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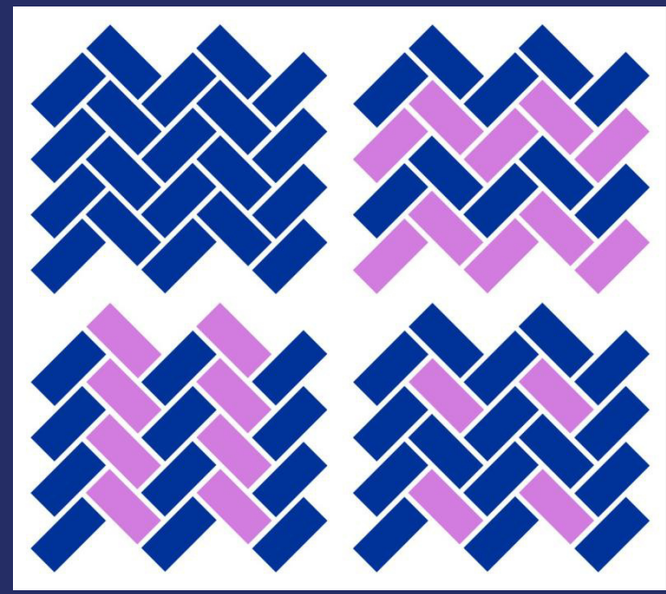
An Open Clinical Study of Meshashrungyadi Basti in Tritiya- Chaturtha Patalgat Doshdushti with Special Reference to Non-Proliferative Diabetic Retinopathy

Dr.Dhanashree Anil Baswat



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नमामि धन्वंतरिमादि देवं सुराः सुरैर्वन्दित पाद पद्मम् ।
लोकैर्जरारूक् भय मृत्यु नाशं धातारमिशंविविधौषधिनाम् ।।
चंव्योमवातावनिवारिवह्निं पंच प्रपंचात्मक देहभाजम् ।
संताप संपात जरा ज्वरान्तकम् नमामि धन्वंतरिमादि देवम् ।।
नवीन नील मुदकान्ति कान्तं शान्तं हरेर्द्वादशमाख्यमूर्तिम् ।
पूर्तिं शतानाम् सुमनोरथानाम् नमामि धन्वंतरिमादि देवम् ।।

Acknowledgement

At the moment of successful completion of my work with all my sense of full devotion and respect;I genuinely bow my head in sacred feet of Lord Ganesha and Lord Shiva,for showering countless blessings to reach this stage of my life.

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INTRODUCTION

INTRODUCTION

Ayurveda is a science which tells about *"HITAYU".* It is divided into 'Eight *angas* called *Ashtanga,* among which *shalakyatantra* is one of the *anga* , which deals with the *urdhwa jatrugat* (above sternum) diseases & their treatment. Among which *Netrarogas* have special importance.

शालाक्यनामोर्ध्वजत्रुगतानांरोपण

श्रवणनयनवादनघ्राणादिसनश्रितानांव्याधिनामुपशमर्थम्

शलाकायंत्रप्राणिधानार्थ ।।

–सुश्रुत उत्तरतंत्र १/८

As an eye is an important sense organ of light and vision through which one can see beautiful world. And also said by *acharya,*

'दृष्टिचनष्टा विविधंजगश्च तमोमयं जायत् एकरूपम् ।'

- अष्टांग हृदय सूत्रस्थान २४-२५

The prevention part of disease can't be achieved to the globalization and buziest life, bad intake habit & lack of exercise [1]. Many people do harm their eyes, due to being careless about himself to take *'Ahar-Vihar'* as stated by own ancient Acharya; by not taking necessary steps to protect the eyesight eventually leading to eye problems. So the changed lifestyle including crucial use of mobiles & computers along with irregular dietary &irregular sleeping habits rise to various disorders [2].

Acharya Vagbhatta in Ashtang hruhday samhita Uttarsthan chapter 13 given importance to protection of eye.

'चक्षूरक्षायांसर्वकालंमनुष्यैर्यत्नःकर्तव्योजीवितेयावदिच्छा

व्यर्थोलोकोअयम्तुल्यरात्रिन्दिवानाम्पुंसामन्धानांविद्यमानेअपिवित्ते ।'

-अष्टांग हृदयउत्तरस्थान १३/९७ He stated that as long as there is desire for living all efforts should be taken to protect the eyes, because a blind man cannotdistinguishbetween day & night. Everything appears to be 'Black'.Hence throughout life true efforts must be taken to protect own's eyes.

Diabetes mellitus (DM) is the fast emerging disease which is the major killers of present era.It affects the urban population as well as rural population. Increase of Diabetes Mellitus may be due to changing lifestyle like fastfood, habits, increased stress, use of pesticides; all this may have contributing factor[3,4]

Excessive intake of heavy, unctuous & new cereals,newly made fruit wines.Also Sedentary–luxurious lifestyle,not undergoing any kind of any de-toxification of body; as well as lack of mental & physical exercises are etilogical factors explained for *Prameha*in ayurvedic classical text.[5]

In 2015,according to World Health Organisation (WHO), there were 69.2 million population in India with diabetes,Hence, forth about 9.8 million population in India may get type 2 diabetes in 2030 approximately.[6]

Diabetes mellitus (DM), commonly referred to as Diabetes; is a group of metabolic disorders in which there are high blood sugar levels over a prolonged period.[7]

It has acute as well as serious long term complications includes cardiovascular disease, stroke, chronic kidney disease, foot ulcers & damage to the eyes mainly [7]. The complications of Diabetes mellitus"Sweet disease" are more dreadful than disease itself. Inclusion of *prameha*among the eight major disorder in*Charak samhita* shows, significance of the disease given by ancient seers. The risks of development of blindness in diabetes increases by 20-25 times as compared to the normal population [8]. Diabetic retinopathy is our point of interest, the disease process on the basis of modern.

Diabetic Retinopathy is a medical condition in which damage occurstoretina due to diabetes mellitus and is leading cause of Blindness (gradual painless visual loss). [9,10]

Pathogically in Diabetic Retinopathy mainly changes occurs in micro-retinal blood vessel & neurons. Resulting in more chances to reduced retinal blood supply.Dysfunction of micro-vessels causes Blood Retinal Barrrier .This pathology results to leaking of blood & its constituents into retinal neurophils. Leakage of Blood & its constituents into retinal neurophils causes loss of pericytes & thickening of vascular endothelial growth factor.[11]

This pathology can be seen after decades but also can be found early.

In such condition, blood sugar level is mostly high with or without oral hypoglycaemic agent.Loss of pericytes & angiogenesis is a hallmark of early change of retina in Diabetic retinopathy.Formation of new vessels posse's all incompetent blood retinal barrier.These formed new vesels are fragile.Hence there is early breakage through protein & other substances get accumulated within retina.Retina becomes oedematous ,increasing chance of detachment.[12]

High prevalence rate of Diabetic retinopathy (34.6%), proliferative diabetic retinopathy (7%), diabetic macular edema (6.8%) and vision threatening Diabetic retinopathy (10.2%) in diabetics was great concerns which led to search &analyze [10].Depending on the severity and clinical appearance DIABETIC RETINOPATHY is divided into stages which are Non proliferative diabetic retinopathy and Proliferative diabetic retinopathy.

NON PROLIFERATIVE DIABETIC RETINOPATHY (NPDR) is most common form of DIABETIC RETINOPATHY. Early stages consist of edema, micro aneurysms, cotton wool spots and hard exudates, lipid that has leaked from abnormal blood vessels in the central retina resulting in blurred central vision. Later stages consist of vascular occlusion, a restriction of blood supply to the retina as well as an increase in macular edema. This is the early stage of diabetic retinopathies. With NPDR tiny blood vessels leak making retina swell. When the macula swells,

it is called as macular edema. This is most common reason "why people with diabetes lose their vision" [10].

Ten percent (10%) of diabetic patients will have vision loss related to macular edema. On fundoscopic examination, micro aneurysms (microscopic blood-filled bulges in the artery walls)cotton wool spots, flame haemorrahage (similar lessions are also caused by the alpha toxin of clostridium novy) & dot-blot haemorrahage can be seen.[13]

Management of NPDR can be done by good glycaemic control with use of oral hypoglycaemic agent,antioxidants and insulin therapyto prevent onset and delay progression of Diabetic eye disease,but these factors are not sufficient to prevent the patients from blindness in future.

Modern three treatments for NPDR are laser surgery, injection of corticosteroids or anti-VEGF agents into the eye, and vitrectomy. These treatments are very standard treatment.Novel agents are emerging, including Ranibizumab, a monoclonal antibody fragment that binds VEGF-A and is anti-angiogenic, it is used for diabetic macular odema.[14] Focal laser photocoaglution is an effective treatment in cases involving hard exudates; possibly because it leads to the closure of microaneurysms and subsequent cessation of leakage into theretinal space [15].

Development with proper screening of herbal antidiabetic drug,WHO gives special attention to it.[16] As synthetic hypoglycaemic agent can developed many serious side effects including haematological and disturbance in kidney,liver and brain,hypoglycaemia;also not duilsble for pregnancy.Herbal medicines comparably to synthetic drugs are considered to be safer due to its few side effects and less toxicity.[17,18]

Acharya Charak has explained in treatise that, a wise *bhishak* should select a formulationof medicinal *Dravyas,Avshadh and Aahar for Bahya and Abhyantar prayog* using his *yukti (yuktivyaprashray chiktisa)* to minimize the signs and symtoms of disease and for betterment of patient.

- तेषाकर्मसुबाह्येषुयोगमाभ्यन्तरेषुच।

  संयोगंचप्रयोगंचवेदसभिषग्वरः।। -चरकसूत्रस्थान४/२९

- युक्तिव्यपाश्रयं –पुनराहारौषधद्रव्याणांयोजना। - चरकसंहितासूत्रस्थान११/५४

Also Acharya Charak had advised-

विकारनामाकुशलोनजिव्हियातकदाचन।

नहिसर्वविकरणां नामोअस्ति ध्रूवास्थिति।।

-चरक सूत्रस्थान १८/४४

As there is no direct co-relation mentioned in classical textfor diabetic retinopathy.Though being the metabolic disorder manifestation of diabetic retinopathy changes in diabetic patient may lead to metabolic derangements.Under the heading of *Drishtigat roga* in *Shalakyatantra,*partial or

complete loss of vision has been explained.Different *dosha* predominance in *timira* shows involvement of different stages of Diabetic retinopathy like changes in Retina,macula,retinal vessels & optic dics;which can be correlated with *Tritiya –Chaturtha patala.*[19]

Considering limitation of this modern therapies, we have decided to explore the treasure of ayurveda to carry out research on Non Proliferative Diabetic Retinopathy. Thus the present study endeovors to discuss *trititya -chaturtha patalgat doshdushti* with special reference to Non proliferative Diabetic Retinopathy.

As per the management part is concern and keeping above in mind the *meshashrungyadi basti* is selected for present study aim on treating *Tritiya-chaturtha patalgat doshdusti* & preventing further damage.

Here is some reference showing action of Basti beneficial for eyes.

- इहखलुबस्तिःनानार्विधद्रव्यसन्योगात्दोषानाम्सन्शोधनम्सन्शमनम्सन्ग्रहाणिकरोति॥

  चक्षुःप्रिणयतिवलिपलितानाम्अपहन्तिवयःस्थापयति॥

  परिव्रिद्धिश्चबस्तिःसम्यगुपासितः॥–सुश्रुतचिकित्स्थान३५/१,२

The*MeshashrungyadiBasti*contains*Meshashrungi,Musta,Haritaki,Amalaki,Bibhitaki , Guduchi, Vasa,Varun, Patol, Shatavari as kwath, shatapuspa as kalka and Madhu, saindhav and Teel tel(seasame oil) assneha.*These drugs collectively act as *pramehghanam, chakshushya,tridoshhar,sangrahik,vrushya,medoghna,rasapachak,dipan,pachan, mastkishashamak,daahprashmana,rasayana,shothhar,shwas-kaashar,balya,medhya* etc [20 TO 32]which will break *samprapti* of Non proliferative diabetic retinopathy.

This present study is aimed to take the clinical study about the efficacy of *Meshashrungyadi Basti in Tritiya- Chaturtha patalgat doshdushti* with special reference to Non Proliferative Diabetic Retinopathy.

Need for STUDY-

1.Number of patients suffering from Non proliferative diabetic retinopathy is quite high.

2. Although above treatments are very successful, they do not cure diabetic Retinopathy and also there are some hazardous effects of laser treatments such as,Colour & Night vision is affected. Peripheral visual loss. The area at which laser photo-coagulation has been done, become dead & do not response any impulse. Laser cannot prevent neovascularization & neovascular glaucoma by natural course [15,16].

3. In previous studies all above symptoms have been correlated with Tritiya-Chaturtha patalgat doshdusti. Accordingly that, various *kalpas*such as *Amalaki Rasayan, Triphala Guggulu,shatavari, nishadi yoga, Vasant Kusumkar Ras, Meshashrung churna, Meshashrugyad ghan vati, Mahagni Vati* etc has been used. But there where no previous study done on in the *BASTI* (i.e. anal route of administration) in the management of NPDR.

4.All ingredients of *MESHASHRUNGYADI BASTI* are easily available as well as this regimen is easily acceptable and adaptable too……. Inspired me to take this topic for present study.

Taking all above consideration in mind, I have selected my synopsis under title:

"AN OPEN CLINICAL STUDY OF *MESHASHRUNGYADI BASTI IN TRITIYA-CHATURTHA PATALGAT DOSHDUSHTI* WITH SPECIAL REFERENCE TO NON-PROLIFERATIVE DIABETIC RETINOPATHY."

AIM AND OBJECTIVES

AIM AND OBJECTIVES

AIM:To study the efficacy of *'Meshashrungyadi Basti' in Tritiya-chaturtha patalgat Doshdusti* with special reference to Non-Proliferative Diabetic Retinopathy.

Objectives:

Primary Objectives-

1) To provide better visual acuity.
2) To assess the efficacy of *Meshashrungyadi Basti* in Non-Proliferative Diabetic Retinopathy.

Secondary objectives-

1)To evolve standard Ayurvedic therapy for management of Non Proliferative Diabetic Retinopathy

2) To review the etiopathogenesis of *Tritiya–Chaturtha patalgat doshdushti* in ayurvedic literature.

3) To prevent the further complications of NPDR (Non proliferative Diabetic Retinopathy) and to avoid the LASER PHOTO- COAGULATION THERAPY.

Research Question :-

Is *Meshashrungyadi Basti* has significant effect on *Tritiya-Chaturtha patalgat doshadusti* with special reference to Diabetic Retinopathy.

HYPOTHESIS:-

'*Meshashrungyadi Basti'* is significantly effective in *Tritiya-chaturtha patalgat doshdushti* with special reference to Non Proliferative Diabetic Retinopathy.

Null Hypothesis :-

'Meshashrungyadi Basti' is not significantly effective in *Tritiya-chaturtha patalgat doshdushti* with special reference to Non Proliferative Diabetic Retinopathy.

PREVIOUS WORK DONE-

1) -Animal study, by Vd.Snehal Tambe

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Netra Sharira Rachna-

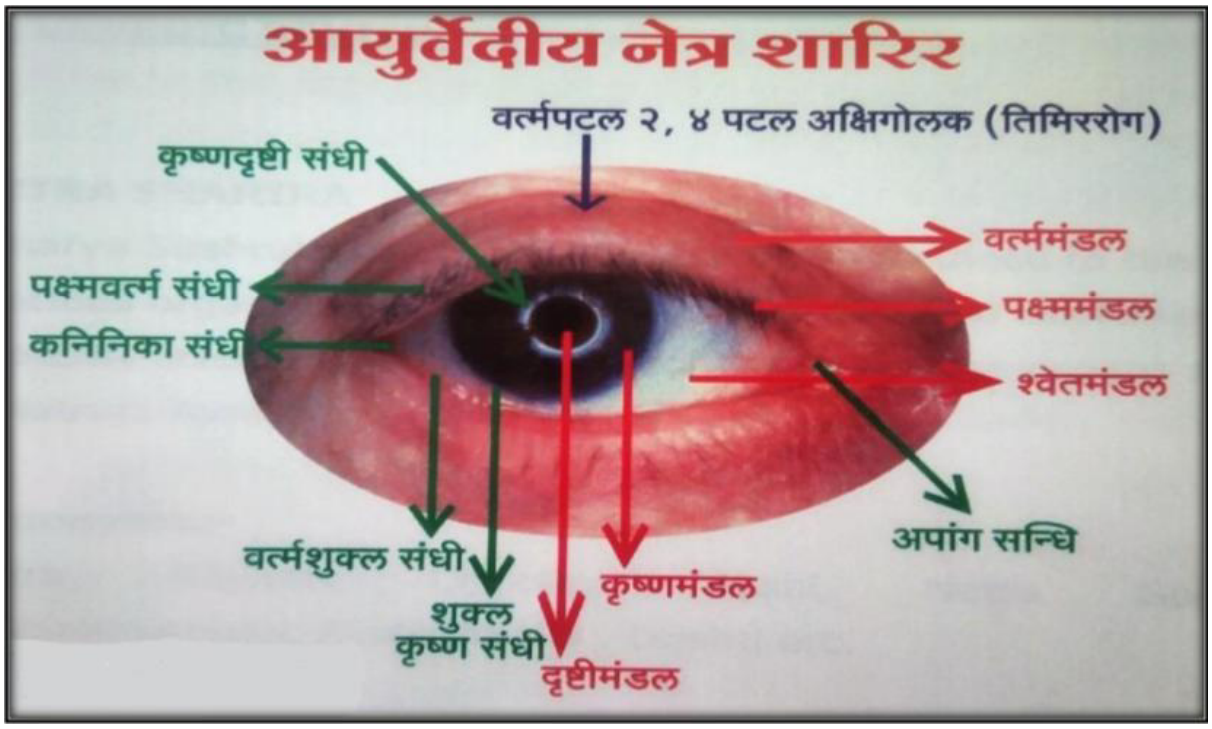
For definite diagnosis of *Netrarogas;its Hetu,Lakshanas,Samprapti* etc have to be known importantly.Likewise for definite medicinal treatment of *Netrarogas,Sharir kriya*&for surgical treatment ,*Sharir rachana of Netra* must be studied wholeheartedly .Otherwise faultly treated patient would suffer& more complications might took place.

