectively managed by constantly using *Ghee* for *Akshi Tarpana*.

Ghrita also contains properties like *Balya*, *Brimhana* and *Rasayana*, so it gives strength to the overall tissues of the eyeball as well as to the nervous tissues.

Ghrita contains vitamin A, D, E, K and carotene in it. Vitamin A and E are antioxidants and vitamin A also keeps the outer lining of the eyeball moist. Digestion, absorption and delivery to a target organ system are crucial in obtaining the maximum benefit from any formulation. This is facilitated by *Ghrita*, since active ingredients of drugs are mixed with *Ghrita* and they are easily absorbed.

Lipophilic action of *Ghrita* facilitates transportation to the target organ and final delivery inside the cell, because cell membrane also contains lipid. This liphophilic nature of *Ghrita* facilitates entry of drug in eyeball through corneal surface since corneal epithelium is also permeable to lipid soluble substances and lipid soluble substances cross corneal epithelium irrespective of their molecular size.

Moreover, *Ghrita* preparation used in *Tarpana* is in the form of suspension containing different particles of the drugs and the particles do not leave the eye as quick as solution. Tissue contact time and bio availability is more hence therapeutic concentration can be achieved.

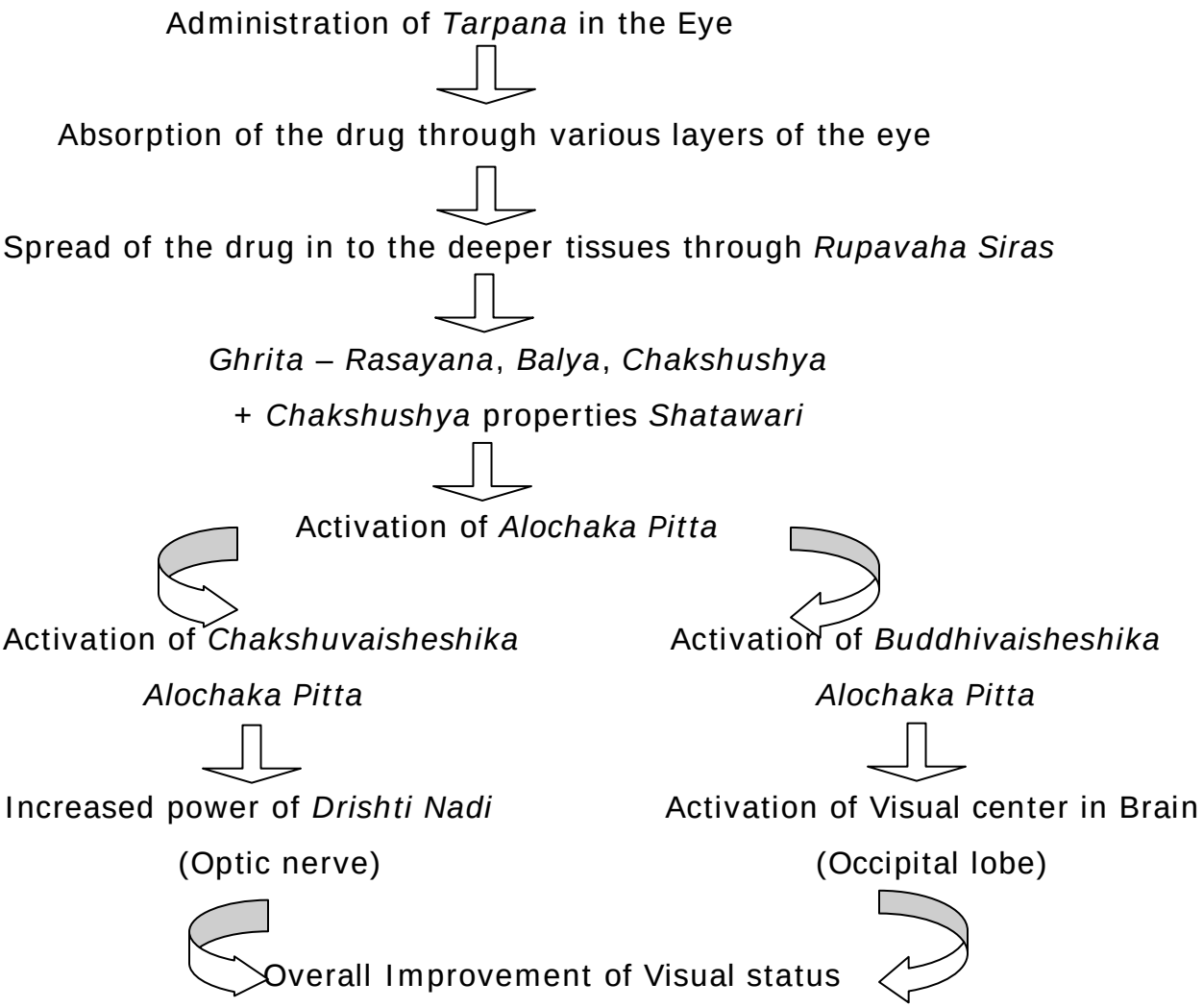
Myopia is a clinical condition in which the refractive error is present and this error may be due to changes in the axial length, refractive index or curvature of the cornea.

The *Shatawari Ghrita* used as *Tarpana* may have its action at the level of axis, index or corneal curvature. The fat soluble contents of the drugs absorbed through trans-corneal route may have action on the refractive media of the eye and eye as a whole. There may be peribulbar deposition of fat exerting pressure upon the sclera and this may be responsible for the reduction in the antero-posterior diameter in myopic eye. Moreover, drugs

placed over eyeball directly for long time may also act by directly exerting pressure upon the cornea and reducing its curvature.

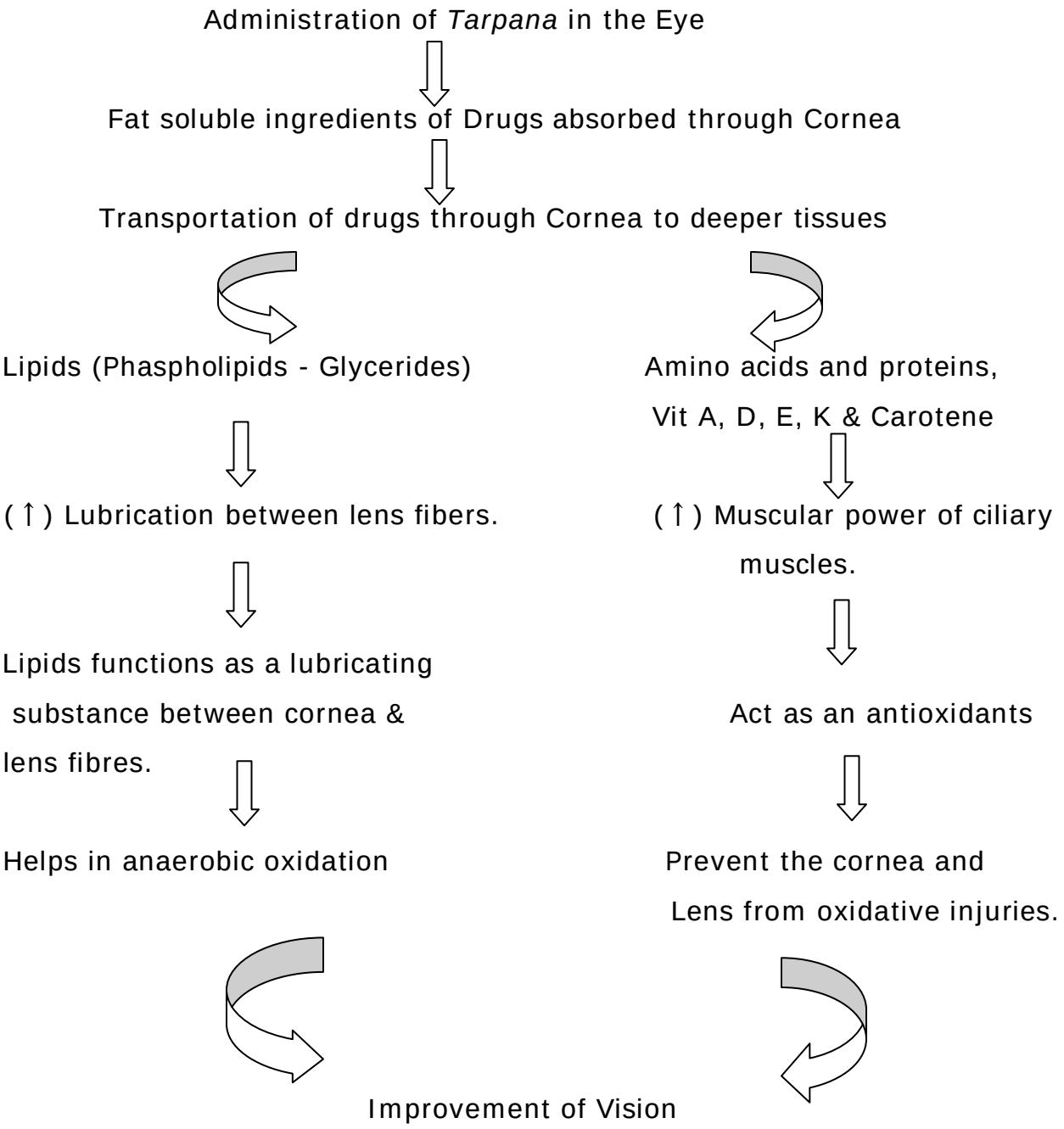
Among different routes employed for therapeutics in eye e.g. *Seka*, *Aschyotana* etc., in *Tarpana* there is contact of drug with eye for long time. This facilitates the action of drug by two ways – one by allowing more absorption of the drug by corneal surface and secondly by exerting direct pressure upon the cornea. There may be changes in the refractive index of the cornea causing less convergence of light rays. The action of *Tarpana* over axis, refractive index and corneal curvature needs further studies with large number of patients.

PROBABLE MODE OF ACTION OF *TARPANA KARMA*



PROBABLE MODE OF ACTION OF *TARPANA*

(Modern pharmacological context)



Following factors take part in the production of Myopia

1) Protein composition in aqueous humour
2) Weak or degraded connective tissue in genetic factors
3) Reading or excessive near work
4) Stress

To overcome these factors *Ayurvedic* treatment with *chakshuya* drugs is very beneficial.

Shatawari Ghrita was more palatable for systemic use and accepted by all the patients & it gives better results in *Timir* (Myopia).

Due to *Balya*, *Rasayana*, and *Chakshuya* properties of *Shatawari Ghrita* asthanopic symptoms like headache, watering, eye strain, neck pain were relieved in most of the patients.

Modified procedure of *Tarpana karma* was very easy, less time consumable and accepted by all the patients.