Acharya Sushrut had given primary importance to *Netra indriya* among *Panchindriya*.So in *uttartantra*, Acharya Sushrut had explained*Netrarog* in first chapter.Also Acharya Vagbhatt had mentioned-

सर्वेन्द्रियाणि येनास्मिन प्राणा येन च संश्रिताः।

तेन तस्योत्तममांगस्य रक्षास्ववहीतो भवेत् ।। -अष्टांग संग्रह उत्तस्थान २८-१४६

Generaly human being mostly depended on its own's eyes other than sense organ.Other indriyas does work when their indriya Vishay arrives towards them (after getting its *Vishay dhyan*). While in case of Netra,after various structural movements &by moving eyes to that particular subject(*Vishay)*;one can achieve roop grahan karya.Hence to lookafter good things or to avoid bad things is totally depended on follower of mind i.e *NETRA*.



Swabhavik netra –

समे समहितदर्शने व्यक्तभागविभागे बलवती तेजसोपपन्ने स्वग़ापांग़े चक्षुषी।

-चरक शारीरस्थान ८-८०

Both eyes must be similar,enable to see perfect scenario,visual power must be perfect,also all parts of eyes must be healthy

Synonyms of Netra-

1)*Netrabudbud*(bubble floating on water) which indictes fragile in nature,smooth,soft in consistency and glossy in character

2)Chakshu3)Nayan4)Dhruk5)Akshi6)Akshi golak7)Drushti

Netra uttpatti & Panchbhavtiktwa-

पलंभुवो अग्नितोरक्तम वतात कृष्णसितजलात ।

आकाशादश्रुमार्गाच्छ्जायन्तेनेत्रबुदबुदे ।। (सुश्रुत उत्तरतंत्र १/११)

The development and evolution of eye is dependent upon the action of the five cosmic elements,called as *Panch Mahabhutas.*All organs of humanbody are composed of *Panchmahabutas* (five cosmic elements).They are *Prithvi,Aap,Vayu,gni,Vayu and Aakash*.Their contribution to eye is called *Panch Bhautikatwa*.Likewise *Uttapatti of netra* is from *panchmahabhutas* but *Tej mahabhuta*has greater dominance.Formation of eyeball in development of embryo is contributed by following *mahabhutas* –[35]

1)Mansa –Prithvimahabhuta

2)Rakta –Tejamahabhuta

3)Krishna bhaag-Vayu mahabhuta

4)Shwet bhaag-Aap mahabhuta

5)Ashrumarga –Aakash mahabhuta

Netra aakruti (shape) -

Shape of netra had been described bt *Acharya Sushrut* as-

- *Suvrutt*–Perfect spherical from all sides
- *Gostanakar*-The shape of eye is like teat of the cow i.e oval /oblong shaped.

***Netra pramaan* (measurements)-**

Acharya Sushrut had described the unit of *Pramaan*(measurements) as *Angule pramaan* like any other body organs.

- विद्यात् द्व्यगुलबाहुल्यं स्वाङ्गुष्ठोदरसंमितम् ।

  द्व्यगुलं सर्वतः सार्ध भिषङ्नयनबुद्बुदम् ।।१०।।

  सुवृत्तं गोस्तनाकार सर्वभूतगुणोद्भवम । (सुश्रुत उत्तरतंत्र १-९,१०)

Acharya Dalhan had clearly commented in context to measurement of eye,Angule is equal to swangushthodara that means the central part of

individual's thumb .Following are the measurement of *Netra* with respective to *Angule Pramaan*:

1)*Bahulya* (Antero posterior diameter) –two and half angule

2)*Ayamavistara* (vertical diameter) i.e from downwards is two angule while (horizontal diameter) I.e from side to side is two and half angule

3)*Sarvatah* –Circumference is three and half angule [36]

- अक्षमध्य चत्तुरङ्गुलं । (चरक विमानस्थान ८/११७)

  Distance between two eyes is two *angules*.

- द्व्यगुलानि नयनान्तरणी । (सुश्रुत सूत्रस्थान ३५/११)

  Distance between two eyes is four *angules.*

- नेत्रायामत्रिभागं तु कृष्णमण्डल मुच्यते ।

  कृष्णात् सप्तममिच्छन्ति दृष्टिं दृष्टिविशारदा: ।। (सुश्रुत उत्तरतंत्र १/१३)

  1/3rd of the transverse extent of eyeball is Krishnamandala(Cornea). According to *Drishtivisharadh (eye specialist)drishti*(pupil) measures to be 1/7th cornea.

- नयन त्रिभाग परिणाहा तारकाः ।

  नवमस्तारकांशो दृष्टि: । (सुश्रुत उत्तरतंत्र ३५/१२)

- तारका कृष्णभाग इत्यर्थ: ।। (डल्हण.सुश्रुत सूत्रस्थान ३५/१२)

About 1/3rd of eyeball is *Taraka or krishnamandala* & *Drishti* is about 1/9th of *Taraka.*

Structural anatomical parts of Netra(Eyes) –

According to*Acharya Sushrut Netra* is composed of 5 mandalas,6 patalas and 6 sandhis.

Further it is explained one by one-

मण्डलानिसन्धीश्चपटलानिलोचने ।

यथात्क्रमंविजानीयात् पंचषट्षडेवच ।। (सुश्रुत उत्तरतंत्र १/१४)[37]

1)***Mandala*** –Mandala can be described as concentric circular visible part of the eye from outside to inside.There are five mandalas of eye;they are as follows :-

I. *Pakshma mandala*
II. *Vartma mandala*
III. *Shweta mandala*
IV. *Krishna mandala*
V. *Drushti mandala*

I. Pakshma mandala-The word '*Pakshma*' is termed for eyelashes.The outermost mandala of eye is formed of Eyelashes.On the lid margin they are situated and are called as '*pakshmasyat*'[38]

II. Vartma mandala-

- तत्र च यद् बाह्यं पटलं तदूर्ध्वधोभेदेन द्वे वर्त्मनी ।। (इन्दु,अष्टांग संग्रह शरिरस्थान ५/५०)
- नेत्रगोलकावरक निमेषोन्मेषाश्रय पटलद्व वर्त्म उच्यते ।। (मधुकोष टीका)

Upper and lower eyelids of eye are joint to eachother in circular form,which is called as Vartma mandala. Eyelids or Vartma is also called as 'Akshi kosha'.The major function of Vartma is Nimesh-Unmesh(blinking) which is performed by vyan–vayu. Nimesh and Unmeshni siras are situated in vartma mandal whichic regulates eyelids movements.[39] According to *Sushrut* there are 21 diseases of vartma mandala & according to *vagbhatta* ,there are 24 diseases of vartma mandala।

III. *Krishna mandala-**Krishna mandala* can be defined as the black portion of the eyeball.About 1/3rd of the whole Netra ,is the size of *Krishna mandala.Mandala* can be compared with cornea.Even though it is transparent in nature,it appears to be black in colour due to iris is present below it. This mandala encloses drishti mandala in it.According to *sushrut* there are set of four diseases & according to *vagbhatta*,there are set of five diseases.[41]

IV. *Shukla mandala-*The part which is located inner side to eyelid,beyond the black circle is called as *Shukla mandala*.Due to whitish appearance it is also known as *Shwet/Shukla mandala* .This mandala can be correlated with scleral part of the outer fibrous coat covered with conjunctiva of the eyeball. According *Sushruta* there are 11 clinical entities in *Shukla mandala*& according to *vagbhatta* there are 13 linical entities.There is dominace of *kapha dosha* due to *jala mahabhuta* presence.[40]

V. *Drishti mandala-*The shape of *Drishti* described by *Drishtivisharada* as *Masurdala matra*(biconvex).*Drishti mandala* is a glistening part ,also known as *Avyayi* (i.e. non-degradable) It is made up of *Prasad bhaag* (core)of *panchmahabhuta.*As it is covered by various patalas,still its appearance is as a hole.Acharya Sushruta mentioned comparative size of Drishti differently in two places .In *Uttartantra* as 1/7th part of *Krishnamandal* and in *Sharir Rachana* as 1/9th part of Taraka.

- कृष्णात सप्तममिच्छन्तिदृष्टिदृष्टिविशारदा।। (सुश्रुत उत्तरतंत्र १/१३)[42]
- नवमस्ताकाशोदृष्टि:। (सुश्रुत सूत्रस्थान ३५/१२)
- संकुचत्यातपेअत्यर्थछायायाविस्त्रुतोभवेत ।।
- दृष्टिश्च रोमकूपश्च न वर्धन्ते कदाचन।। (सुश्रुत शारिरस्थान ४/६०)

Among the two structures of human body,*Drishti* and *romkoopa* are both which never increases in size.

- मसुरदालमात्रातुपंचभुतप्रासादजाम ।

खाद्योतविस्फुलिंङाभामिद्वां तेजोभिरव्ययै: ।

आवृतांपटलेनाक्ष्णौ बाह्येन विवराकृतिम् ।

शीतसत्म्यानृणांदृष्टिमाहुर्नयनचिन्तकाः।। (सुश्रुत उत्तरतंत्र ७/३,४)[43]

Drishti's Structure is explained by Acharya Sushrut in above shloka.

Meaning of Masurdal matra is- Just like shape of masura pulse,is shape of Drishti mandala. Drishti mandal is composed of finer part of *panchmahabhutas (prithvi,agni,vayu,akash&jala)*.It is covered by various patals of the eye.It gleams like a glow worm or spark;appears like small hole.Shit Aahar-Vihar is benficial for eyes

Sandhis of Netra-

Sandhi can be defined as the junctional area between the two mandalas.There are total six *netra sandhis*-

1. *Pakshma-Vartmagat Sandhi*
2. *Vartma-Shuklagata Sandhi*
3. *Shukla-Krushnagata Sandhi*
4. *Krushna-Drishtigata Sandhi*
5. *Kaneenika Sandhi*
6. *Apanga Sandhi*[44]

पक्ष्मवर्त्मगत: सन्धिर्वर्त्म शुक्लगतो अपारः।

शुक्लकृष्णगतस्त्वन्य: कृष्णदृष्टिगतो अपारः।।

ततः कनीनकिगतः षष्ठश्चापाङ्गः स्मृत: ।। (सुश्रुत उत्तरतंत्र १/१६)

1.*Pakshma-vartmagat sandhi-*Junction where Pakshma mandal & Vartma mandala unites is called as Pakshma –Vartma Sandhi.It considered as lid margin where eye lashes grow.Disease that occurs at this peculiar sandhi mainly *Krimiganthi.*

2.*Vartma-Shuklagata Sandhi –* Union line where *Vartma mandala* and *Shukla Mandala* meet is called as *Vartma –Shuklagata sandhi*.In other words it can be express as the fornix of eyeball where the palpebral conjunctiva is reflected on the bulbar conjunctiva seems to be Vartma-Shuklagata Sandhi.

3.*Shukla-Krushnagat Sandhi-*Circular line which adjoins the *Shukla mandala and Krushna mandala* is known as *Shukla –krushnagata Sandhi*.This Scleral-

Corneal junctional area i.e Limbus.Diseases occurs at this area are *Parvani & Alaji*.

4.*Krushna-Drishtigata Sandhi-*Pupillary margin is known as Krushna-Drushtigata Sandhi.Central portion of the eye in which Krushna & Drishti mandala are together joint .[45]

5.*Kaneenika Sandhi –* It is the nasal or inner canthus of eye.The junction near nose i.e joining medial end of upper and lower lids nasal side .On this sandhi lacrimal passage of eye is situated.

कनीनिकागतो नासासमीपे अवस्थितः । (डल्हण सु उ १/१६)[46]

6.*Apanga Sandhi-*At ends of eyebrows i.e outer canthus of eye.Joining area of upper lids & lower eyelids at temporal end (outer canthus)[47]

अपाङ्गो भ्रूपुच्छान्तो स्थितः ।। (डल्हण सु उ १/१६)

AKSHI PATALAS :-

- द्वे वर्त्मपटले विद्यात चत्वार्यन्यानि चक्षिणी ।

  जयते तिमीरं येषु व्याधि: परमदारूण: ।। (सुश्रुत उत्तरतंत्र १/१७)

- तेजोजलाश्रितं बाह्यं तेष्वन्यत । मेदस्तृतियं पटलमाश्रितं त्वस्थिचापरम।

पंचमांशसमं दृष्टेस्तेषां बाहुल्यमिष्यते ।। (सुश्रुत उत्तरतंत्र १/१८-१९)

Patala can be defined as the thin layer or thin membrane.One of the anatomical structures of eyeball is patala,which is described by Sushruta.There are six patalas of eyeball. Among which,two are external patalas called as eyelids.

'द्वे वर्त्मपटले'। (सु उ १/१७)[48]While remaining four are internal patalas where *Timira* disease develops.Among four,outermost & first is termed as *Tejojalashrita*.Second is *Mansashrita,*third is *Medashrita* and fourth is *Asthyashrita.*Individual patala has thickness of 1/5th of Drishtimandala,according to *Dalhan.*

1. *Prathama(first)Patala -Tejo-Jalashrita*
2. *Dwitiya (Second)Patala – Pisitashrita*
3. *Tritiya (Third) Patala- Medashrita*
4. *Chaturtha (fourth) – Astyashrita*

षट च पटलानि। द्वे वर्त्मनि । बाह्यंचाश्रितमग्न्यम्भसी ।

द्वितीयं मांसं तृतीयं मेदश्चतुर्थमस्थि। तेषां बहलता दृष्टे: पंचमांशेन ।।

(अष्टांग संग्रह शरिरस्थान ५/५०)

1)*Tejo-Jalashrita patala* – First and outermost patala of the eyeball.This patala is formed by*Teja & Jala*.Acharya *Dalhana*denoted *Teja to alochaka pitta* ,so teja can be considerable to siragata rakt.He denoted *jala to rasa dhatu,*hence it is considered that the nourishment of first patala is done by *rasa and rakt dhatu.*

If the count begins from outside to inside, the outermost structures of the eyeball:the sclera,the conjunctiva and cornea can be taken as one layer .This can be first refractive media for visual perception.

2)*Pishitashrita/Mansashrita* – *Second patala* of the eyeball.It is formed by Mansa dhatu. Mamsa function is bandhana or tightly holding the structures. The ciliary muscles form this Patala. Second refractive media can be uveal tract.

3)*Medoshrita-* Third patala of the eyeball.It is formed by Meda dhatu.The third refractive media can be vitreous and lens.

4)*Asthyashrita-* Fourth and last patala of the eyeball.It means the layer situated in Asthi dhatu. This can be retina,because bony orbit holds retina and the other neurological structures like optic nerve.This is also known as Drishti patala or where visual perception takes place.[49]

- ***Akshi Bandhana –***

सिराणां कण्डरणां च मेदसः कालकस्य च ।

गुणाः कालात् पर शलेष्म बन्धे अक्ष्णोः सिरयुतः ।।(सु उ १/१९)[50]

> Internal parts of the eyeball are aligned in position by inherent properties of *Sira and Dhamani*(vessels),adiposetissue,*kandara & snayu* (tendons),*Asthi* from which orbit has been formed i.e Kalakasthi as well as by the *Shleshma* (lining mucous membrane)& along with its vessels near to black portion.*Acharya Dalhan* had included both *siras,Dhamani in Sira*.While Kandara means snayu & peshi.

- ***SIRA AND DHAMANI –***

Acharya Sushrut had mentioned 38 siras of eye in Sharis sthan adhyaay 7/7.[51]Out of *38 Siras*there are: *–Vaatvaahi – 8Pittavaahi -10*

Kaphavaahi -10Raktavaahi -10

षटपंचाशन्नयनयोर्निमेषोन्मेषकर्मणी । (वा.शा.३/२९)

Acharya Vagbhatta had mentioned 56 Siras in the eyes.[52] Among which two Siras are responsible for blinking of eyes i.e *Nimeshonmesh* and present each in *apanga sandhi*. During Siravedh, these Siras shouldn't be opened.

Dhamani- There are total four *dhamanis* .Out of which two are rupavahi dhamani (i.e to transmit visual impulses).While remaining two are for Ashru(tears) Drainage from both the eyes .[53]

- ***Peshi –*** In eyes there are two muscles (peshis) situated.[54]

'द्वे नेत्रयोः ।' (सु शा ५/४८)

- **Snayu –** Snayu present in the eyes is prithu type of snayu. [55]
- ***Asthi –****Akshikosha* literally means orbital cavity. In Arundatta sangrah,he mentioned that Tarunasthi is present in Akshikosha.[56]

'अक्षिकोशेषु तरुणानि ।' (अष्टांग संग्रह शरिरस्थान ५/७०)

- ***Sandhi –***In eyes there are Mandaltype of sandhi (joints) are found.

नेत्रेषु मण्डलसंज्ञा ।। (अष्टांग संग्रह शरिरस्थान ५/७५)

- **Marma-** Relating to human eyes,there are two Marmas - 1)*Apanga Marma 2)Aavarta Marma*

1)**Apanga Marma-** It is situated on the outer lower side of eyebrow,laterally to orbits (below the lateral end of eyebrows).

भ्रूपुच्छान्तयोरयो अक्ष्णोर्बाह्यतो अपाङ्गौ,तत्रान्धय दृष्टपघातो वा ।। (सुश्रुत शरिरस्थान ६/२८)

Number –There are two apanga marmas.Generally, it is Sira marma. Size –It measures about ½ Angula in size.

Complications –Injury to this causes diminision of vision and blindness.

2) ***Aavarta Marma –***It is situated above the lateral ends of eyebrows.

भ्रुवोरूपरि निम्नयोरवर्तौ नाम,तत्राप्यन्धयं दृष्ट्युपघातो वा ।। (सुश्रुत शरिरस्थान ६/२८)

Number –There are two aavarta marmas. Generally it is sandhi marma.Size – It measures about ½ Angula in size.

Complications –Injury to this causes diminision of vision and blindness.

Pancha panchak of Chakshu Indriya:-

पंचेंद्रियबुद्धियः – चक्षुर्बुद्धयदिकाः ;ताः पुनरिन्द्रिययार्थसत्वात्मसन्निकर्षजाः,

क्षणिकाः निश्चयात्मिकाश्च, इत्येत् पंचपंचकम ।। (चरक सूत्रस्थान ८/१२)[57]

Following are the Panch panchak of indriya related with Chakshu :

1) Indriya (sense) – Chakshu indriya

2) Indriyadravya (sense material) –Teja Mahabhoot

3) Indriya adhishthan (sense organ) – Akshi (netra) (Eyes)

4) Indriya arth (object of sense) –Rupa

5) *Indriya buddhi (Perception of sense) –Chakshurbuddhi* (visual centre present in brain)

- **FUNCTIONS OF TRIDOSHA ON PHYSIOLOGY OF VISION :-**

1)*Netra and Vaat Dosha*& its role in perception of vision –

सर्वेन्द्रियाणां उदयोजकः ।(चरक सूत्रस्थान १२/८)[58]

व्यानः निमेषादि क्रियः सदा । (चरक सूत्रस्थान २८/९)[59]

.....अक्षि.....ह्युण्डनं.....कुपितो अनिलः । (चरक चिकित्सास्थान २८/२२-२३) [60]

All the movements of body are regulated by*Vata Dosha.*

The inspiratory of the eye lid movements is the *Vyana Vayu.Prana Vayu*,supports all the indriya dhrik (sensory faculties).Indriyartha *Sannikarsha* is however prevented by vitiation of Vayu. And produce Akshi Hyundana or dysfuntion of the eye. Regulation of various activities of the eye is done by Vayu.It is correlated with the nervous system. The motor influences,mediated through the central & peripheral nervous system,are attributed to Vayu.The reflexes of eye like corneal,conjunctival and pupillary reflexes are related to it.The sensory pathway of accommodation reflexes are attributed to *Prana Vayu*.Movements of the eyeball by the extra ocular muscles are the functions of *Vyan Vayu.*Both dilatation and constriction is mediated through Vayu.

There is inseperable role of Vaata dosha in each and every phase of darshana karma.Under *Vaataja Nanatmaj vyadhi* ;timir (blurred vision or blindness) has been mentioned.

2)*Netra and Pitta Dosha –*

- यद दृष्ट्या पित्तं,तस्मिन आलोचको अग्निः इति संज्ञा,स रूपग्रहणाधिकृतः ।।

  (सुश्रुत सूत्रस्थान २१/१०)[61]
- अग्निरेव शरीरे पित्तान्तर्गतः .....दर्शनमदर्शनम .....।। (चरक सूत्रस्थान १२/११)[62]
- दर्शनादर्शने नेत्रगतस्यालोचकस्य । (चक्रपाणि ,चरक सूत्रस्थान १२/११)[63]

In general,Rupa graham karya is done by *Pitta and Alochaka pitta* in particular.It is situated in antah taraka of eye.

Pitta represents agni is responsible for vision or loss of vision depending upon its normal or abnormal state.*Alochakagni means Pitta* located in the eyes.Its functions is Rupagrahan or to form an image.For taking parting in r*upa alochanam ,Alochaka pitta* is supported by *Sadhaka pitta*.

3*)Netra and Kapha –*

Nutrition to all parts of the eye is supplemented by Tarpaka kapha.

This is mainly of lipid portions -Sneha santarpanarm

Kapha has nutritive property and out of which is anugraha(blessings) to the dense orgsns through circulation influenced by Vyaan vaatu.

Additionally,*Shleshak kapha supports Sandhis.*

CORRELATION OF *STROTAS* WITH *NETRA*–

- रक्तवहेद्वेतयोर्मूलं यकृत्प्लीहानौ रक्तवहिन्यश्च धमन्य:,तत्र विध्यस्य..... शोणितागमनं रक्तनेत्रता च । (सुश्रुत शरिरस्थान ९/१२)

According to acharya *Sushrut,Yakrut (liver), Pleeha (spleen) and Raktvaahini dhamani* are the moolasthan/origin of *Raktvaha strotas.*Any tope of harm or injury to these organs may form disease called as Rakt netra.

- अन्नवहे द्वे तयोर्मूलमामाशयो अन्नवहिन्याश्च धमन्य: ,तत्र विध्यस्य..... आन्ध्य । (सुश्रुत शरिरस्थान ९/१२)

Amashaya and Raktvaahini dhamanies are the moolasthan/origin of*Annavaha strotas* ,Any types of injuries to these organs may leads to blindness.

CLASSIFICATION OF *NETRA ROGA* :-

Netra rogas are classified by various types based on their *Adhisthana, Chikitsa , Sadhyasadhyata* etc

- **SANKHYA SAMPRAPTI –**Aacharyas had mentioned different number of total netraroga sankhya. They are as follows –

	AACHARYA	***NETRAROGA SANKHYA***
1.	*Sushruta*	76
2.	*Vagabhata*	94
3.	*Ashtangsangrahakar*	94
4.	*Yogratnakar*	78
5.	*Bhavprakash*	78
6.	*Madhavnidan*	78
7.	*Charaka*	96
8.	*Sharangdhar*	94

- नेत्रामयः षण्णवतिस्तु भेदात् । (चरक चिकित्सा २६/१३०)
- षटसप्तति स्मृताः । (सुश्रुत उत्तरतंत्र १/२८)
- एव नेत्रे समस्ताः स्युरस्टसप्ततिरामयाः । (योगरत्नाकर,भावप्रकाश)

CLASSIFICATION OF *NETRAROGAS* –

1)**ACCORDING TO PREDOMINANCE OF *DOSHA*-** (सुश्रुत उत्तरतंत्र १/२८)

	DOSHA	***NETRAROGA SANKHYA***
1.	*Vaataja*	10
2.	*Pittaja*	10
3.	*Kaphaja*	13
4.	*Raktaja*	16
5.	*Sannipataja*	25
6.	*Aangantuja*	02

2)NETRAROGAS CORRESPONDING TO PARTS OF *NETRA* –

	SS	AS	AH	MN	YR	BP
Vartmagata Rogas	21	24	24	21	21	21
Sandhigata Rogas	9	9	9	9	9	9
Shuklagata Rogas	11	13	13	11	11	11
Krishnagata Rogas	4	5	5	4	4	4
Drishtigata Rogas	12	27	27	12	12	12
Sarvagata Rogas	17	16	16	17	17	17
Others	2	-	-	2	17	17
Total	76	94	94	78	78	94

***SS**-Sushrut Samhita* ***AS** –Ashtang Sangrah* ***AH**-Ashtang Hrudaya*

***MN** - Madhav Nidan* ***YR**–Yogratnakar* ***BP**–Bhavprakash*

3)According to Prognosis of diseases –

	Prognosis	**No. of Diseases**
1.	*Sadhya vyadhi*	52
2.	*Yapya vyadhi*	07
3.	*Asadhya vyadhi*	17

4)According to types of treatment –(सुश्रुत उत्तरतंत्र ८/४-५)

Type of treatment	No of Diseases
Chedya	11
Bhedya	5
Lekhya	9
Vedhya	15
Ashastrakruta	12
Yapya	7
Asadhya	17

NETRAROGA HETUS –[64]

उष्णभितप्तस्यजलप्रवेशाददूरेक्षणातस्वप्नविपर्ययाच्च ।

प्रसक्तसंरोदनकोपशोकक्लेशाभिघातादतिमैथुनाच्च ।।

शुक्तारनालम्लकुलत्थामाष निषेवणाद्वेगनीग्रहाच्च ।

स्वेदादवोधूमनिषेवणाच्चछर्देर्विघातादवमनतियोगात ।।

बाष्पग्रहातसूक्ष्मनिरिक्षणाच्चनेत्रेविकारानजनयन्तिदोषाः ।। (सुश्रुत उत्तरतंत्र १/२६,२७)

1. *Ushnaabhitaptasya jalpraveshat*-It means getting exposed to Sun or heat and then immersing in cold water.
2. *Durekshanata*-Continously looking towards distant object directly for long time.
3. *Swapna Viparyayaacha*-Sleeping in day time (Diwaswapna) and Awakening in night time (Nishi Jagarana) i.e disoriented & improper sleeping habits.
4. *Prasakta Sanrodan*-Weeping excessively for many days.
5. *Kopa/Shok/Klesha*- Anger,worry,anxiety,pain,anguish,grief
6. *Abhighatata*-means any any kind of injury to eyes or nearby parts.
7. *Atimaithun* – Excessive sexual indulgence.
8. *Shuktaranal amla Kulatha Masha Niveshana* – Intake of fermented sourliquids,alcohol based preparations,kulatha,masha,Amla,vinegar etc in excessive amount.
9. *Vega Vinigrahaccha*- Suppression of urges.
10. *Swedadayo* –Hot fomentation and sudation to eyes in excessive amount.
11. *Dhuma Nishevanaccha*–Exposure to smoke and other pollutants excessively.
12. *Chardervighataad*- Suppressing the urge to vomit .

13. *Vamanatiyogata*- Indulging oneself in excessive vamana therapy.
14. *Bashpagrahaat*-During the grief suppressing own's tears .
15. *Suksha Nirikshanaaccha*-Looking continuously at minute little things.

PATHOGENESIS (*SAMANYA SAMPRAPTI)* OF *NETRAROGA* –

Acharya Sushrut explained in shlok that the viatated doshas will spread through sira and reach towards Urdhvajatrugat bhaag and produce Darun (dangerous)eye diseases.[65]

In Ashtang Hruday and Sangrah,Acharya Vagbhatt had not mentioned the definite nidan of netra roga.But the 'achakshushya visheshan' mentioned in below shloka of Nidan sthan explains that aggrevated viatiatd doshas reach out through *Pittavaha Sira to Urdhva Jatrugat bhaag and causes Netragat rog.*

Whereas *Acharya Madhavkara and Yogratnakar* followed the concept of *Acharya Sushrut.*

सिरसारिभिर्दोषैर्विगुणैरुर्ध्वमागतै: । जायन्ते नेत्रभागेषु रोगाः परमदारुणा: ॥(सुश्रुत उत्तरतंत्र १/२०,२१)

PRODROMAL SYMPTOMS *(SAMANYA POORVAROOPA) OF NETRAROGA :-*

According to *Acharya Sushrut Samanya poorvaroopa* mentioned in Uttartantra are as follows

तत्राविलं ससंरम्भमश्रुकण्डूपदेहवत ॥

गुरुषातोदरागद्यैर्जुष्टचाव्यक्तलक्षणै: ॥

सशूलं वर्त्मकोषेषु शूकपूर्णाभमेव च ॥

विहन्यमानंरुपेवाक्रियास्वक्षियथापुरा ।

दृष्ट्वैव धीमान् बुध्येत दोषेणाधिष्ठित तु तत् ॥ (सुश्रुत उत्तरतंत्र १ २१/२३)[66]

- ✓ *Avila* – uncleanliness or Eyes looks like filled with muddy discharge.
- ✓ *Sasarambha* – congestion or redness
- ✓ *Ashru* –Increase or decrease in lacrimation
- ✓ *Kandu* –Itching like sensation
- ✓ *Upadehavat*-stickiness on eyelids.
- ✓ *Guru* –Heaviness in eyelids.
- ✓ *Toda* –Pricking sensation
- ✓ *Raag* –Redness
- ✓ *Sashool Vartmakosheshu Shookpurnabham* – foreign body sensation /feeling as the cavity of eyelids is full of painfull blisters.
- ✓ *Vihanyamanamroopam* – Visual disturbance.

- ✓ *Kriyahani* – Difficulty/impairement in opening and closing the eyelids.

ROOPA OF *TIMIR* TYPES: -[67]

1) VAATAJ TIMIR –

- तत्रवातेनरूपणिभ्रमन्तीवस पश्यति ।।

  आविलान्यरुणाभानि व्याविध्दानि च मानव: ।। (सुश्रुत उत्तरतंत्र ७/१८)

- तत्र वातेन तिमिरे व्याविध्दमिव पश्यति ।।

  चलाविलरुणाभासं प्रसन्नं चेक्षते मुहु: ।

  जालानि केशान माशकान रश्मीश्चोपेक्षिते अत्र च ।। (व उ १२/८,९, अ सं उ १५/८,९)

Distorted or abnormal objects like hazy,black coloured,as if they are moving,false images like spider webs, flies, hair like structure etc are seen by the patient;in *Vaataj Timir.*

Acharya Vagbhatta mentioned in above shlok that patient with *Vaataj Timir* visualize things covered by unsteady,muddy,light red appearance.sometimes patient sees clear image.Also patient visualize network or web of hairs,mosquitoes,rays of sunlight etc.

2)*PITTAJ TIMIR –*

- पित्तेनादित्यखद्योतशक्रचापतडिद्रुणान ।।

  शिखिबर्हविचित्राणि नीलकृष्णानि पश्यति । (सु उ ७/१९)

- पित्तजे तिमिरे विद्युत्खद्योतदीपितम ।

  शिखितित्तिरिपिच्छाभं प्रायो नीलं पश्यति ।। (वाग्भट उत्तरस्थान १२/१३,अष्टांग संग्रह उत्तरस्थान १५/१३)

Self illuminated, flashes of sun,rainbow,lightening like appearances are seen by *Pittaj Timir* patient.Also in Pittaj Timir,bluish& blackish colourly s feather of peacock is seen by patient.

Acharya Vagbhatt mentioned in above shlok that in patient with *Pittaj Timir* visualize bright or shinning things,lightening fire and fly.Also patient sees Colours like feathers of peacock and partridge of tittir bird and mostly sees surrounding things blue in colour.

3)*KAPHAJA TIMIR –*

- कफेन पश्येद्रूपाणि स्निग्धानि च सितानि च ।।

  गौरचामरगौराणि श्वेताभ्रप्रतिमानी च ।

  पश्येदसूक्ष्माण्यत्यर्थं व्यभ्रे चैवाभ्रसंप्लवम ।।

  सलिलप्लावितानिव परिजाड्यनि मानवः । (सुश्रुत उत्तरतंत्र ७/२०-२१)

- कफेन तिमिरे प्रायः स्निग्ध श्वेतं च पश्यति ।।

  शंखेन्दुकुन्दकुसुमैः कुमुदरिव चाचितम ।। (वाग्भट उत्तरस्थान १२/१६)

Glossy and white like the colour of a white chamara or white clouds appearances are seen by *Kaphaja Timir* patient.Most of the object appear as are inundated in water. Also in *Kaphaja Timir*, visualizes of clouds in cloudless sky,other than excessively small objects are seen by patient

Acharya Vagbhatt mentioned in above shloka that Patient with Kaphaja Timir visualize things as *snigdh*(moist and white things such as Conch,Moon,Flowers of *Kumud* (white lotus) and Kunda.

4)RAKTAJA TIMIR –

- तथा रक्तेन रक्तानि तमांसि विविधानी च ।।

  हरितश्यावकृष्णानि धूमधूम्रानि चेक्षेते । (सुश्रुत उत्तरतंत्र ७/१२)

- रक्तेन तिमिरे रक्तं तमोभूतं च पश्यति ।।

  (वग्भट उत्तरस्थान १२/२०,अष्टांग संग्रह उत्तरस्थान १५/२०)

Objects in dark,greenish,greyish,blackish and smoky in color all around the surrounding are seen by *Raktaj Timir*.*Acharya Vagbhatta* mentioned in above shloka that patient with *Raktaj timir* visualize objects red and dark in colour.

5)*SAANIPATIK TIMIR –*

- सन्निपातेन चितराणि विप्लुतानी च पश्यति ।।

  बहुधा वा द्विधा वा अपि सर्वाण्येव समन्ततः ।

  हीनाधिकाङ्गुन्यथवा ज्योतीष्यपि च पश्यति ।। (सुश्रुत उत्तरतंत्र ७/२३-२४)

- संसर्गसन्निपातेषु विद्यात्सडीर्णलक्षणान ।

  तिमिरदीनकस्माच्च तैः स्याव्दयक्ताकुलेक्षणः ।।

  (वग्भट उत्तरस्थान १२/२०,अष्टांग संग्रह उत्तरस्थान १५/२०)

Objects in multicolour, bifurcated and dispersed or multifurcated things,person and stars either supplied with additional limbs or diffective like appearance are seen by patients having *Sannipatik Timir.*

Acharya Vagbhatt mentioned in above shlok that patient with *Sannipatik Timir* visualize sometimes blurred or clear like images,*lakshanas* of all the three doshas appear.

6) *PARIMLAYI TIMIR –*

- पित्तकुर्यात परिम्लायि मूर्च्छित रक्ततेजसा ।।

  पीता दिशस्तथोद्यन्तमादित्यमिव पश्यति ।।

विकीर्यमान खाद्योतैवृक्षास्तेजोभिरेव च ।। (सुश्रुत उत्तरतंत्र ७/२५)

Parimlyayi Timir can be called when *Pitta* gets mixed with *Teja of Rakt dhatu* and thus the disease develops.

Patient with *Parimlyayi Timir* visualizes trees appearing as sparkling with the tangle of fire files.Bright colour as rising sun and Yellowish colour of all the directions can be seen by *Parimlyayi Timir*.

DOSH-DUSHTI PATALGAT* SYMPTOMS*(LAKSHANAS) –

According to Acharyas,Doshdushti Lakshanas can be in *a)Pratham patal*

b)Dwitiya Patal c) Tritiya Patal d) Chaturtha Patal

❖ *LAKSHNAS OF PRATHAM PATALGAT DOSHDUSHTI: -*

1) *DOSHDUSHTI LAKSHANAS OF PRATHAM PATALA –*

- सिराभिरभिसंप्राप्य विगुणो अभ्यन्तरे भृशम ।

  प्रथमे पटले दोषो यस्य दृष्ट व्यवस्थितः ।।

  अव्यक्तानी सरूपाणि सर्वाण्येव प्रपश्यति । (सुश्रुत उत्तरतंत्र ७/६)[68]

- सिरनुसारिणिमले प्रथम पटलश्रिते ।

  अव्यक्तमिक्षते रूप व्यक्तमप्यनिमित्ततः ।।

  (वाग्भट उत्तरस्थान १२/१,अष्टांग संग्रह उत्तरस्थान १५/१)[69]

According to *Sushrut Acharya*,through blood vessels doshas reaches to the eye's inner aspect i.e *abhantara bhaag*. Then they at Prathampatala i.e first layer of *Drushti* get located.Due to this oneself gets blurred visualization.