Due to *Tarpana* procedure refractive errors were reduced in most of the patients. Strength of the eyeball was increased in many patients & it gives best results in *Timir* (Myopia).

Major advantage of *Tarpana Karma* was that a high concentration of medicine was achieved at desired site without exposing the rest of the body.

Epithelium and Endothelium of Cornea are highly permeable for lipid content and Stromal layer to water soluble content so for complete penetration drug should be lipophilic and hydrophilic which was shown by *Shatawari Ghrita*.

Minor side effects of *Tarpana Karma* like irritation of the eyes, redness are noted but these symptoms do not require any specific treatment.

Combination therapy of oral and local (*Tarpana*) use of *Shatawari Ghrita* might give wonderful results.

Shatawari Ghrita is easily available, cost effective and long term use may improve eyesight as well as general health of the patient.

SUMMERY

The fruitfulness of any work is proved only after a thorough discussion is done on the principles/concepts, with the help of available and achieved data, and some conclusions can be drawn. Summary provides a whole theme of the study and anything in Research needs to be summarized and put in a nutshell. Hence, it can be said that, getting some conclusions on any research work is just like getting fruits from own hand planted tree. Hence here also a thorough discussion has been done in the previous chapter by putting the obtained observations and data at par the conceptual and theoretical part. So that a further progress in the subject or any part of the matter can be considered in future for the benefit of the similar patients.

The dissertation entitled "Open, Controlled, Randomized Study of Systemic use of *Shatawari Ghrita & Shatawari Ghrita Akshi Tarpana in Pratham Patalgata Timir w.s.r. to Simple Myopia"* was carried out with the hope of searching better remedy for the disease. The thesis is divided into 10 main chapters.

1) Introduction
2) Aims and Objectives
3) Literary Review
4) Materials and Method
5) Observations & Results
6) Discussion
7) Summary
8) Conclusion
9) Bibliography
10) Annexure

Introduction:

Introduction is the preface of the thesis. In the introduction, importance of *Shalakya* in *Ashtanga Ayurveda*, selection of the problem and drugs, etc is written.

Myopia, a form of refractive error, is a highly significant problem which prevents the individual from seeing distant objects clearly. *Tarpana* is foremost procedure for *Timir* and provides *Vatashamaka* properties and nourishment to the eyes and improves visual acuity. Chakshushya drugs are also used orally for nourishment of eyes and they are helpful for improving the vision. So present study is taken to evaluate the effect between *Shatawari Ghrita Tarpana* and systemic use of *Shatawari Ghrita*.

Aims and Objectives:

In this chapter 'aims' or finally what is to be achieved after research project with the help of object is written.

Literary Review:

It has been further divided into two subsections:-

(i) *Ayurvedic* review

(ii) Modern review

***Ayurvedic* review:**

Ayurvedic review consists of description regarding the anatomy & physiology of *Netra*, concept of *Drishti*, etymological derivations, concept of *Patala*, detailed description of *Timir*, *Nidana*, *Rupa*, *Samprapti*, *Chikitsa*, *Pathya- Apathya*, *Sadhyata- Asadhyata* etc. have been mentioned under the *Ayurvedic* aspects.

A separate chapter on '*Kriyakalpa'* is described in this section.

Modern review:

Modern review comprises of anatomy and physiology of the eye and detailed description of the disease Myopia.

Materials and Method:

In this section, Drug Review deals with the detailed description of *Shatawari*, *Godugdha*, *Goghrita*. An attempt has been made to cover all the aspects regarding drug i.e. synonyms, *Ayurvedic* properties, *Karma*, uses, pharmacological actions & pharmcodynamic properties of *Shatawari Ghrita*.

Clinical Study deals with need and plan of study in detail, criteria for selection and exclusion of patients, sampling, treatment schedule, nature of work, symptom scoring and method of assessment, observations of 360 patients has been described with due importance in this section.

Observations and Results:

A total number of 360 patients completed the therapy, subjective and objective improvement in the patients with statistical analysis of results has been explained in this chapter. All the observations are recorded in a specially designed proforma.

Discussion:

In this section, the logical interpretation of the observations and effects of therapy obtained, probable mode of action of the trial drug and *Tarpana Kriya kalpa* has been discussed.

Summary:

In this chapter contents of all chapters are summarized in short.

Conclusion:

Conclusions are drawn on the basis of the observations and results which are obtained from the data collected and after through discussion.

Bibliography:

In this chapter, books, thesis, websites referred with the name of the author, name of chapter, page number, edition etc. are given.

Annexure:

In this chapter, case record form, consent form etc. are attached.

The study was selected on the following criteria,

- The prevalence rate of the Myopia is very high and no work has been done with the drug *Shatawari Ghrita* on this disease.
- Sufficient numbers of patients are available in the Outdoor Patient Department.
- Oral *Shatawari Ghrita* is palatable to all patients.
- The procedure of Tarpana is very simple cost effective. No any complications seen, prognosis is good. No need of any *purva-karma* and *paschat-karma* because conjunctiva and lacrimal fluid contains various antiseptic properties. *Vitiated* doshas are removed from the eyes through *Tarpana* Procedure.

- Therefore it can be summarized that in early stage of *Timir* (Simple Myopia) *Shatawari Ghrita* can be used orally and topically safely.

CONCLUSION

Conclusion is the determination established by investigating in various ways and deducting by means of various reasons *(Ch. Vi. 8).*

On the basis of the present study, following conclusions can be drawn -

1) **Group – A:** Optical Correction provided better results in chief complaints like Indistinct distant vision.
2) **Group – B:** Oral *Shatawari Ghrita* with optical correction provided better results in chief complaints like Indistinct distant vision, Blurred Vision, Eyestrain and *Headache.*
3) **Group – C:** *Shatawari Ghrita Tarpana* with optical correction provided better results in chief complaints like Indistinct distant vision, Blurred Vision, Eyestrain and Headache.
4) In reduction of dioptric power, both Oral and *Tarpan* (Group B & C) has shown better results than only Optical correction.
5) Oral *Shatawari Ghrita* & *Shatawari Ghrita Tarpana* (Group B & C) shows moderately effective results on Visual Acuity. *Tarpana* shows better results than oral treatment.

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Annexure

Department of Shalakya – Tantra (Netra Roga vibhaga)

Patient Examination record Paper

OPD NO. - Date:

Patient's name-

Age- Sex-

Occupation- Religion-

Full address-

Name & Address of Relative-

[A] HISTORY OF PATIENT

Main Complaints of Patient-

History of present illness-

History of past illness-

Family history-

Treatment history-

[B] EXAMINATION OF PATIENT

General Examination:

1. General condition- 2. Respiratory system-
2. Cardiovascular system-
3. C.N.S. 5. G.I.T.
6. Urinogenital system- 7. Nutritional status-

Temp. - Pulse - B.P.-

Weight- Sensitivity of drug-

Local Examination-

Netra (Eye) - Right Left

a) Eyelash- Misdirected

Madarosis-

b) Eyelid - Position

Movement

Growth

c) Lid margin-Entropion

Ectropion

Swelling

Scales

Ulcers

d) Lacrimal Apparatus-

Redness

Swelling

Lacrimal puncti

e) Conjunctiva-Bulbar

Palpebral

Fornix

f) Cornea- Size

Shape

Transparency

g) Sclera- Discoloration

Inflammation

h) Iris- Colour

Pattern

p) Pupil – No.

Location

Size

Shape

Pupillary reaction

VISUAL ACUITY TEST-

Visual Acuity - Rt. Lt.

Visual Acuity with pin hole Rt. Lt.

Retinoscopic Readings -

Autorefractometer Reading

Fundus Examination-

Follow up :

Visual Acuity ⇨ / **On day** ⇩	**Right Eye**	**Left Eye**
30th day		
90th day		
180th day		

NIDAN PANCHAKA-

1) Hetu –

2) Purvarupa –

3) Rupa –

4) Upashaya - anupashaya –

5) Samprapti –

ROGA VINISCHAYA (DIAGNOSIS)-

CHIKITSA KARMA (LINE OF TREATMENT)

PATHYAPATHYA-

PARINAMA (RESULT) –

CONSENT FORM

Name of the patient: .....

Name of the physician: .....

Name of the institution: .....

The Informed consent

I,..... , have read the information in this form (or it has been read to me). I am free to ask any question and they have been answered. I am exercising my free power of choice, hereby give my consent to be include as a Patient for

"Open, Controlled, Randomized Study of Systemic use of *Shatawari Ghrita & Shatawari Ghrita Akshi Tarpana in Pratham Patalgata Timir w.s.r. to Simple Myopia"*

1. I have read and understand this form and the information provided to me.
2. I have the consent document explained to me.
3. I have been explained about the nature of the treatment.
4. My responsibilities have been explained to me by the investigator.
5. I have been advised about the risks associated with the treatment(s).
6. I have informed the physician of all the treatments I am taking or have in the past month(s) including allopath, ayurvedic , homeopathic or any household treatments .
7. I agree to cooperate with the physician and I will inform him/ her immediately if I suffer unusual symptoms.
8. My identity will be kept confidential if my data are publicly presented.
9. I have had my questions answered to my satisfaction regarding excepted results as well as unwanted effects of the procedure(s)/medication(s).

By using this consent from, I attest that information given in this document has been clearly explained to me and apparently understand by me. I will be given a copy of this consent document.

Patient's sign: Name:

Place: Date: Time:

संमती पत्रक

रूग्णाचे नाव ः .....

डॉक्टरचे नावः .....

संशोधन केंद्राचे नाव ः .....

मी ..... सदर संमतीपत्रकामध्ये दिलेली सर्व माहिती वाचलेली आहे. (मला वाचून दाखवलेली आहे). मी कोणताही प्रश्न विचारण्यास मुक्त आहे व ते उत्तर देण्यास बांधील आहेत. मी शतावरी घृताचा डोळयावर होणा-या उपचारा संबंधीच्या संशोधन उपक्रमास माझी रूग्ण म्हणुन संमती देत आहे.

१. मी सदर प्रत्रक व त्यासोबत पुरविलेली सर्व माहिती वाचून व समूजन घेतली आहे.

२. मला संमतीपत्रकाबद्दल सर्व माहिती देण्यात आलेली आहे.

३. मला उपचारासंबधीची पूर्ण माहिती देण्यात आलेली आहे.

४. मला डॉक्टराकडून माझ्या जवाबदारीची व कर्तव्याची कल्पना देण्यात आलेली आहे.

५. उपचारा दरम्यान होणा-या संभाव्य धोक्याची कल्पना मला देण्यात आलेली आहे.

६. मी डॉक्टराना मला सुरू असलेल्या व पूर्वी घेतलेल्या सर्व प्रकारच्या उपचारासंबधी माहिती दिलेली आहे.

७. मी डॉक्टरानां सहकार्य करण्याचे व उपचारा दरम्यान काही त्रासदायक लक्षणे निर्माण

झाल्यास लगेच कळविण्याचे मान्य केले आहे.

८. माझी माहिती प्रसिध्द करावयाची असल्यास माझी ओळख गोपनीय ठेवण्यात येईल.

९.उपचारासंबंधीची उपयुक्तता त्याचे परिणाम या बद्दलच्या सर्व प्रश्नांची उत्तरे मला समाधानकारक मिळालेली आहेत.

सदर संमतीपत्रक सही करताना त्यातील सर्व मुद्दे मला समजले आहेत (समजावून सांगितले आहेत) . मला सदर समंतीपत्रकाची एक प्रत देण्यात आलेली आहे.

रूग्णाची सही ः

नावः

तारीख ः

वेळः

Estd: 2003

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Shri Yashwant Shikshan Prasarak Mandal's

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■ President ■
Yashwant Eknath Patil

VPIP/ 5875 /2012

AUTHENTICATION CERTIFICATE

Date : 26 / 6 / 2012

We have studied samples of ***"Shatawari Ghrita"*** submitted by Dr. Kiran B. Patil of Yashwant Ayurvedic College P.G.T.& R.C Kodoli.

We hereby identified the sample of the ***"Shatawari Ghrita"*** as per Ayurvedic Pharmacopeia of India and various Ayurvedic literatures with available resources in the institute.

This certificate is issued on his request and is given only for his research work.

Name of Preparation: - ***Shatawari Ghrita***

- Text reference:-

  Bhaishajya Ratnawali

- Organoleptics:

  1) Colour: - Pale yellowish
  2) Odour: - Characteristic
  3) Taste: - Bland bitter
  4) Consistency: - Semisolid

- Standards:-

  1) Solubility:-Slightly Soluble in alcohol and Water insoluble
  2) Refractive index:- 1.454
  3) Acid value: - 1
  4) Specific gravity:- 0.927g
  5) Saponification value:- 238
  6) Loss on drying at 110 C:- Not more than 0.5%
  7) Iodine value:- 40

- Identification test :- Positive
- Therapeutic use:- Vata & Pittashamak, Nutritive, Amlapitta, Dahaher.
- Dose:- 5-20 gms.

Principal
Vasantidevi Patil Institute Of Pharmacy
Kodoli, Tal. Panhala, Dist. Kolhapur

Estd: 2003

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■ President ■
Yashwant Eknath Patil

VPIP/ 5876 /2012

Date : 26 /06 / 2012

AUTHENTICATION CERTIFICATE

We have studied samples of '**Shatawari** ' (***Asparagus racemosus*** Willd), **Godugdha** and **Goghrita**' submitted by Dr. Kiran B. Patil of Yashwant Ayurvedic College P.G.T.& R.C Kodoli.

We hereby identified the sample of the '**Shatawari (*Asparagus racemosus*** Willd), **Godugdha**, and **Goghrita**' as per Ayurvedic Pharmacopeia of India and various Ayurvedic literatures with available resources in the institute.

This certificate is issued on his request and is given only for research purpose.

1) Shatawari (*Asparagus racemosus* Willd)

Organoleptics :

Shatawari Root

Colour: - Yellowish

Odour: - Characteristic

Taste:-Bitter

Consistency:-solid

Identification test: - Positive

2) Godugdha :

Organoleptics:

Colour: - White

Odour: - Characteristic

Taste: - sweet

Consistency: - Liquid

Identification test: - Positive

3) Goghrita (Butyrum deparatu)

Organoleptics:

Colour: - Pale yellowish

Odour: - Characteristic

Taste: - sweet

Consistency: - Semisolid

Standards:-

Solubility:-Slightly Soluble in alcohol

Refractive index:-1.454

Acid value: - 1

Identification test: - Positive

Principal
Vasantidevi Patil Institute Of Pharmacy
Kodoli, Tal. Panhala Dist. Kolhapur

II Shilam Param Bhushanam II

Shri Yashwant Shikshan Prasarak Mandal's

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Ref. No. PGYACK/306/2012 Date: 21/06/2012

Certificate

To whom so ever it may concern.

This is to certify that Dr. Kiran Balasaheb Patil doing Ph.D. in Shalakya Tantra Department under the guidance of Dr. Mudhukar Lahankar (Asso. Prof. & H.O.D. R.A. Podar Govt. Medical College, Worli, Mumbai.) in T.M.V. Pune. He has prepared Shatawari Ghrita under my guidance as per reference in Bhashajya Ratnawali. Raw material required for this and prepared Shatawari Ghrita is authentificated and standardized in our Institute.

Professor - Head of Dept.
Rasashastra Bhaishajya Kalpana Dept.
Yashwant Ayurvedic College. Kodoli

PRINCIPAL,
YASHWANT AYURVEDIC COLLEGE, KODOLI
Tal. Panhala, Dist. Kolhapur.

Sr. No.	O.P.D.No	Age	Sex	Durastha Avyakta Darshan (D.O.V.)				Netrayasa (Eyestrain)				Shirobhitapa (Headache)				Netrasrava (Watering)				Redness				Vihwala Darshana (Blurred Vision)				Visual Acuity								Optical Correction							
	Group A																											Right Eye				Left Eye				Right Eye				Left Eye			
				1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180
1	36466	12	M	1	0	0	0	1	0	0	1																	6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
2	36787	19	M	1	0	0	0	1	1	1	1																	<6/60	<6/60	<6/60	<6/60	<6/60	<6/60	<6/60	<6/60	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5
3	37618	14	F	1	0	0	0									1	0	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
4	38213	18	M	1	0	0	0									1	0	0	0									6/24	6/24	6/24	6/24	6/24	6/24	6/24	6/24	-1	-1	-1	-1	-1	-1	-1	-1
5	3443	19	F	1	0	0	0	1	1	1	1																	6/60	6/60	6/60	6/60	6/60	6/60	6/60	6/60	-4	-4	-4	-4	-4	-4	-4	-4
6	3398	20	F					1	0	0	0					1	0	0	0	1	1	1	1					6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
7	3400	20	F					1	0	0	0					1	0	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
8	43463	25	F																					1	0	0	0	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
9	46504	15	M					1	0	0	0					1	0	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
10	46677	22	M					1	0	0	0	1	0	0	0	1	0	0	0									6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
11	46680	23	M	1	0	0	0									1	0	0	0									6/60	6/60	6/60	6/60	6/60	6/60	6/60	6/60	-3	-3	-3	-3	-3	-3	-3	-3
12	48007	11	M									1	0	0	0													6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
13	48196	11	M									1	0	0	0	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
14	50307	20	F									1	0	0	0	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
15	50330	16	F									1	0	0	0	1	0	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
16	51016	16	F	1	0	0	0									1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
17	51017	25	F									1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
18	51542	25	F	1	0	0	0																					6/9(p)	6/9(p)	6/9(p)	6/9	6/9(p)	6/9(p)	6/9(p)	6/9	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
19	52210	14	F					1	0	0	0	1	0	0	0													6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
20	52288	23	F									1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
21	52504	19	F									1	0	0	0	1	0	0	0									6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
22	53065	23	F	1	0	0	0																					6/36	6/36	6/36	6/36	6/36	6/36	6/36	6/36	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5
23	53548	19	M									1	0	0	0									1	0	0	0	6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
24	54544	25	F									1	1	1	1													6/24	6/24	6/24	6/24	6/24	6/24	6/24	6/24	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
25	55017	18	M					1	0	0	0																	6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
26	55227	23	M	1	0	0	0																					6/24	6/24	6/24	6/24	6/24	6/24	6/24	6/24	-1.25	-1.25	-1.25	-1.25	-1.25	-1.25	-1.25	-1.25
27	55388	21	F	1	0	0	0																					6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
28	55395	18	M					1	0	0	0	1	1	1	1	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
29	57084	23	F					1	0	0	0	1	1	1	1	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
30	57245	23	F	1	0	0	0																					6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
31	57581	25	M	1	0	0	0					1	1	1	1													6/24	6/24	6/24	6/24	6/24	6/24	6/24	6/24	-1.25	-1.25	-1.25	-1.25	-1.25	-1.25	-1.25	-1.25
32	57582	22	M	1	0	0	0					1	1	1	1													<6/60	<6/60	<6/60	<6/60	<6/60	<6/60	<6/60	<6/60	-4	-4	-4	-4	-4	-4	-4	-4
33	58107	21	M					1	0	0	0	1	0	0	0													6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
34	59218	18	M	1	0	0	0																					6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
35	61764	18	M									1	0	0	0	1	0	0	0									6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
36	62017	24	M					1	0	0	0	1	0	0	0					1	0	0	0					6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
37	63175	25	M													1	0	0	0	1	0	0	0					6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
38	63185	24	M													1	0	0	0					1	0	0	0	6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6(p)	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
39	63518	25	M	1	0	0	0																					6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
40	6720	22	M									1	0	0	0	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
41	6722	25	M	1	0	0	0					1	0	0	0													6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
42	6721	20	F	1	0	0	0					1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
43	6724	25	F					1	0	0	0	1	0	0	0	1	0	0	0									6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
44	6824	25	F	1	0	0	0	1	0	0	0	1	1	1	1	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
45	6825	25	M	1	0	0	0	1	1	1	1	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
46	6853	14	M									1	1	1	1	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
47	6948	25	F	1	0	0	0					1	1	1	1													6/24	6/24	6/24	6/24	6/24	6/24	6/24	6/24	-1.25	-1.25	-1.25	-1.25	-1.25	-1.25	-1.25	-1.25
48	6969	25	M	1	0	0	0					1	0	0	0	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
49	6974	24	M	1	0	0	0					1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
50	6973	21	F	1	0	0	0					1	0	0	0	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
51	6975	23	M	1	0	0	0	1	0	0	0	1	1	1	1													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
52	7017	20	F					1	0	0	0	1	0	0	0	1	0	0	0									6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
53	7015	20	F	1	0	0	0	1	0	0	0	1	1	1	1													6/36	6/36	6/36	6/36	6/9	6/9	6/9	6/9	-1.5	-1.5	-1.5	-1.5	0	0	0	0
54	7223	24	M	1	0	0	0	1	0	0	0	1	1	1	1													6/36	6/36	6/36	6/36	6/36	6/36	6/36	6/36	-2	-2	-2	-2	-2	-2	-2	-2
55	7237	12	M	1	0	0	0									1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
56	7248	18	F	1	0	0	0					1	1	1	1	1	0	0	0									<6/60	<6/60	<6/60	<6/60	<6/60	<6/60	<6/60	<6/60	-4	-4	-4	-4	-4	-4	-4	-4
57	7398	25	M					1	0	0	0	1	1	1	1													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
58	7397	24	F					1	1	1	1	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
59	7396	22	M	1	0	0	0	1	0	0	0	1	1	1	1													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
60	7417	15	F					1	0	0	0	1	0	0	0													6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0