Also in above shloka *Acharya Vagbhatta* explained that through *Siras* when doshas get located at *First Patala*,then through being clearly visible image, person visualizesit as hazy,blurred objects

2) LAKSHNAS OF DWITIYA PATALAGATA DOSHDUSHTI-

According to Acharya Sushrut, Doshas get dearanged forming starting to develop of Timir by infiltration in Dwitiya Patala.So the blurring of vision is increases.

Hence due to this fly, mosquitoes, circles, flags,ear rings (kundal) like objects rain,clouds and darkness are seen by the person.Nearer objects appears to be very far away,while distance objects appears to be very close. For threading the needle patient is disabled.[70]

In above *shlokas, Acharya Vagbhatta* explained that by viated doshas get settled in Dwitiya Patala,objects which are absent in surrounding are seen by the person.Person is unable to see small & distant objects. Nearer objects appears to be very far away,while distance objects appears to be very close.

Person visualizes mandal i.e circles,if doshas get arranged in circular manner.And if doshas get located at the centre of the visual area i.e *Drushti* then polyopia,diplopia etc like symptoms appears.If viatiated doshas get stucked at lower,upper,lateral part of drushti,then close visualization of near,distant and lateral respectively situated objects.Also if viatiated doshas get situated at inner aspect of visual area i.e *Drushti* then small objects appears big and big objects appears small.[71]

3) DOSHDUSHTI LAKSHANAS OF TRITIYA PATALGAT DOSHDUSHTI –

- प्राप्नोति काचता दोषे तृतीयपटलाश्रिते ।

  तेनोर्ध्वमिक्षते नाधस्तनुचैलावृतोपमम ।।

  यथावर्ण च रज्येत दृष्टिर्हियेत च क्रमात । (अष्टांग संग्रह उत्तरस्थान १५/६)

According *Acharya Sushrut*,Patient get to visualize objects that are highly above while objects below is unable to see. People in front of eyes appeared to be without their own nose,ears or eyes.Huge things appeared as shelfed by cloths or any fabric.Also unable to differentiate the colours.These all happens when there is infiltration of viated doshas.

If viatiated doshas get stucked at lower,upper,lateral part of drushti,then close visualization of near,distant and lateral respectively situated objects. if doshas get located at the centre of the visual area i.e *Drushti* then polyopia,diplopia etc like symptoms appears. If the viatiated doshas all located all over the drishti mandal then person has overlapped view.[72]

Along with *Acharya Sushrut* many other acharyas had resembled above symptoms in Tritiya patalgat Doshdushti. But only *Acharya Vagbhatta* had explained above features for *Dwitiya Patalgat doshdushti in Timir.*

4) *LAKSHANAS OF CHATURTHA PATALA -*

- ..... चतुर्थ पटल गतः ।।

  रुणद्धि सर्वतो दृष्टि लिङनाशः स उच्यते । तस्मिन्नपि तमोभूते नातिरुढे महागदे ।।

  चंद्रादित्यौ सनक्षत्रावन्तरिक्षे च विद्युतः । निर्मलानि च तेजासी भ्राजिष्णूनि च पश्यति।।

  स एव लिङनाशस्तु नीलिकाकाचसंज्ञीतः ।। (सुश्रुत उत्तरतंत्र ७/१६-१८)

- तत्राप्युपेक्षमाणस्य चतुर्थ पटल गतः ।।

  लिङनाश मलः कुर्वन च्छादयेद दुष्टिमंडलम । (वाग्भट उत्तरस्थान १२/७)

- प्राप्नोति काचता दोषे तृतीय पटलाश्रिते ।

  तथाप्युपेक्षमाणस्य चतुर्थ पटल गतः लिङनाशः मतः ।। (अष्टांग संग्रह उत्तरस्थान १५/७,८)

If *Tritiya Patalgat Doshdushti* is not treated and the vitiated doshas are ignored then they get infiltrated in *Fourth Patala*. Infiltrated viatiated doshas get strucked in fourth patal from all around sides.Hence *Drishti* get enveloped and due occurrence of obstruction,its main function of *Darshanshakti* gets hampered;ultimately leading to disease named *'LINGNAASHA'*. Therefore person

gets blind,no objects,colour or any ray of light is seen by patient.Darkness all around.[73,74]

- ***PATHYA –APATHYA AAHAR VIHAR :-***

1. AAHARAJA APATHYA –

According to *Acharya Vagbhatta Vidahi and Vishtambhakar aahar* are harmful for our eyes.According to *Acharya Yogratnakar, Masha,Katutaila,Aarnala,Patra,Shakha,Phanita,Vesavara,Curd, Patrashak(Green leafy vegetables, Ambupana(excessive drinking of water),Kalingaka,Pinyaak,Virodh (Sprouts),Fish,Sura(Alcohol),Lavana,Vidahi,Teekshna, Katu , Guru food and drink,meat (exception Jaangal maans)*.One should avoid to intake above food items.

2. *VIHARAJA APATHYA –*

Accordingto *Acharya VagbhattaVegadharana,Adhyashana,Shoka,Krodha,Diwaswapna,Nishajaagar are viharaja pathya.* One should avoid doing above things.

According to *Yogratnakar Maithuna,Krodha,Shoka,Ashru,Vata,Nidra,Vami,Vegavarodha,Sukshmekshana (looking at very small objects),Atapa,Snan Prajapalan (excessive talking), Chardana,Danta vigharshana,Suryavilokana,Nishabhojana,Tambul sevana are viharaja apathya.*one should avoid doing above things

3. *AAUSHADI PATHYA –*

According to *Acharya VagbhattaNasya,Anjana, Rudhirasriti (blood letting), Padapuja(using foot wear),Abhyanjana,Udavartana,Lepa,Tamrekshanen etc and Vishuddhi*(Purificatory therapies) should be done for betterment of our eyes.

According to Yogratnakar Nasya,Swedana,Aaschotana,Langhana,Virechana,Pratisaran,Prapooram,Raktmokshan,Shastrakriya,Lepanam,Manonivrutti,Seka should be done for betterment of eyes and to increase visual acuity.

PRAMEHA

The word *Prameha* has been derived from Sanskrit word '*Meh- Sechane'* which can be defined as ''to flow''. *Meha'* means 'to micturate'.The verbal *mehanam* word signifies urination.The '*Pra'*has been derived from *Sanskrit* word *'Mih-Sechane'* which can be defined as 'to flow'.*Meha* means 'to micturate'.Verbally '*Mehanam'* word signifies urination.The '*Pra'* prefix is given for *prameha,*that means excessive in both frequency and quality.[75]

This *Prameha* this is very well known to everyone since Puraan kaal.Story behind this disease is When Dakshaprajapati (son of Brahma dev and father of Devi

Sati) organized Yagyas.One of the Yagya a special type of food item were served named Havish. From that Havish,disease called Prameha originated.

'*Prabhuta mutrata*' means excssive urination and '*Avil mutrata*' means increased turbidity of urine;these adjectives are given for Prameha.[76]Prameha is divided into three type and twenty sub-types by acharyas.Classification s done on the basis of physical chararateristics and colour of urine. Diabetes mellitus and prameha has similar etiopathology and management. Systemic urological and nephrological conditions can be correlated with types of prameha mentioned by acharyas.

*Acharya Charak*had explained *Prameha vyadhi in Charak Samhita*.In Nidan sthan 4th chapter Hetu,Purva *roop,Roop,Samprapti,upashay* is explained.While the Chikitsa i.e treatment part,various*kalpas,yogs* are explained in Chikitsa Sthan.

- ***SAMAANYA NIDAN OF PRAMEHA –*[77]**

Prameha Samaanya Nidan is classified on following factors such as *Apathyakar Aahar, Apathyakar Vihar and Manas nidan* by Charak,Vagbhat and Sushrut Acharyas.

1)*Apathyakar Aahar Nidan* – Use of Newly grown grains like *Yavak,Chanak,Hayanak* etc. Use of new blackgram,new peas and new pulses,*Teel, teelpaste,ghee* and use of sugarcane juice,newly harvested crop and freshly prepared wine are Apathyakar Aahar.Also frequent use of heavy unctuous food,milk,rice and soury and saline taste likefood.These all are *Apathyakar,Pramehajanya Aahar*which tends to increase *Kapha* and have been said to cause Prameha Vyadi.

2)*Apathyakar Vihar Nidan*– Sedentary habits,Luxiorus Lifestyle,taking excessive sleep, not doing physical and mental exercises and also not performing body detoxifying therapies or karmas. These all types of vihar increase Kapha in the body which causes Prameha.

3)*Manas Nidan* – Continuously being Sad,Stress,worrying,anger grief or in anxiety state also causes Prameha.

- ***VISHESH NIDAN OF PRAMEHA-***

Vishesh Nidan of Prameha is divided into 3 types and they are as follows :-

1)Kaphaj Pramehajanya Nidan-

Use of new legumes like *Black gram,Harenu etc.*,new cereals such as *Yavaka,Uddailaka,Hayanak,Naisadha,Mukumdaka,Utkata,Pramodak,Mahavrithi* more frequently and consuming it in large amount. Frequently consuming marshy and aquatic animals,domesticated meat,sesame paste,vegetables.Excessively consuming *Krushara,Vilepi*,sugarcane juice,flour prepared items,*Payasa*,newly prepared wines and milk.Frequent use of all *medajanya* food products.Excessively taking sleep,ack of physical and mental exercises.Sedantary anfd luxurious lifestyle,less work,always sitting,also using

all *kapha* producing products.These all are causative factors for Kaphaj Prameha.[78]

2)*Pittaj Pramehajanya Nidan* – Continously and excessively having alkaline,sour,hot,spicy food.Exposure to intense sunrays and fire,frequent anger,habbits of irregular diet and indigestion leads to *Pittaj Prameha*.[79]

3)*Vataj Pramehajnya Nidan* –Daily Usage of Ras like astringent, pungent,bitter,always contact with cold and rough,hard things,excessive maithun (sexual intercourse) and doing physical work excessively and more frequently leads to increase vitiated vata causing Vataj Pramehaj.[80]

CLASSIFICATION OF *PRAMEHA :-*

Total 20 *Prameha Vyadhi* has been classified into mainly 3 types viz –*Kaphaj Prameha,Pittaj Prameha and Vattaj Prameha.*[81]

1)Kaphaj Prameha- 10

2)Pittaj Prameha -6

3)Vatajj Prameha -4

- ***KAPHAJ PRAMEHA-***

	CHARAK	***SUSHRUT***	***VAGBHATTA***	***MADHAVKAR***
1.	*Udakmeha*	*Udakmeha*	*Udakmeha*	*Udakmeha*
2.	*Ikshuvalikarasa*	*Ikshuvalikarasameha*	*Ikshumeha*	*Ikshumeha*
3.	*Sandrameha*	*Sandrameha*	*Sandrameha*	*Sandrameha*
4.	*Sandra Prasad*	*Surameha*	*Surameha*	*Surameha*
5.	*Shuklameha*	*Pistameha*	*Pistameha*	*Pistameha*
6.	*Shuklameha*	*Shuklameha*	*Shuklameha*	*Shuklameha*
7.	*Sitameha*	---	*Sitameha*	*Sitameha*
8.	*Siktameha*	*Siktameha*	*Siktameha*	*Siktameha*
9.	*Sanayameha*	*Sanayameha*	*Sanayameha*	*Sanayameha*
10.	*Alalmeha*	---	*Lavanmeha*	*Lalameha*
11.	---	*Lavanmeha*	---	---
12.	---	*Phenameha*	---	---

- ***PITTAJ PRAMEHA-***

	CHARAK	***SUSHRUT***	***VAGBHATT***	***MADHAVKAR***
1.	*Ksharameha*	*Ksharameha*	*Ksharameha*	*Ksharameha*
2.	*Kalameha*	*---------*	*Kalameha*	*Kalameha*
3.	*Nilameha*	*Nilameha*	*Nilameha*	*Nilameha*
4.	*Lohitameha*	*Shonitameha*	*Raktameha*	*Raktmeha*
5.	*Manjisthameha*	*Manjisthameha*	*Manjisthameha*	*Manjisthameha*
6.	*Haridrameha*	*Haridrameha*	*Haridrameha*	*Haridrameha*
7.	*---------*	*Amalameha*	*---------*	*---------*

- ***VATTAJ PRAMEHA –***

	CHARAK	***SUSHRUT***	***VAGBHATTA***	***MADHAVKAR***
1.	*Vasameha*	*Vasameha*	*Vasameha*	*Vasameha*
2.	*Majjameha*	*Sarpimeha*	*Majjameha*	*Majjameha*
3.	*Hastimeha*	*Hastimeha*	*Hastimeha*	*Hastimeha*
4.	*Madhumeha*	*Ksaudrameha*	*Madhumeha*	*Madhumeha*

PRAMEHA SAMPRAPTI –[82]

As per *Acharya charak*described about the general pathogenesis(Samprapti) of *Prameha vyadhi in Nidan 4/8*.Though *Acharya charak* mentioned *Prameha as 'Tridoshaj'* ,initially but itstarts from the dearrangement of Kapha dosha.Excessively & prolonged intake of *Kapha Prakopak Aahar –Vihar*,lack of physical activity and exercise etc results in vitiation of Kapha dosha.Vitiated *Bahudrava Kapha* is basically smilar to the characteristics of *Meda dhatu*,also it affects the *Udaka* (lymphatic channel&endocrinal secretions),*Mamsa dhatu* etc.Association of Mamsa dhatu witj vitiated kaph produce *Prameha pidika* and association with Kleda forms conversation o*f Kleda into Mutra.Vitiated Kleda and Meda* do obstruction of the opening of *Mutravaha strotas.*These retain there for quite duration &this retention may lead to *Prameha*.While cause of abnormal digestion,sapta dhatus which are affected are drawn towards the urinary system ,thus results into *Prameha vyadhi*.

FLOW CHART OF *PRAMEHA SAMPRAPTI*

PRAMEHAKAR HETU SEVAN

↓

TRIDOSHDUSTI

(BAHUDRAVA KAPHA)

↓

DHATWAGNIMANDYA

↓

DHATU PRAMANGAT VRUDDHI,UPACHAYGAT HANI

↓

DHATUSHAITHILYA

↓

RAS,RAKTA,MEDA,MANS,MAJJA,VASA,SHUKRA,LASIKA & OJA GET VITIATED

↓

KLEDACHI NIRMITI

↓

CAUSE OF DHATUSHAITHILYA DUSHIT DOSHAS SANCHAR TO WHOLE BODY

↓

HENCE DUSHIT DOSHAS GET MIXED WITH KLEDA AND OTHER DUSHIT DHATUS

↓

CONVERSION OF DRAVA DHATU INTO URINE

↓

MUTRAVAAHI STROTAS

↓

BASTI MUKH

↓

MUTRA AND OTHER DHATUS GET EXCREATED THROUGH URINE

↓↓

PRAMEHA *DHATUKSHAY*

↓

HAMPERING OF OJUS

↓

MADHUMEHA

SAMPRAPTI OF *DIABETIC RETINOPATHY –*

HETU SEVAN

⇓

PRAMEHA

⇓

KAPHA *PITTA* *VATA*

(DRAVA GUNATMAK) *(USHNA GUNATMAK)* *(ROOKSHA GUNATMAK)*

⇓

STHAN SANSHRAYA (AKSHI)

⇓

(INDRIYA PRADOSHA) CHAKSHUGAT STHAN DUSHTI

⇓

ACCORDING TO SAMANYA SAMPRAPTI OF NETRAROGA

⇓

TRITIYA-CHATURTHA PATAL BHAGI DOSH SANCHITI

⇓

STHANIK SIRA VIKRUTI (SIRA ABADDHA)

⇓

STHANIK SIRA VIKRUTI (SIRA ABADDHATA DUE TO KAPHA & MEDA)

⇓

DOSH *DOSH* *DOSH*

(VATA+KAPHA+ *(PITTA+KAPHA+MEDA MEDA)* *(VATA+PITTA+KAPH+MEDA)*

⇓⇓⇓

SIRAGAT KARSHAN *SIRAGAT BHED* *NAVSIRA NIRMAN*

(THINNNING OF VESSELS)(RETINAL HAEMORAHAGE) *(FORMATION OF NEW VESSELS)*

⇓⇓

SIRAGAT VYASCHINIRMITTIRAS-RAKT SNEHA STRAVAN FORMS(ANEURYSM)(EXUDATES)

⇓⇓⇓

FORMS

⇓

NON PROLIFERATIVE DR *PROLIFERATIVE DR*

***SAMPRAPTI* OF DIABETIC RETINOPATHY ACCORDING TO AYURVEDIC VIEW**

Samprapti of Diabetic Retinopathy starts with the longterm and consistence sevan of *Pramehakar hetus*.The main pathological reason for generation of Prameha is the production of bahudrava Shleshma.Due the Drava gunatmak property,*Kapha* get increased which results in the laxity in *Meda Dhatu*.According to *Acharya Vagbhatta* ,during the formation of the *Meda,Siras* get generated from the Meda along with its sneha.And vitiation of Meda causes Sira dushti.Hence there is loss of Siras's fragility and permeability and leads to venous beading.

Whenthe disease get progress,there is vitiation of *Pitta and Vaata guna* along with ushna guna and Rooksha guna.Retinal vasculature becomes fragile.Vitiation of pitta causes *Rasraktgat rakt and Sneha* starts to leak out.

Vitiation of *Tridosha* is caused by final etiopathogenesis.Along with Rooksha guna vitiated Vaata results into loss of elasticity of retinal vessels which ultimately forms micro aneurysms.Due involvement of multiple number of siras,Exudates and dot and blot haemorrhages are formed.

These Exudates and Haemorrhages surrounding the macula causes macular edema, if the disease progress further.Neovascularization ie new,brittle,delicate vessels are formed due to *Rooksha gun of Vata dosha*.And if pathoetiological factors cause more increase in viatiation of Pitta dosha,then further it leads to intra-vitreous and intra retinal haemorrhages.

ANATOMY OF EYE-

Among five sense organ,eyes are most important.Without eyes one cannot vizualise the beautiful world around .Struture of the each eyeball is cystic ad kept distended by the pressure inside it.Its shape is almost spherical.It is referred as globe like.Its diameter is about 2.5cm. It is an oblate spheroid not a true sphere.[83,84] Each eye is situated in the anterior part of orbital cavity on the superior-medial side .It is protected from external injuries because in between the space is filled up by orbital fatty tissue.

AT BIRTH –

About 16mm in diameter,the eyeball is at Birth. Therefore it is hypermetropic.