61	7426	15	F					1	0	0	0	1	0	0	0													6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
62	7423	13	F					1	0	0	0	1	0	0	0													6/6(P)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
63	7468	17	F					1	1	1	1	1	0	0	0													6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
64	7462	9	M													1	0	0	0	1	1	1	1					6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	0.25
65	7485	18	F									1	0	0	0									1	1	1	1	6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
66	7528	22	F									1	0	0	0	1	1	1	1									6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
67	7566	18	F	1	0	0	0																					6/60	6/60	6/60	6/60	6/60	6/60	6/60	6/60	-2.25	-2.25	-2.25	-2.25	-2.25	-2.25	-2.25	-2.25
68	7573	18	F	1	0	0	0					1	1	1	1													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
69	7698	19	M									1	0	0	0	1	1	1	1									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
70	7719	25	M					1	0	0	0	1	0	0	0													6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
71	7720	20	M					1	1	1	1	1	0	0	0													6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
72	7810	25	M					1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
73	7808	22	M					1	0	0	0	1	0	0	0	1	1	1	1									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
74	7805	21	M					1	1	1	1	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
75	7811	25	M	1	0	0	0	1	1	1	1																	6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
76	7839	22	M					1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
77	8049	25	M									1	0	0	0	1	0	0	0	1	1	1	1					6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
78	9203	7	M																	1	1	1	0					6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
79	10905	24	F					1	0	0	0	1	0	0	0	1	1	1	1									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
80	10916	22	M	1	0	0	0					1	1	1	1													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
81	11064	18	M	1	0	0	0																					6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
82	11067	8	M													1	1	1	1									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
83	10543	23	F									1	0	0	0									1	1	1	1	6/60	6/60	6/60	6/60	6/60	6/60	6/60	6/60	-2.25	-2.25	-2.25	-2.25	-2.25	-2.25	-2.25	-2.25
84	11031	22	M					1	0	0	0	1	0	0	0	1	1	1	1									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
85	11032	25	F									1	0	0	0	1	0	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
86	11034	22	F	1	0	0	0					1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
87	11035	24	M	1	0	0	0					1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
88	11145	10	M					1	0	0	0					1	1	1	1									6/36	6/36	6/36	6/36	6/36	6/36	6/36	6/36	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5
89	11221	19	F													1	0	0	0	1	1	1	1					6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
90	11254	25	M	1	0	0	0					1	1	1	0	1	0	0	0									6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
91	11255	20	F									1	0	0	0	1	1	1	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
92	11257	24	F	1	0	0	0					1	1	1	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
93	11253	25	M	1	0	0	0					1	0	0	0	1	1	1	0									6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
94	11282	22	F					1	1	1	0	1	0	0	0	1	0	0	0									6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
95	11389	17	F	1	0	0	0					1	1	1	1													6/6	6/6	6/6	6/6	6/36	6/36	6/36	6/36	0	0	0	0	-1.5	-1.5	-1.5	-1.5
96	11392	21	M									1	0	0	0													6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/6(p)	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
97	11419	25	M					1	1	1	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
98	11422	24	F	1	0	0	0					1	1	1	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
99	11423	22	M									1	0	0	0	1	1	1	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
100	11420	25	F	1	0	0	0					1	1	1	0	1	1	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
101	11643	25	M	1	0	0	0					1	1	1	0	1	1	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
102	11653	21	F													1	1	1	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
103	11714	23	F					1	1	1	0																	6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1.25	-1.25	-1.25	-1.25	-1.25	-1.25	-1.25
104	11685	21	M					1	1	1	1																	6/6(p)	6/6(p)	6/6(p)	6/6(p)	6/24	6/24	6/24	6/24	-0.25	-0.25	-0.25	-0.25	-0.5	-0.5	-0.5	-0.5
105	11912	23	M					1	1	1	1					1	1	1	0									6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
106	11911	24	F	1	0	0	0																					6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
107	11909	25	M									1	1	1	1													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
108	11802	15	F	1	0	0	0																					6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
109	11803	15	F													1	1	1	0									6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
110	11913	25	F									1	1	1	1	1	1	1	0					1	0	0	0	6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
111	11966	15	F									1	1	1	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
112	12158	20	M					1	1	1	0	1	1	1	1													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
113	12159	24	M	1	0	0	0									1	1	1	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
114	12154	25	M					1	1	1	0	1	1	1	1													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
115	12155	25	M	1	0	0	0	1	1	1	1	1	1	1	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
116	12300	20	F					1	1	1	1	1	1	1	0	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
117	12303	23	M	1	0	0	0	1	1	1	0	1	1	1	1													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
118	12286	25	F					1	1	1	1	1	0	0	0	1	1	1	0									6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
119	12708	13	M					1	1	1	0	1	0	0	0													6/6(p)	6/6(p)	6/6(p)	6/6	6/6(p)	6/6(p)	6/6(p)	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
120	13116	7	M	1	0	0	0					1	1	1	1													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1

Sr. No.	O.P.D. No	Age	Sex	Durastha Avyakta Darshana (D.O.V.)				Netrayasa (Eyestrain)				Shirobhitapa (Headache)				Netrasrava (Watering)				Redness				Vihwala Darshana (Blurred Vision)				Visual Acuity								Optical Correction							
	Group B																											Right Eye				Left Eye				Right Eye				Left Eye			
				1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180
1	49258	14	M									1	0	0	1	1	0	0	1									6/9	6/9	6/6	6/9	6/9	6/9	6/6	6/9	-0.25	-0.25	0	-0.25	-0.25	-0.25	0	-0.25
2	50310	10	M	1	0	0	1					1	0	0	1	1	0	0	0									6/60	6/60	6/36	6/60	6/60	6/60	6/36	6/60	-2	-2	-2	-2	-2	-2	-2	-2
3	51541	12	M									1	0	0	0	1	1	0	0	1	1	1	0					6/12	6/12	6/12	6/12	6/6	6/6	6/6	6/6	-0.75	-0.75	-0.75	-0.75	0	0	0	0
4	52028	14	M	1	0	0	0																					6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
5	53046	10	M									1	0	0	0													6/12	6/12	6/12	6/9	6/12	6/12	6/12	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
6	53362	10	M					1	0	0	0	0																6/9	6/9	6/9	6/6	6/9	6/9	6/9	6/6	-0.5	-0.5	-0.5	0	-0.5	-0.5	-0.5	0
7	54703	8	F	1	0	0	0					1	0	0	0													6/9	6/9	6/9	6/6	6/9	6/9	6/9	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
8	56762	12	F									1	0	0	0	1	1	1	1									6/9	6/9	6/9	6/6	6/9	6/9	6/9	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
9	56732	12	F					1	0	0	0	1	0	0	0	1	1	1	1									6/9	6/9	6/9	6/6	6/9	6/9	6/9	6/6	-0.25	-0.25	-0.25	0	-0.25	-0.25	-0.25	0
10	57234	18	F	1	0	0	0																					6/36	6/36	6/36	6/36	6/36	6/36	6/36	6/36	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
11	57821	15	F					1	1	1	0	1	0	0	0													6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
12	57823	20	F	1	0	0	0					1	0	0	1													6/60	6/60	6/60	6/60	6/60	6/60	6/60	6/60	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5
13	58128	25	F					1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
14	61965	25	F	1	0	0	0					1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
15	65030	25	F	1	0	0	0																	1	0	0	0	6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
16	66166	23	M					1	0	0	0	1	0	0	0													6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	-
17	79	25	M					1	0	0	1					1	0	0	0									6/6	6/6	6/6	6/6	6/9	6/6	6/6	6/9	0	0	0	0	-0.5	0	0	-0.5
18	1491	23	F	1	0	0	0	1	0	0	1																	6/60	6/60	6/60	6/60	6/60	6/60	6/60	6/60	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5
19	2596	25	F					1	0	0	0					1	1	0	0	1	1	1	1					6/6(p)	6/6(p)	6/6	6/6	6/6(p)	6/6(p)	6/6	6/6	-0.25	-0.25	0	0	-0.25	-0.25	0	0
20	2689	23	M	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
21	8046	25	F									1	0	0	0													6/9	6/9	6/9	6/9	6/6	6/6	6/6	6/6	-0.5	-0.5	-0.5	-0.5	0	0	0	0
22	3578	25	M	1	0	0	0													1	1	1	1					6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
23	3877	20	F	1	0	0	0					1	1	1	1	1	0	0	1									6/18	6/18	6/18	6/18	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.5	-0.5	-0.5	-0.5
24	4333	20	F					1	0	0	0																	6/12	6/12	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
25	4608	25	F					1	0	0	0	1	0	0	0													6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
26	5343	25	M	1	0	0	0	1	1	1	1	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
27	5495	18	M	1	0	0	0	1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
28	5497	25	M	1	0	0	0					1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
29	5556	22	M					1	0	0	1	1	0	0	0													6/9	6/9	6/9	6/9	6/12	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
30	5651	21	M	1	0	0	0					1	0	0	0													6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
31	5650	24	M	1	0	0	0	1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
32	5631	25	F					1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.25	0	0	-0.25	-0.25	0	0	-0.25
33	5793	23	F					1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.25	0	0	-0.25	-0.25	0	0	-0.25
34	5792	25	M									1	0	0	0	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
35	5794	24	F									1	0	0	0	1	0	0	1									6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.25	0	0	-0.25	-0.25	0	0	-0.25
36	5947	19	M					1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
37	5952	21	M					1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.25	0	0	-0.25	-0.25	0	0	-0.25
38	6094	24	M									1	0	0	1	1	0	0	0									6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
39	6095	20	M					1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.25	0	0	-0.25	-0.25	0	0	-0.25
40	6096	19	M	1	0	0	0					1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
41	6331	25	M	1	0	0	0																					6/60	6/60	6/60	6/60	6/60	6/60	6/60	6/60	-4	-4	-4	-4	-4	-4	-4	-4
42	6249	25	M	1	0	0	0					1	0	0	1													6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.5	0	0	-0.5	-0.5	0	0	-0.5
43	7461	13	F									1	0	0	0													6/6(p)	6/6	6/6	6/6	6/18	6/18	6/18	6/18	-0.25	0	0	0	-0.75	-0.75	-0.75	-0.75
44	7877	16	F	1	0	0	0																					6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
45	7804	23	F					1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
46	8051	22	F					1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
47	8044	24	F	1	0	0	0	1	0	0	1	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
48	8045	25	F	1	0	0	0	1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.5	0	0	-0.5	-0.5	0	0	-0.5
49	8132	19	F					1	0	0	0	1	0	0	0													6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
50	8184	18	F					1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
51	8182	20	M					1	0	0	0	1	0	0	0	1	0	0	1									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
52	8180	22	F					1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
53	8181	24	M	1	0	0	0	1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.5	0	0	-0.5	-0.5	0	0	-0.5
54	8211	25	F					1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
55	8261	25	M					1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
56	8383	25	M					1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	0.5	-0.5	-0.5	-0.5
57	8360	25	M					1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
58	8267	25	M					1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
59	8266	20	M									1	0	0	0													6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
60	8264	25	M	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
61	8453	25	F					1	0	0	0	1	0	0	0													6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0