Sclera -is thin and slight bluish in colour.Cornea- is relatively large in size.Anterior chamber –is shallow Pupil –are smallLens –round.The fovea is not structurally and functionally developed.It continues to develop after birth till 4 -6 weeks.The cones are short.Infants starts to fix the object by 6 weeks.

Infant follows object with both eyes at the age of six months. And develops full range binocular vision by 6 year of age.Whole eyeball is developed to full adult normal size by 10 years of age.

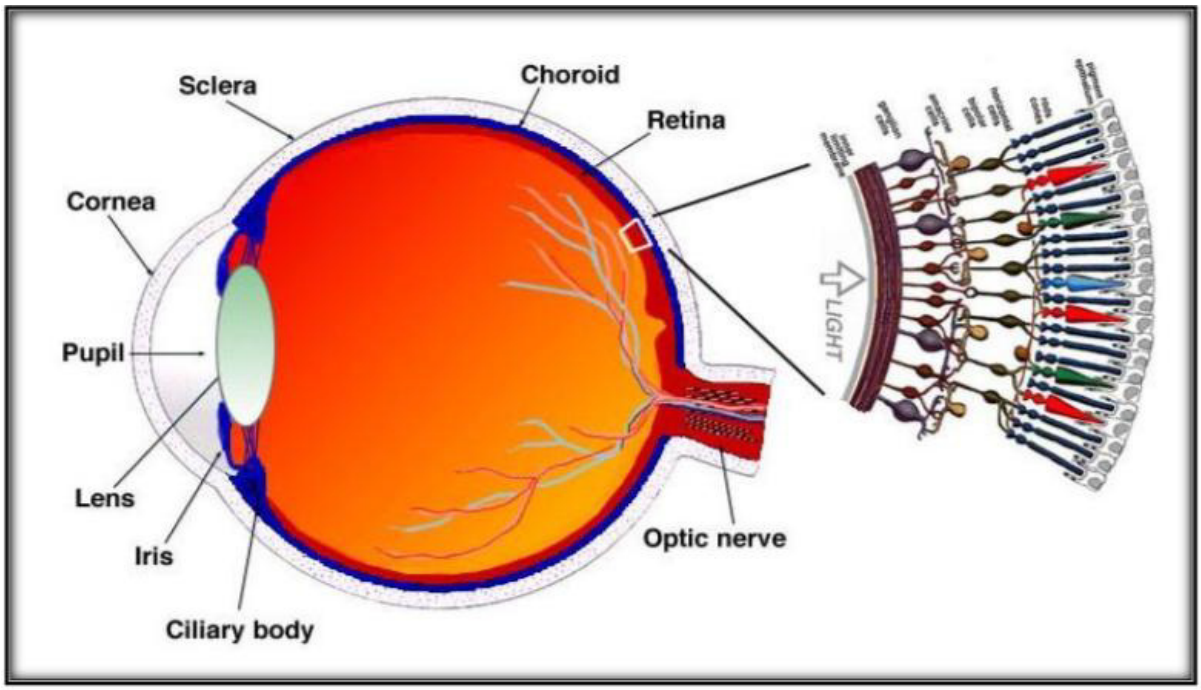
DEVELOPMENT OF EYE EMBRYOLOGICALLY –

Embryologically it is first evident in the 4th week of intrauterine life.

Ectodermal Structures are-

1)Pigmentory epithelium of retina 2)Retina proper3)Nerve fibres and optic nerve 4)Ciliary body 5)Iris lens 6)Conjuctiva 7)Corneal epithelium8)Eyelids

Mesodermal structures are-1)Sclera 2)Cornea 3)Anterior layer of iris body 4)Angle of Anterior Chamber 5)Vitreous body



- **Eyeball Dimensions –**Antero-posterior diameter – 24mm.Vertical diameter -23mm.Horizontal diameter – 23.5. Circumference -77 mmm.Weight – 7 m.Volume -6.5 ml

Eyeball is supported anteriorly by the eyelids. While posteriorly it is fixed up by optic nerve.Eyeball is supported inferiorly by the hammock of the suspensory ligaments attached to the orbit through the medial and lateral check ligaments.The eyeball movements is controlled by the muscles i.e four rectus muscles and two oblique muscles. Tenon's capsule covers the sclera and gives a smooth surface like the synovial sheath of the joint.

EXTRAOCULAR MUSCLES –

Each eyeball is held by facial sheaths and extraocular muscles in a quadrilateral pyramid shaped bony cavity known as orbit.The movements of theeach eyeball is controlled by Six extraocular muscles.There are about four rectus muscle and two oblique muscles.Rectus muscles originates from annulus of zinn (common tendinous ring),which is attached at the apex of the orbit encircling the optic foramina.[117]

MUSCLES		**ACTION**		**INSERTED INTO SCLERA FROM LIMBUS AT DISTANCE**
	PRIMARY	**SECONDARY**	**TERTIARY**	
Superior Rectus	Elevation	Intorsion	Adduction	7.7mm
Inferior Rectus	Depression	Extorsion	Adduction	6.5mm
Medial Rectus	Adduction	-	-	5.5mm
Lateral Rectus	Abduction	-	-	6.9mm
Superior Oblique	Intorsion	Depression	Abduction	-
Inferior Oblique	Extorsion	Elevation	Abduction	-

ACCESSORY STRUCTURES OF AN EYE

Eyelids,Eyebrows,Eyelashes and lacrimal apparatus.

COATS OF EYEBALL –[85]

Eyeball anatomically is made up of three concentric coats.

- Outer /Fibrous coats – Sclera and cornea
- Middle/ Vascular Coat – Iris,ciliary body and choroid
- Inner or Nervous coat – Retina,Optic Nerve

❖ OUTER/FIBROUS LAYER

SCLERA –Sclera is whitish opaque part.It forms the posterior 5/6th part of the external fibrous tunic of the eyeball. Its outer whole surface is covered by Tenon's capsule.Also the bulbar conjunctiva cover its anterior part.Sclera is almost avascular structure but loose connective tissue between conjunctiva and sclera called as epsclera is very vascular.The brown in colour inner surface lies in contact with choroid and ciliary body.The space between them is called supra choroidal space which contains groove for ciliary nerve and blood vessels.Anteriorly,sclera is continuous with cornea at the limbus or sclera-corneal junction.In its anterior most part near the limbus there is circular furrow which encloses the Sinus venosus sclera or canal of schlemm. Through the sinus, the aqueous humour drain into the anterior sclera or ciliary vein.

Optic nerve pierced the sclera about 2mm medial to the posterior pole of the eyeball.Fusion of sclera is with dural sheath of the optic nerve.In front of the equator sclera provides insertion of the four rectus muscles and two oblique muscles behind the equator.[86,87]

CORNEA-

Cornea is avascular,transparent, elliptical watch glasslike structure.

Dimensions of cornea-

Anterior surface –It is elliptical.Horizontal diameter-11.7mm.Vertical diameter - 11 mm

Posterior surface – It is circular.Diameter- 11.5mm

Thickness of Cornea – Periphery -1 to 1.2mm. Centre -0.5 to 0.6mm

The central 1/3rd of the cornea is known as the optical zone.

Refractive power -45 dioptres.Refractive index -1.376[88]

The cornea consists of 6 distinct layers viz.1)Corneal epithelium2)Bowman's membrane3)Stroma4)Predescement membrane or dua's layer5)Descement membrane6)Endothelium

1) CORNEAL EPITHELIUM –It is stratified squamous non keratinized type, continuous with that of conjunctiva. It consists of three types of cells namely – basal columnar cells, two or three strata of wing cells and two layers of squamous surface cells.[90]

1) BOWMAN'S EPITHELIUM-

It is a structure less homogenous layer formed by collagen fibres.It shows resistance to infection,but once destroyed then unable to regenerate.Hence heals by scarring ,results in corneal opacity.[91]

2) STROMA –

Stroma contributes about 90% i.e most of the corneal thickness.It consist of collagen fibrils embedded in hydrated matrix of proteoglycans i.e bundles of dense collagen fibres separated by corneal space.Stroma can regenerate damage after scarring.[92]

3) DUA'S LAYER –

It is the sixth layer of cornea.Its existence is proposed recently.

It is between the stroma and descements membrane,so called as predescement membrane.Some of the authorities believe that this to be previously described continuation of the posterior stroma.[92]

4) DESCEMENTS MEMBRANE –

It is highly strong elastic homogenous layer.Descements membrane has high resistant against chemical reagents,trauma and pathological process.Therefore it can maintain the integrity of eyeball for long period.[93]

5) ENDOTHELIUM –

Endothelium consists a monolayer of flat polygonal epithelium cells.About 3000 cells/mm^2 is the cell density of endothelium.Throughout the life it maintain corneal deturgescence by pumping excess fluid out of stroma.[94]

CONJUCTIVA – It is translucent,thin mucous membrane.It covers theanterior aspect of sclera and posterior surface of the eyelids.It adjoints the eyeball to the eyelids,so this mucous membrane is called as Conjuctiva.

PARTS OF CONJUCTIVA –

- Palpebral Conjuctiva – It is extremely thin,richly vascular and strongly bounded to the tarsal plate.It is subdivided into three parts.They are as follows.
- Marginal Conjuctiva –It is transitional zone between skin and conjunctiva.It is extended from the lid margin to 2mm back of eyelid upto the subtarsalis.In the marginal zone lacrimal punta gets open up.
- Tarsal Conjuctiva – It is highly vascular,thin,transparent structure. It is adherent firmly to the whole tarsal plate in the upper eyelid ,only width of tarsus in the lower eyelid.Through the tarsal conjunctiva ,tarsal gland appears as yellow streaks.
- Orbital conjunctiva –Orbital conjunctiva lies loose between the fornix and tarsal plate.Upper eyelid orbital conjunctiva is loose and lies over the muller muscles.Globlet cells present in this zone are more in number.
- Bulbar Conjuctiva – It is translucent,thin loosely attachedby connective tissue to sclera and fascia bulbi.Pericorneal plexus formed by Subconjunctival vessels and anterior ciliary arteries,can be seen in loose tissue under the scleral part of bulbar Conjuctiva.It is separated from anterior sclera by episcleral tissue and Tenon's capsule.
- Limbal Conjuctiva –Limbal conjunctiva is a 3mm ridge of bulbar conjunctiva around the cornea. Conjuctiva,episcleral tissue and Tenon's capsule are fused to one another into a dense tissue,which is strongly adherent to sclero –corneal junction.
- Conjuctival fornix – A transitional region between palpebral conjunctiva and bulbar conjunctiva is known as Conjuctival fornix.It adjoints the bulbar conjunctiva with the palpebral conjunctiva.It is just basically circular cul-de-sac which is broken only at medial side of curuncle and plica semilunaris.[95]

❖ MIDDLE /VASCULAR COATS -

IRIS – It is thin contractile pigment diaphragm 12mm in diameter with a central aperture pupil which regulates the amount of light reching the retina.Iris divides the space between the lens & cornea into anterior & posterior chamber.[96]

Four layer of iris from anterior to posterior – a) Anterior limiting layerb)Stroma of irisc) Anterior epithelial layer d)Posterior pigmented epithelial layer[97]

CILIARY BODY– It is forward to the scleral spur and backward to the ora serrata of the retina.Ciliary body is triangular in shape on cross section.Angle of anterior & posterior chamber are formed by anterior side of triangle.Iris is attached in its middle side. Inner side of triangle is divided into two parts,anterior part (about 2 mm) having finger like ciliary processes known as pars plicata.The posterior smooth part (about 4mm) is known as pars plana.

CHOROID –Choroid extends from optic disc to the ora serrata.It is posterior most part of the vascular coat of eyeball.Inner surface is brown in colour,smooth and it lies in contact with pigment epithelium of the retina.Outer surface lies in contact with the sclera.[98]

❖ INNER/NERVOUS COAT

RETINA

Retina is a semi-transparent,delicate,multilayer sheet of the neural tissue. It lines the inner aspect of the posterior 2/3rd of the wall of eyeball. It extends from the optic disc to the Purplish –red colour appearance of retina is due to visual pigmented purple colour of rods and underlying vascular the choroid.Retina develops from diverticulum of forebrain.At about gestational 25thday,neuroectoderm lining the primitive forebrain proliferates to form a balloon like outpouching known as optic vesicle.Optic vesicle invaginate to form double walled bowl known as optic cup.The inner wall differentiates into nine layers of retina.While outer wall becomes the pigment epithelium.Retina is most highly developed tissue of eye.

It can be divided grossly into two parts,they are –a)Posterior pole b)Peripheral retina

These two are separated by retinal equator.The imaginary line which is consider to lie in line with the exit of four vena verticose is retinal equator.[99]

1) **Posterior pole**- Area of retina posterior to the retinal equator is known as Posterior pole. It can be best examined by slit lamp indirect biomicroscopy using +78D and +90D lens and direct ophthalmoscopy.

Two distinct areas are included in posterior pole of retina.

a) Optic disc

b) Macula lutea

a)Optic disc- Approximately,it is 1.5 mm diameter well defined circular ,pink coloured Optic disc.There is a depressed area seen in the centre of the optic disc, is known as physiological cup.All the layers of the retina terminates at the optic cup,except the nerve fibre layer;which passes through the lamina cribosa to run into the optic nerve.Through the centre of the optic cup,the central retinal artery and vein enters.[101]

b)Macula lutea – It is also called as yellow spot or area centralis.Macula is most sensitive part of retina. It is approximately 5.5mm in diameter.Also it is rich in cones.[102]It is situated about 2 disc diameters(DD) temporal to the optic disc(1 DD,1.5mm).Central depressed part of area centralis is called as fovea centralis. It has diameter of 1.5 mm which is about as optic disc,which has small central depression approximately 0.35mm in diameter called as Foveola.[103]It is thinnest part of retina. Mainly it contains high density of cones.Each cones directly relays to a single ganglion cell. It is "rod free zone",here Rod photoreceptors are excluded.[104]

There is depression in the centre of foveola known as umbo,which corresponds to foveolar reflex. Foveal avascular zone is located within fovea but extends over a central area about 0.4-0.6 mm in diameter. It no blood vessels are contain but surrounded by continuous network of capillaries.[105]

2) **Peripheral retina**-It is bounded by retinal equator posteriorly and ora serrata anteriorly.[106]

ORA SERRATA –It is serrated peripheral margin where retina ends.Here retina is firmly attached to both vitreous and choroid.Pars plana extends anteriorly from ora serrata.[107]

Microscopically retina consists of three typs of cells and has 10 layers,they are:-[108]

i. **Retinal pigmented epithelium(RPE)-** It is the outermost layer of retina.RPE is made up of single layer hexagonal cells. Single Adult human contains 3.5 million RPE cells.RPE is firmly adherent to the underlying basal lamina (bruch membrane).

   Junction between adjacent RPE cells firmly forms the outer blood-retina barrier,which is an important physiological barrier to the free flow of molecules between the leaky choriocapillaries & neuroretinal photoreceptors.Dark brown RPE is rendered by melanin to black.Another pigment lifoscin accumulated as an end product of outer photoreceptor segment in the Retinal Pigment Epithelium and in Bruch's membrane.As lipofuscin is the pigment of aging.Hence minute amount of it can be already detected in the RPE of children.

ii. **Layer of Rods and Cones –** Rods and cones are also known as photoreceptors.They are the end organs of vision,which converts light stimulus into the visual impulse.This process is known as phototransduction.

Aprroximately 120 million rods and 6.5 million cones in number are present in human retina.Rods contains a photosensitive substance name as Rhodopsin(Visual purple) which is responsible for peripheral vision and vision of dim illumination i.e scotopic vision. Cones having highly density at the fovea, also contain photosensitivity substance.They are responsible for central and colour vision.

iii. External limiting membrane- External limiting membrane is a fenestrated membrane.Through this membrane process of rods and cones are pass.

iv. Outer nuclear layer – Outer nuclear layer consists of nucleus of rods and cones.

v. Outer plexiform layer –This layer consists of connections between rod spherules and cone pedicles with dendrites of bipolar cells and horizontal cells.

vi. Inner nuclear layer- Inner nuclear layer consist of bipolar cells,horizontal cells and amacrine,Muller's cells and capillaries of central artery retina.

vii. Inner plexiform layer –Inner plexiform layer is made up of synapses between axon of bipolar cells and dendrites of ganglion cells and processes of amacrine cells.

viii. Ganglion cell layer- Ganglion cell layer consists of nuclei of ganglion cells.It is the second order neurons of visual pathway. Ganglion cells are of two types. In the macular region,midget ganglion cells are present and dendrite of each cell synapses with the axon of single bipolar cell. Predominately Polysynaptic ganglion cells lie in peripheral retina & each cell synapse with hundred bipolar cells.

ix. Nerve fibre layer –It is the layer formed by axon of ganglion cells. Nerve fiber layer forms the optic nerve which passes through the lamina cribosa.

x. Internal limiting membrane- Being the innermost layer,it separates retina from the vitreous.Internal limiting membrane is formed by joining of terminal expansion of the Muller fibres & Basal lamina.[109]

DIVISION OF RETINA –

Retina is divided functionally into Temporal Retina and Nasal Retina. Both are divided by line drawn vertically through the centre of fovea. Nerve fibres originating from the Temporal retina passes through the optic nerve & Optic tract of the same to terminate in the ipsilateral geniculate body. Nerve fibres which originate from the nasal retina passes through the optic nerve and then crosses in the optic chiasma.Then travel through the contralateral optic tract to terminate in the contralateral geniculate body.

RETINAL BLOOD SUPPLY –[110]

- Retinal blood is supplied with ophthalmic artery which is branch of carotid artery.
- Retinal outer four layers i.e pigment epithelium,layer of rods and cones,external limiting membrane and outer nuclear layer are supplied by choroidal vessels
- While inner six layers are supplied by central retinal artery.
- From the centre of physiological cup of the optic disc,Central retinal artery get emerge.Then divides into 4 branches viz superior nasal,superior temporal,inferior nasal and inferior temporal.These all are end arteries.

RETINAL ARTERIAL SYSTEM –

1)CENTRAL RETINAL ARTERY – It is an end artery.It enters the optic nerve 1 cm behind the globe.While it is composed of 3 layers –

i. The Intima – It consists of single layer of endothelium and it is the innermost layer.

ii. Internal elastic lamina – This layer separetes the intima from the media.

iii. Tunica media – Tunica media contains the layer of smooth muscles.

iv. Tunica adventitia –Tunica adventitia is the outermost layer and it is composed of loose connective tissue.

2)RETINAL ARTERIOLES – From Central retinal artery,Retinal arterioles are arise.Also contains smooth muscle in their walls but internal elastic lamina is discontinuous.

3) CAPILLARIES – They are devoid of elastic tissue and smooth muscles.

STRUCTURE OF WALL OF CAPILLARIES –

i. Endothelial cells –Endothelial cells are linked by tight junctions, forming Blood Retinal Barrier

ii. Basement membrane –Basement membrane lies beneath te endothelial cells with an outer basal lamina enclosing pericytes.

iii. Pericytes–Pericytes participates in autoregulation of microcirculation.

VENOUS SYSTEM – From retinal capillaries, Retinal venules and vein drains blood.

i. Small venules –Small venules are larger than capillaries.

ii. Larger venules –Large venules merge to form veins.

iii. Veins –Veins contains small amount of smooth muscle & elastic tissue in their walls.

OPTIC NERVE

Approximately optic nerve carries 1.2 millions afferent nerve fibres.It extends from lamina cribosa upto the optic chiasma.Fibres of the optic nerve originate from the nerve fibre layer of the retina.[111]All retinal fibres converges to form the optic nerve measuring about 5mm to the nasal side of the macula lutea. Nerve pierces the lamina cribosa to pass backwards & medially through orbital cavity.Then it get passes through the optic foramen of the sphenoid bone medially & backwards to meet up the nerve at the optic chiasma from the other eye.[112]

Optic nerve can be divided into –

i. Intraocular part – Intraocular part starts from optic,then passes through the sclera & choroid. Length -1mm

ii. Intraorbital part – Intraorbital part starts from the back of eyeball to the optic foramina. Optic nerve is closely surrounded by annulus of zinn and origin of four recti muscles, at the optic foramina.Length -30 mm

iii. Intracanalicular part –Intracanalicular part is closely related to ophthalmic artery.Length -6-9mm

iv. Intracranial part- Intracranial part lies above cavernous sinus & converges with its fellow to form chiasma. Length –[113]

EYEBALL CONTENTS –

1)AQUEOUS HUMOUR – It is a clear watery fluid filling 0.25ml of anterior chamber and 0.6ml of posterior chamber

Composition- It composed of 99.9% of water and 0.1% of solids,amino acids,proteins,non-colloidal constituents (glucose,ascorbate acid,lactic acid,k^+,Na^+,Cl^+ and HCO_3^-) in amount of millimoles/kg.Aqueous humour maintains the optical transparency and intraocular pressure.It Plays an role importantly in providing substrates and removing metabolites from avascular cornea &lens.[114]

2)LENS – It is bicovex in shape,transparent in colour and crystalline structure placed between iris and vitreous like in saucer shaped depression known as patellar fossa. In adult,equatorial diameter is 9-10 mm nd thickness changes with age from 3.5mm at birth to 5mm at extreme age.Weight varies from 135mg(0-9 years) to 255mg (40-80 years of age). Lens has two surface – Anterior & Posterior.Posterior surface is more convex than anterior surface.Refractive index of lens is 1.39,Total diopter power is –about 18D.Accomodative power of lens at birth is about 14-16D,at 25 year of age 7-8D and at 50 years of age 1-2D[115]

3)VITREOUS HUMOUR – Vitreous humour is a colorless,transparent,an inert,avascular,jelly like material which fills the posterior cavity(space between lens and retina) of eyeball.It occupies about 4ml in volume in adult. It is formed by network of randomly oriented collagen fibrils, interspersed with numerous spheroidal macromolecule of hyaluronic acid.Vitreous is hydrophilic gel which mainly serves the optical funtions.Also it stabilizes the volume of the globe. Being avascular vitreous gets nourishment from choroid,ciliary body and retina.

Vitreous can be divided into two parts –

a)Cortical Vitreous (Cortex) – This part lies adherent to the ciliary body zonules, anteriorly lens and from posteriorly adherent to retina.

b)Main vitreous body – Vitreous body is true biological gel and has dense fibriller structures.

Vitreous is anteriorly attached to the posterior surface of lens.Base of vitreous i.e part of vitreous is about 4mm across the ora serrata ,here the attachment of the vitreous is strongest .Around the margins of the optic disc ,foveal region and back of the crystalline lens (ligament of wieger) are the other firm attachments.[116]

DIABETIC RETINOPATHY –

Diabetes mellitus (DM) has become fast emerging, silent major killer of human being in present era**.**There are two main types of DM; type 1 DM also known as insulin dependent diabetes mellitus or IDDM and type 2 DM also known as non-insulin dependent mellitus or NIDDM. The complication of DM primarily is due to microangiopathy been linked directly to glycemic control and thus damage to the eyes,kidney and nerves.[118]Diabetic Retinopathy is a medical condition in which damage occurstoretina due to diabetes mellitus and is leading cause of Blindness (gradual painless visual loss).

RISK FACTORS ASSOCIATED WITH OCCURRENCE OF DIABETIC RETINOPATHY-[119]

- **Duration–** Development of Diabetic Retinopathy after 10yrs,20% of type type 1 & 25% of type 2 diabetics.

  Development of Diabetic Retinopathy after 20 Years,90% of type type 1 & 60% of type 2 diabetics.

  Development of Diabetic Retinopathy after 30 Years,95% of both type type 1 & type 2 diabetics

- **Sex-** Ratio of female:Male is 4:3. Incidence of DR in females is more than males.

- **Types of Diabetes –**Diabeti Retinopathy is common and about 40% in type 1 diabetes.

Diabetic Retinopathy is less common and is about 20% in type 2 diabetes.Risk is greater in type 1 DM than in type 2 DM

- **Control of Blood glucose level –**DCCT(Diabetes Control & Complications Trail) and UKPDS (United Kingdom Prospective Diabetes Study) thes two landmark clinical showed that if tight glycaemic control(HbA_1C value of 7% or less) could reduce the risk of DR development in all diabetic patients.
- **Systemical hypertension –**It should becontrolled below 140/80.Systematicaly increased hypertension is the common risk factor in type 2 diabetes.
- **Nephropathy –** Indication of microalbuminuria is a high risk renal involvemet. Elevated blood urea, proteinuria % elevated blood creatinine are the indicators of the presence of retinopathy.
- **Pregnancy-**

  There is 10% risk of developing background retinopathy to the women having DM without retinopathy & early period of pregnancy.

  At the onset of pregnancy, women with background retinopathy may show progression. Also there is some regression after delivery.

  Women with background retinopathy have about 4% risk of progression to proliferative retinopathy.

  Untreated proliferative retnopathy at the onset of pregnancy worsen the situation, unless they are treated.
- **Obesity –** If the body mass increases then the risk of developing Diabetic retinopathy increases.
- **Other risk factors –** include smoking,hyperlipidemia.

DIABETIC RETINOPATHY CLASSIFICATION –

Classification by Early treatment of Diabetic Retinopathy Study (ETDRS)[139,40]

- **1)BACKGROUND (NON PROLIFERATIVE)DIABETIC RETINOPATHY (NPDR)-**Signs such as microaneurysms,Dot & Blot haemorrhages and exudates are present.These are early sign of Diabetic Retinopathy.NPDR is sub classified – 1)Mild NPDR -At least one micro-aneurysm or intra retinal haemorrhage.
- Hard/soft exudates may or may not be present.

2)Moderate NPDR

- Moderate microaneurysms / intraretinal haemorrhage.
- Early intra retinal microvascular abnormalities.

- Hard/soft exudates may or may not be present.

3)Severe NPDR(4-2-1 rule)

- Any one of the following should be present
- Four quadrants of microaneurysms/intraretinal haemorrhages.
- Venus beading which is more marked in atleast 2 quadrants.
- Intra-retinal micro vascular abnormalities which are more severe in at least 1 quadrant.

4)Very severe NPDR-Two or more of the criteria for severe NPDR

3)PRE-PROLIFERATIVE DIABETIC RETINOPATHY (PPDR)-PPDR is charaterised by venous changes,cotton wool spots,intraretinal microvascular anomalies(IRMA) and also deep retinal haemorrhages. Progressive retinal ischemia with high risk of progression of neovascularization on retina indicates PDR.

4)PROLIFERATIVE DIABETIC RETINOPATHY(PDR) – Almost 2/3rd of diabetes type1 are likely to develop PDR.About 50% of cases after 25 years of the onset disease, develop PDR .An abnormal new blood vessels (neovascularization) seen on or within one dic diameter area of the disc(NVD) and/or new vessels elsewhere (NVE) in fundus,characterizes PDR.Types –1) Early PDR without HRCs –New vessels on the disc(NVD) or New vessels elsewhere (NVE).2)High risk PDR- a)Any NVD with vitereous haemorrhages.b)New vessels on the disc greater than ETDRS standard photograph10A. c) NVE greater than ½ disc area with vitereous haemorrhage.[136]

5)DIABETIC MACULOPATHY – Presence of Retinopathy at macular region but it is commonly reserved for significant changes. These changes may be associated with NPDR or PDR.

Retinal thickening caused by the accumulation of fluid between the outer plexiform & inner nuclear layer is said to the Diabetic macular oedema. Types of maculopathy -1)Focal maculopathy – Characterised by retinal thickening which is associated with complete or incomplete ring of exudates to leakage.Focal leakage with adequate macular perfusion is seen in FFA 2)Diffuse maculopathy – Is characterised by small haemorrhages and by scaterred microanuerysms. This may be associated by cystoid changes.Mid & late phase of diffuse hyperflorescence is seen in FFA.3)Ischemic maculopathy – Is caused by microvascular blockage.In this there is marked visual loss with microanuerysms,haemorrhages, mild to moderate macular oedema & hard exudates.[137]Capillary non-perfusion area at fovea,while other area of the capillary non-perfusion at posterior pole & periphery is seen in FFA.4)Mixed maculopathy –It is combined features of ischemic & exudative maculopathy.

Clinical significant macular oedema(CSME) –As defined by Early Treatment Diabetic Retinopathy Study, clinical examination of CSME are –

- Centre of retina has within 500µm thickening of the retina.
- Exudates within 500 µm of the centre of macula if associated with retinal thickening.
- Any part of which is within 1 disc diameter of the centre of the macula,at least 1 dics area.[138]

Fluid initially located between the outer plexiform & inner nuclear layer later on it may involve the inner plexiform layer. Until entire thickness of retina becomesedematous.The fovea with the central accumulation fluid assumes as cystoid appearance i.e Cystoids macular edema (CMO),which can be detectable by OCT (optical coherence tomography),it appears as flower like pattern on flurosccience angiography.

Classification of DME by OCT – 1)Non tractional DME –It has following types – a) spongy thickness of macula(>250µ) b)cystoids macular edema c)Neurosensory detachment with or without a & b. 2)Tractional DME –a)Vitero-foveal traction b)Thickened posterior hyloid membrane

6)ADVANCED DIABETIC EYE DISEASES (ADED) –ADED is characterized by the complications such as tractional retinal detachment, neovascular glaucoma, significant persistent vitreous haemorrhage.[120]

Risk factors for progression of NPDR to PDR,observed in ETDRS include presence of – 1)IRMAs 2)Multiple increasing intraretinal haemorrhages 3)Venous beading & loops 4) Wide spreading of capillary non-perfusion areas.

PATHOGENESIS–

Clear understanding of the disease follows the effective as well as appropriate management of NPDR.In poorly controlled diabetes,chronic hyperglycemia results in biochemical alterations and altered haemodynamic condition of the retinal vasculature.This further leads to chronic hypoxia.As retina is highly metabolic tissue,dependent on optimal oxygenation and compensatory pathways such as regulation of vascular endothelial growth factor i.e VEGF protein. These are targeted against retinal hypoxia,ultimately leading to process of pathology of vascular permeability,microaneurysms,vascular occlusion or closure of capillaries i.e NPDR.

In the prognosis of DR,Hyperglycemia plays an important role.As it leads to increase the cell uptake of glucose with deleterious effects. Hyperglycemia inducing retinal stress and Diabetic retinopathy include following mechanisms:-[121]

1)Protein Kinase C Activation–In the pathogenesis of hyperglycemia induced vascular damage, many biochemical mechsnisms are mentioned and explained.But in increase in the endogenous activator of protein kinase C (PKC) de novo synthesis of diacylglycerol (DAG) is important in mediating a variety of structural and functional abnormalities in vascular tissue.PO_4 groups added and

removed to intracellular proteins via kinase & phosphates.It is an important regulatory system for activation and deactivation of receptorpathways,tissue enzymes, and transcription factors controlling gene expression.

Phosphorylation of numerous substrate proteins are mediated by PKC at serine or theorine residues triggers a cascade of pathophysiological responses.In Diabetic retinopathy,division and permeability of endothelial cells is controlled by cellular protein called as Protein Kinase C.Thus PKC control changes in permeability of endothelium,blood flow.So the response & formation to angiogenic growth factors contributes to leakage of retina,ischemia and neovascularization. Loss of pericytes is also contributed by PKC activation.It is an early sign of Diabetic retinopathy[124]

2)Polyol pathway –On the Enzyme Aldose Reductase,Polyol pathway is depended. Aldose reductase reduced aldehydes in the cell to inactivate alcohol.Sorbital pathway becomes active,when blood glucose concentration is high. Then Aldose reductase reduces that high glucose to sorbitol with the help of co-factor NADPH (Nicotinamide Adenine dinucleotide phosphate).[122]

For the regenerating a critical intra cellular anti-oxidant,reducing glutathione, NADPH cofactor plays an important roleIncreased level of sorbitol affects the Intra mural pericytes of retinal capillaries. This results in the loss of their primary function,leading in weakness and saccular outpouching of capillary walls.[123]

3)Non Enzymatic Glycation (Advanced Glycation End products)Proteins (AGE) – Especially in the existence of High glucose,Carbohydrates interacts with protein side chain to form Amadori products in the non-enzymatic fashion.Subsequently these forms AGEs.AGE specific receptor interaction is associated in vitro with oxidative stress & nuclear factor-B activation. This is responsible for higher expression of proinflammotory cytokines, vasoactive mediators, procoagulant factors and lymphocyte adhesion molecules.This whole procedure causes disruption of retinal haemodynamic and vascular endothelial cells damage.[125]During the diabetes,AGE get collected in retinal pericytes affecting the function of pericytes which leads to loss of pericytes.Along with this changes in thickening of basement membrane,hyperpermeability and formation of microaneurysm are observed.[126]

4)Hexosamine Pathway –When there is maximum intracellular glucose not extracted by glycosis then Hexosamine pathway gets activated.

Inside the cell when glucose gets high, then most of them are converted to glucose-6-phosphate.Then it get converted to fructose-6-phosphate.A small fraction of glucose is metabolised through the hexosamine pathway in euglycaemia. While fructose-6-phosphate is converted to N-Acetyl Glucosamine-6-phosphate by enzyme glutamine fructose-6-phosphate amono transferase in hyperglycaemia. Hence in this pathway the glucose flow results in the rapid metabolism of gluvosamin-6-phosphate leading to formation of uridine diphosphate N acetylglucosamine (UDP-GlcNAc). This causes changes in protein

and gene function which reduce cell protection.Hence finally stimulates cell apoptosis on endothelial cells and retinal neurons.[127]

5)Blood Retinal Barrier Dysfuntion–Inner blood retinal barrier formed by intra retinal microvasculature and outer blood retinal barrier formed from retinal pigment epithelium,protects the Retina from blood borne products.In Diabetic retinopathy inner blood retinal barrier gets compromised & leaking of blood constituents into the neutrophil occurs.

In Diabetes,breakdown of blood retinal barrier leads to diabetic macular edema,which is the commonest cause of blindness.

6)Inflammatory changes in diabetic retinopathy –In the pathogenesis of diabetic retinopathy, the role of proinflammatory cytokines, chemokines & other inflammatory mediators leads to persistent low–grade inflammation. Also influx of leukocyctes contributes to the damage of the retinal vasculature and neovascularization. The major part of inflammatory process is the Leukocytes. Significantly it has been found to be increased in the diabetic Patients. In Diabetic retinopathy it contributes to the nonperfusion of capillaries. In the death of endothelial cells and blood retinal barrier breakdown,Leukostasis been postulated to be a factor of it. Capillary nonperfusion,Diabetic retinal vascular leakage and damage of endothelial cells are associated to leukocyte recruitment and adhesion to the retinal vasculature. In diabetic patients there is increase in level of TNF-alpha.[131]

7)Degeneration of capillaries –In diabetic retinopathy, degeneration of retinal capillaries underlines the progressive ischaemia.Loss of pericytes from the capillary wall is a histological and pathological hallmark of Diabetic retinopathy.[128]

8)Angiogenic factors (VEGF)role–Angiogenesis i.e the formation of new blood vessels is central to the pathology of proliferative diabetic retinopathy.It is stimulated by factors such as VEGF in the response to the retinal ischemia,caused by capillary loss or/and formation of microanuerysm.[129]In the retina, VEGF is the main mediator of angiogenesis;which causes the breakdown of blood retinal barrier,Neovascularization and stimulation of endotjelial cells growth.VEGF cellular function is mediated by the activation of two membrane bound to tyrosine kinase receptors.VEGF is bounded to the membrane bound receptors to activate two possible pathways,a calcium influx channel or a mitogen activationg protein kinase signalling pathways.These both pathways lead to the vascular leakage & blood retinal barrier breakdown ;which with VEGF is associated.[130]

Signs of Diabetic Retinopathy-

1)Microaneurysms- The earliest clinically visible signs of Diabetic retinopathy is the retinal capillary microaneurysms.They are the hallmark of NPDR,although they are seen in other retinal vascular diseases such as retinal vein occlusion.Microaneurysms appears as the tiny dots ,which initially occurs in temporal to the fovea.They are localized out pouching sacular,dilatations of capillary due to the pericytes loss.Microanuerysms are located in the inner

nuclear layer,loss of pericytes;which cause endothelial cell proliferation.These endothelial cell proliferation is responsible for formation of cellular microanuerysm.Leakage of plasma constituents into the retina due to microanuerysms leads into breakage of blood retinal barrier.FFA shows minute hyper-florescent dots in early frames & in late frames due to leakage it shows diffuse hyperflorescence.