62	8527	25	M	1	0	0	0	1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.5	0	0	-0.5	-0.5	0	0	-0.5
63	8530	24	F					1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.5	-0.5	-0.5	-0.75	-0.5	-0.5	-0.5
64	8529	19	M					1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
65	8528	20	M					1	0	0	0	1	0	0	0	1	0	0	1									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
66	8618	25	F									1	0	0	1													6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.25	0	0	-0.25	-0.25	0	0	-0.25
67	8877	23	F	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
68	8672	21	M					1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
69	8671	19	M	1	0	0	0	1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
70	8673	25	M					1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.5	0	0	-0.5	-0.5	0	0	-0.5
71	8668	24	F	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
72	8670	25	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
73	8734	18	M					1	0	0	0	1	0	0	0													6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
74	8751	23	F					1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.5	0	0	-0.5	-0.5	0	0	-0.5
75	8756	25	M					1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
76	8917	16	M					1	0	0	0	1	0	0	0													6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
77	8934	8	F									1	0	0	0													6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
78	9200	14	F	1	0	0	0	1	0	0	1																	6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.5	0	0	-0.5	-0.5	0	0	-0.5
79	9178	12	M									1	0	0	0	1	0	0	0	1	0	0	0					6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
80	10296	13	M					1	0	0	0					1	0	0	0									6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
81	10665	13	M					1	0	0	0					1	0	0	0									6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
82	12301	22	M	1	0	0	0					1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
83	12302	18	F					1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.5	0	0	-0.5	-0.5	0	0	-0.5
84	12436	23	M					1	0	0	0	1	0	0	0													6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
85	12435	23	M	1	0	0	0	1	0	0	1					1	0	0	0									6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
86	12433	22	F					1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.5	0	0	-0.5	-0.5	0	0	-0.5
87	12434	21	F	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
88	12527	23	F	1	0	0	0	1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
89	12623	21	M					1	0	0	1	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
90	12626	19	F	1	0	0	0	1	0	0	0					1	0	0	0									6/6(p)	6/6	6/6	6/6	6/6(p)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
91	12668	16	F	1	0	0	0	1	0	0	1																	6/9	6/6	6/6	6/9	6/9	6/6	6/6	6/9	-0.5	0	0	-0.5	-0.5	0	0	-0.5
92	12624	24	M	1	0	0	0	1	0	0	0					1	0	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
93	12803	18	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
94	12807	25	M	1	0	0	0					1	0	0	0	1	0	0	0									6/24	6/24	6/24	6/24	6/24	6/24	6/24	6/24	-1	-1	-1	-1	-1	-1	-1	-1
95	12806	21	F	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
96	12801	25	M	1	0	0	0	1	0	0	0	1	0	0	0													6/24	6/18	6/18	6/18	6/24	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
97	12947	23	F	1	0	0	0					1	0	0	0													6/60	6/60	6/60	6/60	6/60	6/60	6/60	6/60	-2.5	-2.25	-2.25	-2.25	-2.5	-2.25	-2.25	-2.25
98	12964	22	F	1	0	0	0					1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
99	12961	24	M					1	0	0	0	1	0	0	0					1	0	0	0					6/24	6/18	6/18	6/18	6/24	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
100	12965	23	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
101	12963	25	F	1	0	0	0					1	0	0	0	1	0	0	0									6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
102	12900	20	M	1	0	0	0																					6/6	6/6	6/6	6/6	6/60	6/60	6/60	6/60	0	0	0	0	-1.75	-1.5	-1.5	-1.5
103	13115	17	F	1	0	0	0					1	0	0	0													6/12	6/9	6/9	6/9	6/12	6/9	6/9	6/9	-0.75	-0.5	-0.5	-0.5	-0.75	-0.5	-0.5	-0.5
104	13110	16	F	1	0	0	0					1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1.25	-1	-1	-1	-1
105	13109	19	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
106	13112	22	M	1	0	0	0					1	0	0	0													6/24	6/18	6/18	6/18	6/24	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
107	13123	25	F	1	0	0	0					1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
108	13196	15	M	1	0	0	0					1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
109	13200	10	M	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.5	-0.5	-0.5	-0.75	-0.5	-0.5	-0.5
110	13202	16	F	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
111	13194	25	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
112	13193	25	F	1	0	0	0					1	0	0	0	1	0	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
113	13305	20	F					1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
114	13404	20	F	1	0	0	0					1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
115	13405	18	M	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/9	6/9	6/9	6/12	6/9	6/9	6/9	-0.75	-0.5	-0.5	-0.5	-0.75	-0.5	-0.5	-0.5
116	13403	20	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
117	13406	20	F	1	0	0	0	1	0	0	0					1	0	0	0									6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
118	13437	17	M					1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
119	13452	25	M	1	0	0	0	1	0	0	0					1	0	0	0									6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
120	13864	15	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1

Sr.No	O.P.D.No Group C	Age	Sex	Durastha Avyakta Darshana (D.O.V.)				Netrayasa (Eyetrain)				Shirobhitapa (Headache)				Netrasrava (Watering)				Redness				Vihwala Darshana (Blurred Vision)				Visual Acuity								Optical Correction							
																												Right Eye				Left Eye				Right Eye				Left Eye			
				1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180	1	30	90	180
1	53366	13	M									1	0	0	0													6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
2	53519	17	M									1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
3	57289	13	M																	1	0	0	0					6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
4	57537	13	M					1	0	0	0					1	0	0	0									6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
5	59059	12	F	1	0	0	0																					6/36	6/36	6/36	6/36	6/36	6/36	6/36	6/36	-2.25	-2	-2	-2	-2.25	-2	-2	-2
6	59219	16	M	1	0	0	0					1	0	0	0													6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
7	61747	13	F									1	0	0	0	1	0	0	0									6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
8	64394	15	M	1	0	0	0									1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
9	65358	16	F	1	0	0	0					1	0	0	0	1	0	0	0									6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
10	66635	14	F	1	0	0	0					1	0	0	0	1	0	0	0									6/60	6/60	6/60	6/60	6/60	6/60	6/60	6/60	-2.25	-2	-2	-2	-2.25	-2	-2	-2
11	55006	17	M	1	0	0	0	1	0	0	0	1	0	0	0													6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
12	449	10	M	1	0	0	0					1	0	0	0	1	0	0	0	1	0	0	0					6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
13	649	12	F									1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
14	2597	12	F					1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
15	2608	15	F					1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
16	2968	12	F					1	0	0	0					1	0	0	0									6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
17	3068	12	M	1	0	0	0	1	0	0	0	1	0	0	0													6/60	6/60	6/60	6/60	6/60	6/60	6/60	6/60	-3.25	-3	-3	-3	-3.25	-3	-3	-3
18	3	16	M	1	0	0	0	1	0	0	0	1	0	0	0													6/60	6/60	6/60	6/60	6/60	6/60	6/60	6/60	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5
19	3370	10	M	1	0	0	0																					6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
20	3910	16	F									1	0	0	0													6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
21	4578	13	M					1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
22	4676	13	F	1	0	0	0																					6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
23	5267	14	M									1	0	0	0													6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
24	5958	9	M	1	0	0	0	1	0	0	0																	6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
25	5949	10	M									1	0	0	0													6/6(p)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
26	5945	25	F	1	0	0	0					1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
27	5948	23	F	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
28	6097	22	F	1	0	0	0					1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.25	-0.25	-0.25	-0.5	-0.25	-0.25	-0.25
29	6338	21	F					1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/24	6/18	6/18	6/18	-0.5	-0.5	-0.5	-0.5	-1	-0.75	-0.75	-0.75
30	6250	21	F					1	0	0	0	1	0	0	0													6/9(P)	6/6	6/6	6/6	6/9(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
31	6251	24	M	1	0	0	0					1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
32	6248	20	M					1	0	0	0	1	0	0	0	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
33	6545	20	M					1	0	0	0	1	0	0	0	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
34	6544	21	M	1	0	0	0	1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
35	6543	24	M					1	0	0	0					1	0	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
36	6620	23	F					1	0	0	0					1	0	0	0									6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
37	6623	25	M					1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
38	6658	15	M					1	0	0	0	1	0	0	0													6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
39	6723	21	M	1	0	0	0					1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
40	7717	22	F					1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
41	7718	23	F	1	0	0	0	1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
42	8750	25	M	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
43	8757	24	M	1	0	0	0	1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
44	8060	22	F	1	0	0	0	1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
45	8062	19	F					1	0	0	0	1	0	0	0	1	0	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
46	8061	25	M	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
47	8059	20	M					1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/6	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
48	9192	25	M	1	0	0	0					1	0	0	0	1	0	0	0	1	0	0	0					6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
49	9195	21	M	1	0	0	0	1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
50	9194	20	M					1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
51	9197	22	F	1	0	0	0	1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
52	9336	25	M					1	0	0	0	1	0	0	0	1	0	0	0									6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
53	9297	21	M					1	0	0	0																	6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
54	9504	25	F	1	0	0	0	1	0	0	0	1	0	0	0													6/24	6/24	6/24	6/24	6/24	6/24	6/24	6/24	-2	-2	-2	-2	-2	-2	-2	-2
55	8799	25	M	1	0	0	0	1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
56	9800	24	F	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
57	9798	20	F					1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
58	9797	25	M	1	0	0	0					1	0	0	0	1	0	0	0									6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
59	10078	25	M					1	0	0	0	0	0	0	0	1	0	0	0									6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
60	10202	21	F					1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
61	10197	20	F					1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5

62	10196	25	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
63	10205	19	F					1	0	0	0	1	0	0	0													6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
64	10206	23	F	1	0	0	0	1	0	0	0																	6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
65	10295	22	M					1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
66	10298	20	F									1	0	0	0	1	0	0	0									6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
67	10299	20	M	1	0	0	0																					6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
68	10360	8	F									1	0	0	0	1	0	0	0									6/24	6/18	6/18	6/18	6/24	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
69	10436	17	F	1	0	0	0	1	0	0	0																	6/60	6/60	6/60	6/60	6/60	6/60	6/60	6/60	-3.5	-3	-3	-3	-3.5	-3	-3	-3
70	10437	18	F	1	0	0	0					1	0	0	0	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
71	10476	25	M									1	0	0	0	1	0	0	0									6/6(P)	6/6	6/6	6/6	6/6(P)	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
72	10521	18	F					1	0	0	0	1	0	0	0													6/18	6/12	6/12	6/12	6/6	6/6	6/6	6/6	-1	-0.75	-0.75	-0.75	0	0	0	0
73	10550	22	F					1	0	0	0																	6/60	6/60	6/60	6/60	6/60	6/60	6/60	6/60	-2.5	-2.5	-2.5	-2.5	-3	-2.5	-2.5	-2.5
74	10625	24	M	1	0	0	0	1	0	0	0					1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
75	10623	22	M	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
76	10624	21	M	1	0	0	0	1	0	0	0	1	0	0	0													6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
77	10626	25	M	1	0	0	0									1	0	0	0	1	0	0	0					6/12	6/9	6/9	6/9	6/12	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
78	10749	25	M	1	0	0	0									1	0	0	0									6/24	6/24	6/24	6/24	6/24	6/24	6/24	6/24	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5
79	10901	21	F									1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.25	0	0	0	-0.25	0	0	0
80	10912	21	F					1	0	0	0	1	0	0	0	1	0	0	0									6/9	6/9	6/9	6/9	6/9	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
81	10911	25	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
82	13453	24	F	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
83	13456	22	M	1	0	0	0					1	0	0	0					1	0	0	0					6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-1	-0.75	-0.75	-0.75	-1	-0.75	-0.75	-0.75
84	13666	20	M	1	0	0	0									1	0	0	0	1	0	0	0					6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
85	13665	25	M	1	0	0	0					1	0	0	0	1	0	0	0									6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
86	13667	25	F	1	0	0	0					1	0	0	0	1	0	0	0									6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
87	13668	18	M	1	0	0	0					1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
88	13744	20	F					1	0	0	0	1	0	0	0	1	0	0	0									6/12	6/9	6/9	6/9	6/12	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
89	13743	24	F					1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
90	13867	17	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
91	13870	23	F									1	0	0	0	1	0	0	0	1	0	0	0					6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
92	13866	24	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
93	13876	22	F	1	0	0	0					1	0	0	0													6/36	6/24	6/24	6/24	6/36	6/24	6/24	6/24	-1.75	-1.5	-1.5	-1.5	-1.75	-1.5	-1.5	-1.5
94	14028	21	M									1	0	0	0	1	0	0	0	1	0	0	0					6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
95	14022	20	M	1	0	0	0					1	0	0	0	1	0	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-1	-0.75	-0.75	-0.75	-1	-0.75	-0.75	-0.75
96	14039	18	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
97	14025	24	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
98	14175	23	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
99	14174	23	M	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-1	-0.75	-0.75	-0.75	-1	-0.75	-0.75	-0.75
100	14171	16	F	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
101	14170	19	F	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
102	14482	22	M					1	0	0	0	1	0	0	0					1	0	0	0					6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
103	14480	15	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
104	14483	24	M	1	0	0	0					1	0	0	0	1	0	0	0									6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
105	14485	18	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
106	14481	25	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
107	14403	17	M	1	0	0	0					1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
108	14658	23	M	1	0	0	0					1	0	0	0	1	0	0	0									6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
109	14657	24	F	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
110	14656	17	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1
111	14659	17	F	1	0	0	0	1	0	0	0									1	0	0	0					6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
112	14820	17	F	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/9	6/9	6/9	6/12	6/9	6/9	6/9	-0.75	-0.5	-0.5	-0.5	-0.75	-0.5	-0.5	-0.5
113	14819	25	F	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
114	14816	22	F	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
115	14831	22	M	1	0	0	0	1	0	0	0	1	0	0	0													6/9	6/6	6/6	6/6	6/9	6/6	6/6	6/6	-0.5	0	0	0	-0.5	0	0	0
116	14818	16	M					1	0	0	0	1	0	0	0													6/12	6/12	6/12	6/12	6/12	6/12	6/12	6/12	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75	-0.75
117	14962	19	M	1	0	0	0	1	0	0	0	1	0	0	0													6/12	6/9	6/9	6/9	6/12	6/9	6/9	6/9	-0.75	-0.5	-0.5	-0.5	-0.75	-0.5	-0.5	-0.5
118	14963	25	F	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1.25	-1	-1	-1	-1.25	-1	-1	-1
119	14961	17	M					1	0	0	0	1	0	0	0													6/12	6/9	6/9	6/9	6/12	6/9	6/9	6/9	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
120	14960	25	M	1	0	0	0	1	0	0	0	1	0	0	0													6/18	6/18	6/18	6/18	6/18	6/18	6/18	6/18	-1	-1	-1	-1	-1	-1	-1	-1

Open, Controlled, Randomized Study of Systemic use of *Shatawari Ghrita & Shatawari Ghrita Akshi Tarpana in Pratham Patalgata Timir w.s.r. to Simple Myopia*

1: Introduction

सर्वेन्द्रियाणां नयनं प्रधानम् ।

Eyes are the most important God's gift to human beings. Eyes are involved in 90% of our daily activities. We see, we learn, we enjoy and we proceed in life.

Now a days rate of eye diseases have been increasing due to adopting modern and fast lifestyle. Increasing use of computers, televisions, 3D cinemas poor general health, lack of exercise results in lots of burden on our eyes. That results in eyestrains, dryness, loss of vision, headache, burning of eyes, light sensitivity & distorted vision.

In *Ayurvedic* ophthalmology, the progression of pathogenesis of *Drishtigata Rogas* is explained in terms of involvement of successive *Patalas*. Vitiated *Doshas* produces various clinical pictures, when they are situated in different *Patalas*. Involvement of successive *Patala* means the pathology progresses to deeper tissues and the prognosis worsens accordingly.

Timir is one such disease which is included under *Drishtigata Rogas* by all *Acharyas.* Clinical features of *Timir* vary according to various *patals* i.e. first to fourth *patal.*

प्रथमे पटले दोषो यस्य दृष्टौ व्यवस्थितः ।
अव्यक्तानि स रूपाणि सर्वाण्येव प्रपश्यति ।। सु.उ ७अ

सिरानुसारिणि मले प्रथमं पटल श्रिते ।
अव्यक्तमीक्षते रूपं व्यक्तमप्यनिमित्ततः।। (अ.हृ.उ.१२/)

Clinical features of *Pratham Patalagata Timir* are having similarities with that of Refractive errors in modern ophthalmology viz Myopia.

Refractive errors contribute about 8% of the general population. Simple or developmental myopia is the commonest variety. Its prevalence increases from 2-15% up to 18 years of age. So I want to observe the *Ayurvedic* management in Simple myopia.

Etiology of simple myopia:

1) Physiological variation in the length of the eyeball or associated with precocious neurological growth also called as Axial type of simple myopia.
2) Curvatural type of simple myopia is considered to be due to underdevelopment of the eyeball.
3) Role of Diet.
4) Role of Genetics: It plays some role in the biological variation of the development of the eye.
5) Excessive near work in childhood was also put forward but did not gain much importance.

Treatment of Myopia:

1) Optical correction with appropriate concave lenses
2) Contact lenses
3) Refractive surgery like LASIK, Radial keratotomy, Photorefractive keratectomy

Limitations of this treatment:

1) Disadvantage of using spectacles is cosmetic blemish especially in younger generation.
2) Use of contact lenses is costly and corneal complications may occur with this treatment.
3) Refractive surgeries are also costly and surgical complications are bound to be.
4) There is no local or systemic management in modern ophthalmology on myopia.

Therefore to overcome the limitations of treatment of Myopia, I took the role of systemic use of *Shatawari Ghrita* and *Shatawari Ghrita Akhi Tarpan* in Simple Myopia for the study.
In *Ayurveda* treatment of *Timir* is,

शतावरीपायस एव केवलस्तथा कृतोवा ऽऽ मलकेषु पायसः ।
प्रभूत सर्पिस्त्रिफलोदकोत्तरो यवौदनो वा तिमिरं व्यपोहति ।।
सु.उ १७

त्रिफला घृतं मधु यवाः पादाभ्यगं शतावरी मुद्गाः।
चक्षुष्यः संक्षेपाद् वर्गः कथितो भिषग्भिरयम्।।
(चक्रदत्त–नेत्र)

घृतं पुराणं त्रिफलां शतावरी पटोलमुद्गामलकं यवानपि।
निषेवमाणस्य नरस्य यत्नतो भयं सुघोरात्तिमिरान्नविद्यते।।
(सु.उ.१७/४८)

Shatawari and Ghrita these are easily available, cost effective and considered as *Chakshushya dravyas*.

Sufficient works have already been carried out on *Timir* and its management with *Kriyakalpa* in this regard. But very little work has been done regarding the systemic treatment in *Timir* along with *Tarpan*. So the disease *Timir* and its management with systemic use of *Shatawari Ghrita* and *Shatawari Ghrita Tarpan* have been selected for the present study.

Previously various *Ghritas* were used for *Tarpana Karma* in *Timir* which were combinations of many dravyas e. g. *Triphaladi Ghrita*, *Jeevantyadi Ghrita*, *Mahatriphala Ghrita*, *Sahadevi Ghrita*, *Triphala Ghrita*, *Patoladi Ghrita* etc.

Due to combinations of many *dravyas* it is difficult to assess the effect of specific *dravya* so in the present study only single *dravya* i. e. *Shatawari Ghrita* was used.

Previously various indigenous *dravyas* were also used for *Timir* e. g. *Saptamrita Lauha*, *Triphala* etc. Different *dravyas* and different procedures were used in same disease. It is difficult to understand which *dravya* and which procedure gives the results.

If single *dravya* is used in different manner i. e. orally and locally it might gives wonderful results and it is easy to assess the results.

In modern Ophthalmology Optical correction with concave lenses is the only treatment for Myopia

Availability, cost effectiveness, variety of options of medicines is the need of science.

No single study was carried out regarding the use of *Shatawari Ghrita* in *Timir* w.s.r. to simple myopia.

Taking all these points into consideration the present study was desined to assess the role of *Shatawari Ghrita* in *Pratham Patalagata Timir* w.s.r. to Simple Myopia.

The main aim of the study was to evaluate the role of *Shatawari Ghrita* systemically and topically in *Pratham patalagata Timir* w.s.r. to simple myopia.

2: Aim and Objectives:

Aim:

To evaluate the role of systemic use of *Shatawari Ghrita* and *Shatawari Ghrita Akshi Tarpan* in *Pratham Patalgata Timir* w.s.r.to Simple myopia.

3: Review of literature

Detail review of literature regarding *ayurvedic* concept of eye, *patal*, *patagata vyadhi*, concept of vision in *ayurveda*, *timir*, its types, treatment modalities was done from all the available literatures of *Ayurveda*.

Also modern concept of eye, its anatomy, physiology, refractive errors, their types, myopia, its types, treatment modalities was taken from modern texts & updates from internet through websites.