2) Exudates –Due to chronic localised retinal oedema,they get occurred.To differentiate from the older term for cotton wool spot-soft exudate,exudates are also known as hard exudates.Exudates are developed at the junction of oedematous as well as normal retina.They are made up of lipoprotein and lipid filled macrophages located in the outer plexiform layer.Exudates are waxy yellow like flecks arranged in forming circinate pattern or clumps around the microanuerysms frequently at posterior pole.With time they get increases in number & size.They are absorbed spontaneously in the case of leakage over a period of month,either by phagocyteosis or into healthy surrounding.By chronic leakage,enlargement & deposition of crystalline cholesterol. Hyperflorencent with large dense exudates is seen in FFA, though background choroidal florescence is covered.While retinal capillary florescence is preserved by overlying the lesion.

3) Cotton wool spots – Theses are fluffy whitish lesion in nerve fibre caused by capillary occlusion. They represent areas of nerve fiber infarcts.

4) Dot & Blot Haemorrhage –

Intraretinal haemorrhage –It arises from the venous end of capillaries.While they are located in the middle layer of retina,resulting oval/round shape red dot/blot haemorrhage.

Haemorrhage of Retinal nerve fibre layer-are arises from the superficial precapillary arterioles.Due to architecture nerve fibre layer they are flame shaped.Also are superficial,presenting in he nerve fibre layer. [132]

5.Intra retinal microvascular abnormalities- Arteriolar shunts that run from retinal arterioles to venules, thus bypassing the capillary bed.Therefore are seen often adjacent to areas of marked capillary hypoperfusion,are known to be IRMA.[133] Signs - Irregular,fine,red intraretinal lines that run from arterioles to venules,without crossing major blood vessels.[134]

6.Venous abnormalities – These anomalies are seen in ischemia consist of generalized dilatation & tortuosity,looping,beading occurs adjacent to area of capillary non-perfusion.These changes correlates with likehood of developing proliferative disease.[135]

SYMPTOMS OF DIABETIC RETINOPATHY –Impaired colour vision,blurriness in vision,floaters etc.

TREATMENT OF DIABETIC RETINOPATHY –[141]General –Modalities of treatment of Diabetic retinopathy includes metabolIc control of Diabetes mellitus & its associated risk factors,intravitreal steroid injections,intravitreal anti-VEGF drugs,laser theraphy and pars plana vitrectomy.

1) Metabolic control of DM & associated risk factors–Blood glucose level and also other biochemical parameters(cholesterol,blood urea,serum creatinine,haemoglobin,hypertension etc) of the patient should be in normal range.Patient should prohibit alcohol consumption & smoking.Regular exercises is must.

2) Intraviteral anti-VEGF drugs –In etio-pathogenesis ofDiabeticretinopathy & maculopathy,Vascular endothelial groth factor plays an important role.0.5mg anti-VEGF Ranibizumab given in 0.1ml intravitrealy leads to improvement in vision in >40% cases & 40% cases stabilzes vision.over laser therapy these drugs must be preferred in patients with Diffuse DME,Diffuse CME,Focal CME involving centre of fovea,DME with neurosensory detachment.It is also recomded before PRP in PDR and diffuse DME.Its effects lasts for 4-6 weeks & frequent injections are required.

Steps should followedare[142] -1)Application of topical anesthetic 2)Application of 5% or 10% povidine-iodine drops 3)Insert sterile speculum to separate the lids 4) Injection of volume 0.05ml is injected in 3 to 3.5mm posterior to the limbus into midvitreous cavity for phakic eye.Injection must ne given in infra-temporal quadrant & straight injection path is employed. 5)Reapply povidine –iodine drops & antibiotic eye drops6)Place sterile cotton swab immediatelyover injection site to prevent reflux.

Risk management of post injection – IOP(Intraoccular pressure) should be measured specially for patient with glaucoma,whom complain of plain,who receive large injection volumes and reduced vision.4th generation antibiotic eye drops must used.Fundoscopic examinations is recommended after injection to assess the central retinal artery perfusion,retinal detachment & injection related haemorrhage.

3)Intravitreal steroids -20 mg Intravitreal tricinolone acetonide(IVTA) is another steroidal drug is being tried.This hassome anti-VEGF effects as well as restores inner retinal barrier.Its uses are to restrict risk of glaucoma,steroid induced cataract & increased vulnerability to endophthalmities.

4)Laser therapy –Uses of laser in eye diseases is said to be Laser photocoagulation or Laser photoblation.It is used to treat the new blood vessels in advance stages of Diabetic retinopathy.It blocks off any abnormal blood vessels ,also stops damge leak aswell as destroy the tissues that stimulating the growth of these new,abnormal blood vesels.Maculae oedem can be stabilize by Laser also prevents further fluid accumuaton.It is used to put small burns around the retinal tear by preventing retinal detachment.For focal DME and diffuse DME,ETDRS recommended focal laser and grid laser respectively.It helps possibly stimulating the RPE pump mechanism & by inhibiting VEGF release.Laser therapy is performed by using double frequency YAG laser of 532nm or green laser or diode laser.

Steps[143] –firstly local anesthetic is inserted in eyes to numb the eyes & some mydriasis is instilled to dilate the pupil.Around 20-40 minutes normally it takes.It is opd basis basis procedure .Although may have sharp pricking

sensation when laser is done,but while doing it is not usualy painful.Before laser beam is aimed to eye,following adjustment must done –amount of enery used,size of spot or end of the beam directed into the eye,pattern applied by the laser beam onto the targeted area.[124]

Depended on eye condition and extent of damage represents no.of of treatments.PDR may require 3-4 different sessions at 2 to 4 intervals of months.

5)Macular photocoaglution –Following are the types-a)Grid Photocoaglution – May considered only some recalcitrant caes not responding to anti-VEGF & intravitreal steroids,choice of treatment for diffuse DME. b)Focal photocoaglution-Argon or diode burns are applied on the leaking microanuerysms 500-100µm from the foveolar.Duration is 0.05-0.1s,spot size is 50-100µmTreatmen of choice for Focal DME not involving centre of fovea.

6)Panretinal Photocoaglution –Aso known as Scatter laser considering of 1200-1600 spots.Duration of 0.1s and each of 500µm size.Outside the temporal arcaded and nasal side one disc diameter from the disc upto the equator,laser burns are applied.One burn must be one burn's width apart.It shrinks abnormal vesels.Inferior quadrant of reina in PRP is firstly coagulated.In this macula must b avoided.Destruction of hypoxic retina which is the cause for procuction of vasoformative factors is caused by PRP. Indications are –PDR with HRCs,Neovascularisation of iris,Severe NPDR,One eye patient,Pregnancy.[126]

7)Surgical Treatment –It is indicated in cases sush as –a)Advanced PDR with densely vitreous haemmorrhage –Pars plan vitrectomy (PPV) along with removal of opaque vitreous gel & endophotocoaglution must be done at an early stage.b) Tractional DME with NPDR-PPV with removal of posterior hyloid.c) (ERM)Extensive fibrovascular epiretinal membrane with advanced PDR must be treated with PPV,also by removal of ERM & endophotocoaglution d) Tractional retinal detachment along with advanced PDR must treated with PPV with endophotocoagilation.In this reattachment of detached retina must done by other method like scleral buckling & internal tamponade using intravitreal silicone gass like Sulphur hexafluroid or oil.

DRUG REVIEW-

At end of treatise, *Acharya Charak* has explained that thousands of combinations of drugs are mentioned in various forms in different refence of *Samhita*.A wise bhishak must choose and make formulation according to prognosis,*prakurti,doshabala,kaala,rogbala* etc.on the basis of knowledge & experience gained by reading various texts even though they are not mentioned over it.

Keeping above in mind,drugs for *Meshashrungyadi basti* were selected for the present study.Initially pilot study was done under experts supervision and then this study started after not getting any side effects.

The*Meshashrungyadi Basti* contains *Meshashrungi,Musta,Haritaki,Bibhitaki,Amalaki,Guduchi,Vasa,Varun,Patol,Shatavari.Mentioned drugs collectivelyact aspramehghanam,chakshushya,tridoshhar,sangrahik,vrushya,medoghna,rasapachak,dipan,pachan,mastkishashamak,daahprashmana,rasayana,shothhar,shwas-kaashar,balya,medhya etc* [20 TO 32]

1) MESHASHRUNGI[20]

मेषश्रुंगीदलंतिक्तंकुष्ठमेहकफप्रणुत।

दिपनंसंस्रनकासक्रिमिव्रणविषापहम्।।-भावप्रकाशनिघण्टु२५५/ गुडुच्यादिवर्गः

- **Latin Name –** Gymnema sylvestre**Family –** Asclepiadaceae
- ***Paryay –*** *Medhashringi, Gudmar***Parts Used –** Leaves, Root
- **Ayurvedic Properties**

  Rasa – *Kashaya Tikta****Veerya –*** *Ushna****Vipaka –*** *Katu*

  Guna – *Laghu, Snigdha*
- ***Doshaghnata –*** *Kaphavatashamak*
- ***Rogaghnata –*** *Prameha, Kushta, krumi*
- **Dosage –***Kwath* – 40-80 ml, leaf powder – 4 gm
- **Chemical composition –** Gymnema saponin, gymnemic acids, acylated derivative of gymnemagenin, 3-0 glucuronide of gymnemagenin, gymnemosides A-F, triterpene saponin, dammarene saponins, flavones, anthraquinones, phytin, resins, lupeol, B-amyrin related glycosides and stigmasterol, pentatriacontane.
- **Action –** Extracts of herb used to treat problems like hyperglycemia, obesity, high cholesterol, anaemia. It suppresses the taste of sweet foods and consequently reduces the desire to eat, regulate weight, promote healthy blood lipid levels, controls shugae craving, useful in dyspepsia.

2) *MUSTHA* –[21]

मुस्तंकटुहिमंग्राहीदिपनपचानम्।

कषायंकफपित्तास्रतृड्ज्वरारुचिजन्तुजित।। -भावप्रकाशनिघण्टु९३/ कर्पुरादीवर्गः

- **Latin Name :** Cyperus rotundus Linn.
- **Family :** Cyperaceae
- **Gana:***Charaka–Truptighana,Trushnanigrahana,Lekhaniya Stanyashodhana.Sushruta – Musthadi, Vachadi*
- ***Paryay :** Mustak, Purnakoshta*
- **Types –***Bhadramusta,Nagarmostha,Kaivartmustha*
- **Parts used –** *Mula*
- **Ayurvedic properties-**

  ***Rasa –** Katu, Tikta, Kashay**Veerya –** Sheeta**Vipaka –** Katu*

  ***Guna –** Laghu, Ruksha**Doshaghnata –** Kapha Pittaghana*

- ***Rogaghnata –**Twakdoshara, Agnimandya, Ajaeerna, Krumighana, Mutrakruchhra Atisar*
- ***Karma –**Stanyashodhana, Medoghna, Rasapachan Swed-daurgandhyahar, netrarogahara, raktaprasadka, kledaghna*
- ***Kalpas –** balasanjeevani churna, Shadangodaka*
- ***Strotogamitwa –** Rasa, Rakta, Medo, Stanya*
- **Chemical composition[144] –**Hydrocarbons, ketones, alkaloids, alpha–cyperone, beta–cyperone, alpha – rotunol, beta –pinene, limonene, linoleic acid, tannin, saponines.
- **Action –** Beta-pinene has potent anti-inflammatory activity via prostaglandin E2. It acts as broad spectrum antibiotic. It acts as ACE inhibitor and angiotensin-converting enzyme (ACE) inhibitors slowed the progression of diabetic retinopathy from milder to more severe nonproliferative levels as studied in chemical analysis.

➢ D – Limonene decreases plasma glucose levels.

3) *AMALAKI* :-[22]

हरितकीसमंधात्रीफलंकिन्तुविशेवत:।

रक्तपित्तप्रमेहघ्नंपरंवृष्यंरसायनम।।भावप्रकाशनिघण्टु३९/ हरितक्यादीवर्गः

- **Latin name –** Emblica officinalis**Family –** Euphorbiaceae

- ***Gana –*** *Charak-Vayasthapana, Virechanopaga Sushruta-Triphala, Parushakadi*
- ***Names –*** *Tishya, Jatiphalarasa, Pancharasa Shriphala, Dharika, amruta, dhatriphala, vrushya, Kayastha*
- **Parts used –** Fruit, Juice of leaves, seed
- **Ayurvedic Properties –*Rasa –*** *5 rasas except Lavana, Amla rasa pradhana****Veerya –*** *Sheeta****Vipaka –*** *Madhura****Guna –*** *Laghu Ruksha Sheeta****Doshaghnata –*** *Tridoshahara*
- ***Rogaghnata –*** *In Netravikara for Aashotana, Pandu, Rajayakshma, Shukrameha, Raktapradara, Trushna, Jwara, Daha.*
- ***Karma –*** *Dahashamaka, Mastishka shamaka, Rachana, Dipana, Pachana, Shonitsthapana, Gharbhasthapaka, Rasayana, Shaithilya nashaka*
- **Dosage –** Fruit juice – 12 ml.Churna – 3 to 6 ml
- ***Kalpas –*** *Chayanprash, Bhramharasayana, Dhatriloha, Amalaki rasayana.****Strotogamitwa –*** *Raktavaha, Medovaha, Shukravaha*
- **Action –**[133]Vitamin C (ascorbin acid), minerals, amino acids, glutamic acid, aspartic acid, alinine, gallic acid, gum, albumin, crude cellulose, chromium, zinc, copper. Gallic acid acts as hypoglycemic, hypolipidemic, anti-fungal, antioxidant. It is helpful in albuminourea and showed regeneration of beta cells of pancrease. ascorbic acid is antioxidant.

4) *HARITAKI :-*[23]

हरितकीसमंधात्रीफलंकिन्तुविशेवत:।

रक्तपित्तप्रमेहघ्नंपरंवृष्यंरसायनम।।भावप्रकाशनिघण्टु३९/ हरितक्यादीवर्गः

- **Latin name –** Terminalia chebula**Family –** Combrataceae
- ***Gana–****Triphala,Amalakyadi,Prajasthapana,Jwaraghna,*

  Kushthaghna, Arshoghna
- ***Names –*** *Shiva, Pathya, Avyatha, Abhaya, Chetena, Rohini, putana, Amruta, Jeevpriya, Pranada*
- **Types –** 7 types*Vijaya, Rohini, Putana, Amruta, Abhaya, Jivanti, Chetaki.*
- **Parts used –** Fruits
- **Ayurvedic Properties –**

चाक्षुष्यालघुरायुष्याबृंहणीचानुलोमिनी।

श्वासकासप्रमेहर्शःकुष्ठशोथोदरक्रिमीन्।।

कामलांशुलमाध्मानंप्लीहानंचयकृदगदम्।

अश्मरीमुत्रकृच्छ्रंचमूत्राघातंचनाशयेत्।। -भावप्रकाशनिघण्टु२०/ हरितक्यादीवर्गः

Rasa – *Madhur, Amla, Katu, Tikta, Kashaya Kashaya rasa prominent*

Veerya – *Ushna****Vipaka –*** *Madhur****Guna –*** *Laghu, Ruksha*

Prabhav – *Tridoshahara****Doshaghnata –*** *Tridoshaghna*

- ***Rogaghnata –*** *Netravikara, Drushtimandya, Shoola, Anaha, Gulma, Vibhanda, Shukrameha, Shwetpradara, Mutrakrucch Murtaghata.*
- ***Karma –*** *Dahashamana, Chakshushya, Rasayana, Vranashodhana, Vranaropana, Medhya, Balya, Dipana, Pachana, Yakruta – uttejaka*
- ***Dosage –*** *Shodhana – 3 to 6 gmsRasayana – 1 gms*

  Balaharitaki – 1 to 3 gms
- ***Kalpas –****Abhayarishta, Pathyadi kadha, Vyaghriharitaki, Agastiharitaki*
- ***Strotogamitwa–*** *Rasavaha, Majjavaha, Raktavaha, Medovaha*
- **Chemical composition –**

  Phenolic acid, tannins, luminol, vaniline, l-ascorbic acid, analogs of vitamin E, vitamin E-fat soluble antioxidant, Vitamin E- water soluble antioxidant, l- glutamine, gallic acid.
- **Action –** Luminol-which is an antioxidant. lycine, glutamine and vaniline are essential amino acids. Gallic acid acts as hypoglycemic, hypolipidemic, anti-fungal, antioxidant. It is helpful in albuminourea and showed regeneration of beta cells of pancreas. Gallic acid restores total protein, albumin, and total body mass of diabetic patient to near normal.[135]

5) *BIBHITAK :-*[24]

बिभितकंस्वादुपाकंकषायंकफपित्तनुत्।

उष्णवीर्यंहिमस्पर्शंभेदनम्कासनाशनम्।।

रूक्षनेत्रहितंकेश्यंकृमीवैस्चर्यनाशनम्।। -भावप्रकाशनिघण्टु३६/ हरितक्यादीवर्गः

- **Latin name –** Terminalia beleric**Family –** Combrataceae
- **Synonyms –**

  Aksha, Karshaphala, Kalidruma, Bhutavas, Kalivruksha, Dharmagna.
- ***Gana –*** *Charak-jwarahar, Virechanopag, Sushruta-Triphala, Mustadi*
- **Part used –** fruit, seed, Bark.
- **Ayurvedic Properties –*****Rasa –*** *kashaya****Virya –*** *Ushna*
- ***Vipak –*** *Madhur****Guna –*** *Laghu, Ruksha*

- ***Doshaghnata –*** *Tridhosh shamak, Kaphahara*
- ***Rogaghnata –*** *Kasa, Shwasa, Pratishyaya, Netraraga, Dourbalya, Netrabhishyanda, Vatavyadh*
- ***Karma –****Chakshushya,Dhatuvardhak, Vajikarana, Vedanasthapan, Dipana, anulomana, krimighan Grahi, Dahaprashamana*
- **Chemical composition –** Tennin, gallo-tannic acid
- **Actions –** Antistress, antihistaminic, Blood pressure depressant, Antifungal, Antiviral, laxative, antipyretic

6) GUDUCHI :-[25]

गुडूचिकटुकातिक्तास्वादुपाकारसायनी।

संग्रहिणीकषायोष्णालघ्वीबल्याअग्निदीपानी।।

दोषत्रयामतृटदाहमेहकासांश्चपाण्डुताम्।

कामलाकुष्ठवातास्रज्वरकृमीहरीत।।

प्रमेहश्वासकासार्शःकृच्छ्रहृद्रोगवातनुत्।। -भावपक्रशनिघण्टु१०/ गुडुच्यादिवर्गः

- **Latin name –** Tinospora cordifolia**Family –** Menispermaceae
- ***Names –*** *Amrutvalli, Jwarari, Madhuparnika, Rasayani, Kundalani,Vayastha, Chakralakshanika, Bahuchinna, Vatsadani*
- ***Types –*** *1) Padma Guduchi2) Kanda Guduchi*
- ***Parts used –*** *Kanda*
- ***Ayurvedic properties –Rasa –*** *Tikta, kashaya**Veerya –*** *Ushna*

  Vipaka – *Madhur**Prabhav –****Vishaghna**Guna –*** *Laghu, Snigdha*
- ***Doshaghnata –*** *Tridoshaghnata*
- ***Rogaghnata –*** *Trushna, Daha, Mehaghna, Pandu, Kamala, Vatarakta, Jwara, Agnimandya, Shoola.*
- ***Karma –*** *Dahaprashamana, Trushnashamana, Medoghna, Vrushya, Rasayana, Yakrut-uttejaka*
- **Dosage –** Kwath – 60 to 100 ml.Churna – 1 to 3 gm

  Satwa – 0-75 to 2 gm **Strotogamitwa –** Raktavaha, Shukravaha
- ***Kalpas –*** *Guduchyadi churna, Guduchyadi kwath, Guduchi leha, Amruta arishta*
- **Chemical composition –**

  Alkaloids, steriods, glycosides, aliphatic compounds, tinosporine, cordifol, columbin, magnoflorin, syringine, palmitine, hydroxy-4 methoxy benzaldehyde, antioxidants, antihyperglycemics.