Detail review of *Netra Kriyakalpa*, *Tanpana*, its advantages, disadvantages, procedure was taken through *ayurvedic* literature.

Detail review of *Shatawari*, *Goghrita*, *Godugdha* their uses, physical and chemical properties was taken from available literature.

Review of all the previous work done was taken in relation to the present study and it was assessed and compared to the present study.

Novelty of proposed work was discussed on the background of previous work done.

4: Materials and Methods:

Materials

Drug used - *Shatawari Ghrita*

In *Charak Samhita Kalpasthana* chapter 12, in *Sushruta Samhita Chikitsasthana* chapter 31, in *Ashtang Samgraha kalpasthana* chapter 8 and in *Sharangdhara Madyama Khanda* chapter 9, there is detail description regarding *Snehapaka Kalpana*. *Shatawari Ghrita* was prepared by using this method. In *Bhaisajya Ratnawali*, chapter 27, method of preparation of *Shatawari Ghrita* was given and it was used in the present study.

Shatawari Ghrita was prepared by classical method of *Ghritapaka*. One part of *Shatawari Kalka*, four parts of *Goghrita* and sixteen parts of *Godugdha* were taken and all the contents were heated on the constant heat with continuous stirring the contents. *Madyama paka* of *Shatawari Ghrita* was prepared by applying suitable methods. *Shatawari Ghrita* was used as *Shaman Sneha* for systemic use and for *Akshitarpana*.

Prepared *Shatawari Ghrita* was standardized first by various suitable methods in laboratory and then only it was used for the study.

Instruments used **-** Snellen's chart , Autorefractometer, Retinoscope, Fundoscope , *Tarpan* Goggle etc.

Approval from Institutional ethics committee was taken for the study.

Clinical study is carried out in three phases -
1) Diagnosis or Identification phase
2) Interventional phase
3) Assessment phase

Inclusion criteria:

1) Patient between 7-25 years of age group irrespective of gender.
2) Patient having Simple Myopia upto -6.0 D.
3) Patient having *lakshanas* of *Pratham patalgata dosha dushti*.

Exclusion criteria:

1) Patient having myopia more than -6.0D.
2) Patient having ocular diseases other than simple myopia.
3) Patient having any systemic diseases.
4) Patient having post operative myopia.

Method of work:

1) Total 360 patients were selected randomly for the study on the basis of clinical presentation and diagnostic criteria.
2) Detail case pro forma was prepared and used accordingly.
3) Written consent of the patient as well as his parents or guardians was taken in his own language and in English.
4) Clinical study was conducted in three groups after thorough examination of patient's ocular condition.
5) Group – A - In 120 patient's optical correction with appropriate concave lenses was prescribed.
6) Group - B - In 120 patient's optical correction with concave lenses was prescribed along with systemic use of *Shatawari ghrita* for 30 days.
7) Group – C - In 120 patient's optical correction with concave lenses was prescribed along with *Shatawari ghrita Akshi* Tarpan.

According to *Sharangdhar* adult dose of *Ghrita* is one pala i.e. 40 gm. In 17-25 year age group *Shatawari ghrita* is given 20 gm in the morning and 20 gm in the evening. In 7-16 year age group *Shatawari Ghrith* is given *according to Young's Rule i.e. Age of the child in years /age of child + 12 X Adult dose.*

Shatawari Ghrita Akshi Tarpan was done in 1 *X* 7 days in 3 sittings each with 7 days intervals i. e. total 21 days.

Procedure for *Tarpana*:

1. The procedure was performed only in morning hours.
2. The procedure was carried out in a neat, quiet and dark room where there was no direct entry of air or Sunlight.
3. The position was kept supine as mentioned in the texts.
4. Eyes were cleaned with cotton soaked in Luke warm water before the procedure.
5. A specially designed *Tarpana* goggle was taken and it was used for *Tarpana* Procedure. There was no chance of leaking of the medicine in this method. This gives best results and more comfort to the patient in less time.
6. Boundaries were made by keeping the orbital margins as anatomical landmarks. Dimensions of the boundary were kept as mentioned in the text (02 *Angula* heights).
7. *Ghrita* was melted by keeping in Luke warm water.
8. *Ghrita* was poured in the amount sufficient to immerse the eyelashes. Patients were instructed to keep the eyes blinking at their comfort level and the blinking rates were recorded.

9. The retention period was kept the maximum time limit as constant (25 minutes) as per the reference of *Ayurvedic* Pharmacopoeia of India-Part-I, Vol.-VI (1000 *Matras* -25min.9sec.).
10. Removal of *Ghrita* was tried with cotton.
11. *Swedana* after the procedure was carried out with cotton soaked in Luke warm water.

Follow up:

1st	On 30th day
2nd	After 3 months
3rd	After 6 months

Criteria for assessment:

Subjective:

Subjective symptoms were assessed with the help of following scoring pattern:

1) Visual Acuity:

A) Distant visual acuity was recorded with the help of Snellen's test type chart.

6/6	_____	0
6/6(P) to 6/9	_____	+
6/9 (P) to 6/12	_____	+ +
6/12(P) to 6/18	_____	+ + +
6/18(P) to 6/24	_____	+ + + +
6/24(P) to 6/36	_____	+ + + + +
6/36(P) to 6/60	_____	+ + + + + +
< 6/60	_____	+ + + + + + +

2) Indistinct Vision:

0 – No feeling of indistinct vision.
1 – Occasional indistinct vision.
2 – Regular indistinct vision without disturbing routine work.
3 – Regular indistinct vision disturbing day to day work.

3) Blurred vision:
0 – No such problem
1 – Occasional blurring or disturbance of vision.
2 – Regular blurring without disturbing routine work.
3 – Regular blurring disturbing day to day work.

4) Eye Strain:
0 – After >6 hours of near work.
1 – After 4 – 6 hours of near work.
2 – After 2 – 4 hours of near work.
3 – Before 2 hours of near work.

5) Headache:
0 – No headache
1 – Very occasional headache.
2 – Irregular attacks of frequent headache.
3 – Regular headache.

6) Watering of eyes:
0 – No watery discharge
1 – Mild watery discharge
2 – Moderate watery discharge
3 – Severe watery discharge

7) Redness of Eyes:
0 – No redness in eyes
1 – Occasional redness in eyes
2 – Regular redness in eyes

The results will be drawn strictly on the basis of data collected & after statistical analysis.

1) Ineffective – Vision remains same.
2) Slightly effective – Vision improved by less than one line.
3) Moderately effective – Vision improved by one line.
4) Effective – Vision improved by two or more than two lines.

5: Observations and Results:

The results were drawn strictly on the basis of data collected & after statistical analysis.

1) Age: In the present study the number of patients in 7 -17 age group were 87 i. e. 24.16% and the number of patients in 18 -25 age group were 273 i. e. 75.83%.

2) Gender: In the present study the number of males were 201 i. e.55.83% and the number of females were 159 i. e. 44.16%. The percentage of males was higher than the females.

3) Occupation: In the present study 73.05% patients were taking education, 15% patients were in the service, 11.66% were housewives.

4) Etiological factors:

In this series 46.66 % were having *Sukshmanirikshana*, 8.61% *Shirobhitapa*, 62.5 % *Krodha* , 15.55 % were having *Swapnaviparyaya* & 21.94% were having *Shoka* as *Nidana*, *Durekshanat* 25.27 % patients, 02.22 % patients were doing *Ratri atyambupana*, 38.61 % *Ushnabhitaptasya Jalapraveshata*, 8.61 % *Shirobhighata*, 22.77% *Malavarodha*, 1.38% *Dhumanishevanam*, & 07.5 % were having *Atimaithuna* as *nidana sevana* & none of the patients were having, *Chhardivighatada*, *Vamanaatiyogata*, *Rituviparyaya*, *Mutravarodha*, *Vashpagrahata*, *Atisantapa Rajosevana*, *Atiratribhojana*.

5) Chief Complaints:

In the present study the maximum 78.05% patients were having Headache, 57.22% patients were having Eyestrain, 51.38% patients were having Diminished vision, 30.27% patients were having Watering of eyes, 6.11% patients were having redness of eyes,1.94% patients were having Blurred vision and no one patients were having the symptoms like Diplopia and Burning of Eyes.

6) Fundus Examination:

In the present study all the patients were having normal fundus picture.

7) Visual Acuity:

In the present study maximum 53.75% patients eyes were having visual acuity in between 6/6 – 6/9, 35.97% eyes were having visual acuity in between 6/12 – 6/18. The 5.41% patients eyes were having visual acuity in between 6/24 – 6/36 and 4.86% eyes were having visual acuity 6/60.

8) Dioptric Power:

In the present study the Dioptric power of 85% patients were lie in 0.00 – 1.00, 10.69% patients were lie in -1.25 – 2.00, 2.36% patients were lie in -2.25 – 3.00 and 1.94% patients dioptric power was lie in -3.25 – 4.00.

9) Group –A: Optical correction - After 30 days the effect of treatment on Chief complaints shows various results. Optical correction gave 96% cure rate in indistinct distant vision, 66.66% in Blurred vision, 62.19% in Headache, 59.18% in Eyestrain, 64.70% in Watering of eyes and the percentage of cure in Redness of eyes was 71.42%.

10) Group – B (Optical correction with Oral *Shatawari Ghrita)* - After 30 days the effect of treatment on Chief complaints shows various results. Optical correction with Oral *Shatawari Ghrita* gave 96.77% cure rate in indistinct distant vision, 100% in Blurred vision, 98.98% in Headache, 97.46% in Eyestrain, 83.33% in Watering of eyes and the percentage of cure in Redness of eyes was 40%.

11) Group – C (Optical correction with *Shatawari Ghrita Tarpana*) After 30 days the effect of treatment on Chief complaints shows various results. Optical correction and *Shatawari Ghrita Tarpana* gave 95.89% cure rate in indistinct distant vision, 97% in Headache, 96.15% in Eyestrain, 88.33% in Watering of eyes and the percentage of cure in Redness of eyes was 80%. In Group – C no one patient was suffering from Blurred vision.

12) Indistinct distant vision (30^{th} Day) - After 30 days the overall effect of treatment on indistinct distant vision between the three groups shows no significant results. The Chi square value was 0.0795 ($P>0.05$). It means that the treatments show similar effect on indistinct distant vision.

13) Eyestrain (30^{th} Day) - After 30 days the overall effect of treatment on Eyestrain between the three groups shows extremely significant results. The Chi square value was 50.248 ($P<0.05$). It means that the difference in results was because of treatments.

14) Headache (30^{th} Day) - After 30 days the overall effect of treatment on Headache between the three groups shows extremely significant results. The Chi Square value was 68.4159 ($P<0.05$). It means that the difference in results was because of treatments.

15) Redness of eyes (30^{th} Day) - After 30 days the overall effect of treatment on Redness of eyes between the three groups shows no significant results. The Chi Square value was 4.9445 ($P>0.05$). It means that the treatments show similar effect on Redness of eyes.

16) Watering of eyes (30th Day) - After 30 days the overall effect of treatment on Watering of eyes between the three groups shows significant results. The chi Square value was 7.4142 ($P<0.05$). It means that the difference in results was because of treatments.

17) Optical correction (30th Day) - On first follow – up (30th day) the overall effect of treatment on Optical correction between the three groups in 120 patients in each group shows extremely significant results. The 'P' value was $P<0.0001$.

The variations between the means of three groups were significantly greater than expected by chance.

The Optical correction and oral *Shatawari Ghrita* gives good results than only Optical correction and Optical correction with *Shatawari Ghrita Tarpana* gives good results over Optical correction and oral *Shatawari Ghrita*.

18) Optical correction (90th Day) - On second follow – up (90th day) the overall effect of treatment on Optical correction between the three groups in 120 patients in each group shows extremely significant results. The 'P' value was $P<0.0001$.

The variations between the means of three groups were significantly greater than expected by chance.

The Optical correction and oral *Shatawari Ghrita* gives good results than only Optical correction and Optical correction with *Shatawari Ghrita Tarpana* gives good results over Optical correction and oral *Shatawari Ghrita*.

19) Optical correction (180th Day) - On third follow – up (180th day) the overall effect of treatment on Optical correction between the three groups in 120 patients in each group shows extremely significant results. The 'P' value was $P<0.0001$.

The variations between the means of three groups were significantly greater than expected by chance.

The Optical correction and oral *Shatawari Ghrita* gives good results than only Optical correction and Optical correction with *Shatawari Ghrita Tarpana* gives good results over Optical correction and oral *Shatawari Ghrita*.

20) Visual acuity (30th Day) - On first follow – up (30th day) the overall effect of treatment on Visual acuity between the three groups in 120 patients in each group shows extremely significant results. The 'P' value is $P<0.0001$.

The variations between the means of three groups were significantly greater than expected by chance.

The Optical correction and oral *Shatawari Ghrita* gives good results than only Optical correction and Optical correction with *Shatawari Ghrita Tarpana* gives good results over Optical correction and oral *Shatawari Ghrita*.

21) Visual acuity (90th Day) - On second follow – up (90th day) the overall effect of treatment on Visual acuity between the three groups in 120 patients in each group shows extremely significant results. The 'P' value was $P<0.0001$.

The variations between the means of three groups were significantly greater than expected by chance.

The Optical correction and oral *Shatawari Ghrita* gives good results than only Optical correction and Optical correction with *Shatawari Ghrita Tarpana* gives good results over Optical correction and oral *Shatawari Ghrita*.

22) Visual acuity (180th Day) - On third follow – up (180th day) the overall effect of treatment on Visual acuity between the three groups in 120 patients in each group shows very significant results. The 'P' value was $P<0.0024$. The variations between the means of three groups were significantly greater than expected by chance.

The Optical correction and oral *Shatawari Ghrita* gives good results than only Optical correction and Optical correction with *Shatawari Ghrita Tarpana* gives good results over Optical correction and oral *Shatawari Ghrita*.

23) Visual acuity (180th Day) - In Group – A (Optical correction) vision remains same in 80% eyes and in 20% eyes vision was improved by less than one line. There was no improvement of vision by one or two lines with optical correction after 180 days.

In Group – B (Optical correction & oral *Shatawari Ghrita*) vision was improved by one line in 14.16% eyes while in 14.58% eyes vision was improved by less than one line and in 71.25% eyes vision remains same.

In Group – C (Optical correction & *Shatawari Ghrita Tarpana*) vision was improved by one line in 28.33% eyes while in 12.5% eyes vision was improved by less than one line and in 59.16% eyes vision remains same.

Systemic and Topical use of *Shatawari Ghrita* with Optical correction gives good results in *Timir* (Simple myopia).

6: Discussion:

In present study, *Shatawari Ghrita* has been used as a topical application in the form of *Tarpana* and in the form of oral medication.

Bhavaprakasha has also described *Ghrita* as *Rasayana*, good for the eyes and protects body from various diseases.

When we look at above said qualities of *Ghrita*, mode of action for *Akshitarpana Kriya* which is mainly done with *Ghrita* can be specified as follows.

The *Ghrita* has the quality of trespassing into minutest channels of the body. Hence when applied in the eye, it enters into deeper layer of *Dhatus* and cleanses every minutest part of them.

Moreover, *Ghrita* due to its *Sansakaranuvartana* quality easily imbibes the properties of other drugs processed with it without leaving its own properties. Drugs used in the *Shatawari Ghrita* are more or less having *Chakshushya* properties. So, *Shatawari* and *Godugdha* processed with *Ghrita* are beneficial for the power of sight.

Also in the description of the *Drishti*, *Sushruta* has mentioned that *Sheeta dravyas* are *Satmya* (Wholesome) for *Drishti*. *Ghrita* is also *Sheeta Virya*, hence the eye being the site of *Alochaka Pitta* can be effectively managed by constantly using *Ghee* for *Akshi Tarpana*.

Ghrita also contains properties like *Balya*, *Brimhana* and *Rasayana*, so it gives strength to the overall tissues of the eyeball as well as to the nervous tissues.

Ghrita contains vitamin A, D, E, K and carotene in it. Vitamin A and E are antioxidants and vitamin A also keeps the outer lining of the eyeball moist. Digestion, absorption and delivery to a target organ system are crucial in obtaining the maximum benefit from any formulation. This is facilitated by *Ghrita*, since active ingredients of drugs are mixed with *Ghrita* and they are easily absorbed.

Lipophilic action of *Ghrita* facilitates transportation to the target organ and final delivery inside the cell, because cell membrane also contains lipid. This liphophilic nature of *Ghrita* facilitates entry of drug in eyeball through corneal surface since corneal epithelium is also permeable to lipid soluble substances and lipid soluble substances cross corneal epithelium irrespective of their molecular size.

Moreover, *Ghrita* preparation used in *Tarpana* is in the form of suspension containing different particles of the drugs and the particles do not leave the eye as quick as solution. Tissue contact time and bio availability is more hence therapeutic concentration can be achieved.

Myopia is a clinical condition in which the refractive error is present and this error may be due to changes in the axial length, refractive index or curvature of the cornea.

The *Shatawari Ghrita* used as *Tarpana* may have its action at the level

of axis, index or corneal curvature. The fat soluble contents of the drugs absorbed through trans-corneal route may have action on the refractive media of the eye and eye as a whole. There may be peribulbar deposition of fat exerting pressure upon the sclera and this may be responsible for the reduction in the antero-posterior diameter in myopic eye. Moreover, drugs placed over eyeball directly for long time may also act by directly exerting pressure upon the cornea and reducing its curvature.

Among different routes employed for therapeutics in eye e.g. *Seka*, *Aschyotana* etc., in *Tarpana* there is contact of drug with eye for long time. This facilitates the action of drug by two ways – one by allowing more absorption of the drug by corneal surface and secondly by exerting direct pressure upon the cornea. There may be changes in the refractive index of the cornea causing less convergence of light rays. The action of *Tarpana* over axis, refractive index and corneal curvature needs further studies with large number of patients.

1) *Shatawari Ghrita* was more palatable for systemic use and accepted by all the patients & it gives better results in *Timir* (Myopia).

2) Due to *Balya*, *Rasayana*, and *Chakshuya* properties of *Shatawari Ghrita* asthanopic symptoms like headache, watering, eye strain, neck pain were relieved in most of the patients.

3) Modified procedure of *Tarpana karma* was very easy, less time consumable and accepted by all the patients.

4) Due to *Tarpana* procedure refractive errors were reduced in most of the patients. Strength of the eyeball was increased in many patients & it gives best results in *Timir* (Myopia).

5) Major advantage of *Tarpana Karma* was that a high concentration of medicine was achieved at desired site without exposing the rest of the body.

6) Epithelium and Endothelium of Cornea are highly permeable for lipid content and Stromal layer to water soluble content so for complete penetration drug should be lipophilic and hydrophilic which was shown by *Shatawari Ghrita*.

7) Minor side effects of *Tarpana Karma* like irritation of the eyes, redness are noted but these symptoms do not require any specific treatment.

8) Combination therapy of oral and local (*Tarpana*) use of *Shatawari Ghrita* might give wonderful results.

9) Shatawari Ghrita is easily available, cost effective and long term use may improve eyesight as well as general health of the patient.

7: Summary:

The fruitfulness of any work is proved only after a thorough discussion is done on the principles/concepts, with the help of available and achieved data, and some conclusions can be drawn. Summary provides a whole theme of the study and anything in Research needs to be summarized and put in a nutshell. Hence, it can be said that, getting some conclusions on any research work is just like getting fruits from own hand planted tree. Hence here also a thorough discussion has been done in the previous chapter by putting the obtained observations and data at par the conceptual and theoretical part. So that a further progress in the subject or any part of the matter can be considered in future for the benefit of the similar patients.

The dissertation entitled "Open, Controlled, Randomized Study of Systemic use of *Shatawari Ghrita & Shatawari Ghrita Akshi Tarpana in Pratham Patalgata Timir w.s.r. to Simple Myopia"* was carried out with the hope of searching better remedy for the disease. The thesis is divided into 10 main chapters.

1) Introduction
2) Aims and Objectives
3) Literary Review
4) Materials and Method
5) Observations & Results
6) Discussion
7) Summary
8) Conclusion
9) Bibliography
10) Annexure

8: Conclusion:

Conclusion is the determination established by investigating in various ways and deducting by means of various reasons *(Ch. Vi. 8).*

On the basis of the present study, following conclusions can be drawn -

1) **Group – A:** Optical Correction provided better results in chief complaints like Indistinct distant vision.
2) **Group – B:** Oral *Shatawari Ghrita* with optical correction provided better results in chief complaints like Indistinct distant vision, Blurred Vision, Eyestrain and *Headache.*
3) **Group – C:** *Shatawari Ghrita Tarpana* with optical correction provided better results in chief complaints like Indistinct distant vision, Blurred Vision, Eyestrain and Headache.
4) In reduction of dioptric power, both Oral and *Tarpan* (Group B & C) has shown better results than only Optical correction.
5) Oral *Shatawari Ghrita* & *Shatawari Ghrita Tarpana* (Group B & C) shows moderately effective results on Visual Acuity. *Tarpana* shows better results than oral treatment.

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10) Annexure:

1) Detail Case Record Form with consent in English and Marathi
2) Standardization and Authentification certificates of the drug
3) Permission letter from I.E.C. and Superintendent of Hospital
4) Master chart

All these documents are enclosed in this chapter.