- **Action-**Hydroxy-4 methoxy benzaldehyde is having moderate antioxidant activity.Palmitine is essential amino acid steriods are anti-inflammatory. Many alkaloids are hypoglycemic and anti-dislipidemic.[147]

7) *SHATAVARI* :-[26]

शतवारीगुरु: हिमातिक्तास्वाद्वीरसायनी।।

मेधाअग्निपुष्टिदास्निग्धानेत्र्यागुल्मातिसारजित्।।

शुक्रस्तन्यकरीबल्यावातपित्तास्रशोथजीत्।

महाशतवारीमेध्याहृदयावृष्यारसायनी।। - भावपक्रशनिघण्टु१८९/ गुडुच्यादिवर्गः

- **Latin name –** Asperagus racemosus**Family –** Liliacae
- ***Names –*** *Shatavari, Shatamuli, Shatvirya, Atirasa*
- ***Gana –*** *Balya, Vayasthapan, Madhurskandha, Vidarigandhadi, Kantakpanchmula, Pittashaman, pittaprash*
- ***Types :****Shatavari : Asperagas racemosusMahashatavari : Asperagus sarmentosa* ***Doshghnata –*** *Vatapittashamak*
- ***Ayurvedic Properties :Rasa –*** *Madhura, tikta****Virya –*** *Sheeta*

  Veepak – *Madhura****Guna –*** *Guru, snigdha*
- ***Strotogamitwa –*** *Rasa, rakta, shukra, aartawa vaha*
- ***Rogaghnata –****Shukrakshaya, Garbhasrava Dourbalyadhatukshaya, Drushtiman dya, Amlapitta – shula*
- ***Karma –*** *Shukrajanan-vrushya,Balya-rasayan, Garbhaposhak, Styanyajanan, Raktabharshamak, Mutrala, Medhyanadibalya, Vednasth apan*
- ***Dosage :****Juice : 10-20mlKwath : 50-100ml Powder : 3-6gm*
- ***Kalpas –*** *Shatavari ghruta, Narayan taila, vishnutaila, shatamulyadi louha*
- **Chemical composition –**Main chemical components are saponins, Shatavarin, Asparagosides, Asparagamine, Recemosol.
- **Action –** Sponin-increases secretions of prolactin and ACTH thushelps in lactation, it act as a immunomodulator, exibit antioxytocic activity as it blocks spontaneous uterine motility.

8) *PATOL*–[27]

पटोलंपाचनंवृष्यालघुअग्निदिपनम्।

स्निग्धोउष्णंहन्तिकासास्रज्वरदोषत्रयकृमीन्।

पटोलस्यभविन्मूलंविरेचनकरंसुखात्।। -भावप्रकाशनिघण्टु७०/ शाकवर्गः

- **Latin name –** Tricosanthes dioica, Roxb**Family –** Cucurbitaceae
- ***Gana –*** *Charakokta – Trishnanighrahana, Triptighna, Sushrutokta – Patoladi, Aragvadhadi.*
- ***Names :*** *Kulaka, Rajiphala, Beejagarbha, etc.*
- ***Part used :*** *Leafs, phachanga, fruits*
- ***Ayurvedic properties :Rasa –*** *Tikta**Vipaka –*** *Madhura*

  Veerya – *Ushna**Guna –*** *Laghu, Snigdha*
- ***Dhoshaghnata :*** *Tridoshagna**Srotogamitwa :*** *Rasavaha*
- ***Rogaghnata :*** *Jwaraghna*
- ***Doses :*** *Swaras – 10 ml, Kwatha – 50-100 ml*
- ***Kalpa :*** *Patoladichurna, Patoladi kwatha*
- **Chemical constituents :** The fruit are rich in protein (2%), fats and carbohydrates leaves are rich in protein (5.4%), fats carbohydrates and other elements.
- **Action –** It is blood purifier and also reduces oedema, Antypyretic, used in circulatory disorders.

9) *VASA* –[28]

वासकोवातकृतस्वर्यकफपित्तास्रनाशनः।

तिक्तवस्तुवरकोहृदयोलघुशितस्तृडर्तिहृत्।

श्वासकासज्वरच्छर्दीमेहकुष्ठक्षयापहः।। -भावप्रकाशनिघण्टु९०/ गुडुच्यादिवर्गः

- **Latin name –** Adhatoda vasica**Family –** Acanthaceae
- ***Names –*** *Sihasya vajidant, vrusha, Aatarushak, Panchamukhi*
- ***Types –*** *1. Krushna vasa2. Shweta vasa3. Rakta vasa*
- ***Parts Used –*** *Root, leaves, flower*
- ***Ayurvedic Properties –Rasa –*** *Tikta, Kashaya **Veerya –*** *Sheet*

  Vipaka – *Katu**Guna –*** *Laghu, Ruksha*
- ***Doshaghnata –*** *Kapha pittaghna **Strotogamitwa –*** *Pranvaha*
- ***Rogaghnata –*** *Raktapitta, kasa, shwas, netra-abhishyanda*
- ***Dosage –*** *Swaras – 10ml, kwatha – 40-80ml*
- ***Kalpas –*** *Vasavaleha, vasaghruta, vasarishta*

  Chemical composition – Vasicine, vasicine acetate, 2 acetyl benzylamine, quinazoline, methanol.

- **Action –** Anti microbial, anti tussive, methanol shows potent sucrose inhibitory activity.

10) VARUNA –[29]

वरणोवरणसेतुस्तीक्तशाकःकुमारकः।

वरुणपित्तलोभेदीश्लेषमकृच्छ्राश्ममरुतान्।।

निहन्तिगुल्मवातस्रकृमीच्छ्रोष्णोअग्निदिपनः।

कषयोमधुरस्तिक्तःकटुकोरूक्षकोलघुः।। - भावप्रकाशनिघण्टु६ ६/ वटादीवर्गः

- **Latin Name -** Crataeva nurvulao**Family -** Crataevaceae
- ***Names –*** *Tiktashak, Bilwapatra, Ashmarighna, Triparna*
- ***Parts Used –*** *Twak*
- ***Ayurvedic Properties –Rasa –*** *Tikta, kashaya, katu, madhur*

  Veerya – *Ushna****Vipaka –*** *Katu****Guna –*** *Laghu, Ruksha*

  Prabhav – *Ashamaribhedana*
- ***Doshaghnata –*** *Vatakaphagna* ***Strotogamitwa –*** *Mutravaha*
- ***Rogaghnata –*** *Mutrashmari, Mutraghat, Mutrakruccha*
- ***Dosage –*** *Kwath – 40-80ml, Swaras – 10ml*
- ***Kalpas –*** *Varunadi kwath, varunadi ghruta*
- **Chemical composition –** Alkaloids, triterpenes, tanins, saponins, flavonoid, plant sterols, glucosilinates.
- **Actions –** Anti-oxidant, anti-inflammatory, anti-microbia

11)*TEEL –[148]*

- ***Latin Name –*** *Sesamum indicum****Family -*** *Pedaliacae*
- ***Regional Names –*** *Marathi –Til,Hindi -Til*
- ***Parts Used –****Seeds,Oil*
- ***Ayurvedic Properties –Rasa –****Madhur,Kashaya,Tikta*
- ***Veerya –*** *Ushna****Vipaka –*** *Madhur****Guna –****Guru,Snigdha*

  Karma–*Dipana,Grahi,Balya.*
  - ***Doshaghnata –****Vatashamana,Sanskarane,Tridoshahara*
  - **Chemical composition –** Vit A,B,C ,Sessamin ,Sesamol.

- **Actions–**Agnimandya,Arsha,Prameha,Kashtartava,Skin Diseases,Vatavyadhi.

12)*SHATPUSHPA-* ***[149]***

- ***Latin name –****Anethum sowa*
- ***Family –****Apiaceae*
- ***Ayurvedic properties –Rasa-****Katu,Tikta****Veerya –****Ushna*

  Guna- *Laghu,ruksha,tikshna* ***Vipaka –****Katu*

  Doshkarma- *Kaphavatashamak*

13)SAINDHAV –[150]

- ***Latin name –****Sodium choridum imura*
- ***English name –****Rock salt*
- ***Ayurvedic properties –Rasa-****Lavana,Anurasa-Madhur*

  Veerya –*Anushna*

  Guna- *Laghu,snigdha****Vipaka –****Madhur*

  Doshkarma- *Tridosha shamak*

  Therapeutic use –It is the only lavana having chakshushya property ,rest other lavanas are achakshushya.

14)*MADHU-* ***[31]***

Latin Name – Mal depuratum**English Name –** Honey

Classical Name –Madhu

It is a thick, syrapy, translucent pale yellow or yellowish brown to dark beown liquid;with a sweet and characteristic taste.

Types of *Madhu* –

Charak –*Makshik, Paittik, Kshudra and Bhramar*

Sushruta-*Makshik, Kshudra, Paittik ,Bhramara, Ardhya ,Chhatra.*

Ayurvedic Properties – Rasa*–Madhura,Kashaya****Vipaka*** *–Katu*

Virya *–Sheeta .Guna –Guru,Ruksha,Yogavahi.Doshaghanta-Tridoshahara*

Action & Uses –In Charak, Madhu is Shleshmapitta prashaman shreshtha. Acharya Vagbhata had mentioned,Madhu is best for kapha dosha act as shaman

dravya.Also it is used in Kasa,shwas,prameha,Chhardi and for atisara vyadhi.According to Acharya Sushrut,Madhu has lekhana Sukshma mar

Chemical constituent –Madhuis a thick,translucent pale yellow or yellowish brown to dark brown liquid.It has characteristic sweet taste.

***Basti* review –**

In the *Panchkarma* therapy ,Basti is the major procedure.Among the *Samshodhana* procedures ,Basti is the most important .Basti term is derived from the fact that the *Basti yantra* or the apparatus used for introducing the medicated materials is made up of Basti or the urinary bladders of the animal .*Acharya sushrut* mentioned for all those or medicated liquid materials which are thus introduced through rectum with the help of Basti are designated as Basti .Basti can can be given through rectum but also through urethra depending on the disease.Basti given through urethra is termed as *Uttarbasti*.

***Basti* effects –**

Basti's main effect is *Samshodhana of Dosha*.Also it act as *Samashana* property.Anabolism in ininmaciated persons,Restoration of Semen,Improvement in vision,Karshana in obese person,Improvement in lustre,prevention of aging,strength and longetivity..Basti has wide application in its different forms.

Mode of Action –*Basti* is said to be half or whole treatment of almost all diseases due ot its wider application. Even though it is considered as best treatment for *Vata dosha*,it is also advisable for the treatment of kapha dosha,Pitta dosha and *Sarvadhatu ashrita Vyadhi.*[151]By using specific drugs prescribed for that particular condition, Basti karma can be adopted in many diseases.Basti procedure cures diseases of all Dosha of all three Marga i.e *Shakha,koshtha & Marma,Asthi* .It is given to *Moolasthan of Vata dosha.Vata dosha* is prominent for formation of all diseases. Amarkosha has explained the word '*Payu*' as a synonym of *Guda*.Its name is from its capacity that is to drink or absorb Basti Dravya or oil. Parashara mentioned that *Guda is the Mula sthan* of the body,where all the Siras are located.Adminstration of the Sneha through the Guda reaches up to the head giving nutition of the body.[155]*Acharya Sushrut* explained that the Virya of the drugs given the Basti reaches all over the body through the Srotas.*Basti* contains Sneha dravya in sufficient quantity. So Basti drugs mixed with *Sneha Dravya* when introduces through rectum, it easily get absorbed in large intestine. Perhaps Basti has its effect over Agni.Agni is said to be main cause of any disease.So Basti is considered by Ayurveda scholars to be as Ardhachikitsa or even Poorna chikitsa.[152]According to Acharya Sushrut,Basti can cure both *Timir and Adhimatha* among eye diseases.[153]Also *Acharya Sushrut* had mentioned *''Chakshyuhu Prinayati''* while describing the importance of *Basti chikitsa.*[154]This indicates that the pharmacological action of *Basti* can penetrate blood retinal barrier(BRB),resulting in improvement of vision;by alleviating prime dosha i.e Vata dosha) including all indriya karma.Basti does

both *Shodhana(purification) and Shamana(alleviation) of the vitiated doshas.*It is indicated in all thre doshas*(Vata,Pitta and Kapha).Acharya Vagbhatta* in general treatment of Timir mentioned Basti as one of treatment along with *Tarpan,Alepana* etc.Also he mentioned *Niruha and Anuvasan Basti for Timir.*[156]Due to Anatomical structure of the colon,Drugs used in Basti and methods of preparation,Basti procedure may enhance the drug permeation to the ocular tissues.As Shira/Head is the seat of *Pranavayu & Netra* is seat of *Alochak pitta*,while treating most of dieases of Netra have to be implemented on the line of *Shodhana and Pitta Shamak chikitsa* for pacification of *Alochaka Pitta*.[157]Basti therapy by various of medicaments influence greatly normal bacterial flora of the colon,this was suggested by Dwarkanatha.So it modulates the rate of endogenous synthesis of vitamin B12 which is normaly macufactured by colinic bacterial flora. For the maintainace or regeneration of nerves,Vitamin B12 plays an important role.According to *Dwarkanath* ,it was one of the possible mechanism through which Basti could help in neurological diseases.Hence by proper evaluation of disease based on modern pathophysiology along with Ayurvedic prospectives for the effective selection of drugs,these aspects are best understood.

Role of *Basti* in Diabetic Retinopathy-

Diabetic retinopathy is known as disease of microvasculature;due to prolonged hyperglycemia.Other factors implicated in *Madhumeha/Prameha are Jhatharagni & Dhatwagnimanda* which can be correlated with insulin defiency or/ insulin resistance cause of metabolic & endocrinal derangements.[158]

Many changes at cellular & capillary level over the body are caused by *Agnimandya.*This leads to formation of *Ama*,ultimately *Ama* dearanges *Vata,Pitta and Kapha(Tridosha)* in their proportion in quality and quantity.All organs are affected by this.*Srotodusti and Siraabhisyanda* are caused by Ama,which is main pathological process for starting the eye diseases.In the formation of reactive oxygen species(ROS) & oxidative stress damage to the endothelial cells of retinal capillaries can be correlated to the *Ama.*So the oxidative stress damage in Diabetic retinopathy by the modern medicine scholars[159]can be correlated to the Ama theory.Diabetic retinopathymainly attributed to *Sira srotas Abhisyanda & Raktavaha Srotodushti.*It is due to *Achakshyuya aahara –vihara* speciallyby *Prameha* patients.[160]In the development of Diabetic Retinopathy,*Raktavritavata and Pranavrittavyana* has implications.*Twakmamsa antarajadaha & Raktayukta sotha mandal* are symptoms of Raktavritavata.[161]Correlation can be done with Raktayukta sothmandala to splinter haemorrhages and IRMA and retinal edema.Also Raktavrittavata stages can correlated to rheological factors such as inflammatory cytokinins,leucocyte adhesion,erythrocyte and platelet involved in pathology of Diabetic retinopathy.*Raktavritavata*must be treated as per vatarakta chikitsa[161].Rather *Acharya charak* mentioned *Basti* as best treatment for Vatarakt.[162]Also*Acharya vagbhatta,Sushrut and Yogratnakar*[163] described Basti as the treatment for Timir.The complications of Diabetes mellitus is*Madhumehajanya Timir*.In the pathogenesis of Diabetic retinopathy,doshas

involved are Vatapitta prominently *Kapha anubandha*.While *dhatus* vitiated are *meda and rakt dhatus*.And *Raktvahastrotas* is involved.Retina is mainly cellular central nervous system tissue.It has 15 to 20 nm wide intercellular spaces ,it do not cantain tight junctions(TJs).So both the small lupophilic & hydrophilic drug can easily permeate the retina.{164}

Contents of *BASTI* –

Saindhava- Cells of the intestinal mucosal membrane are easily permeable dor sodium choride,that isotonic/hypotonic solutions are almost absorbed as rapidly as water.It does by enhancing temporary disruption of BRB by osmotic mechanism[165]

Madhu-Honey along with salt makes homogenous solution(colloidal solution).Then work as prodrug,by haing properties to get penetrated easily enhancing bioavailability.

Teel Taila –The permeation of drugs through outer BRB(RPE) through transcellular & paracellular route is enhanced by Lipophilicity.

Kalka –The drugs which cannot used in form of decoction because of containing volatile properties can be used in the form of kalka.Modern pharmacologist said that it can be correlated with the carrier mediated drug delivery through colon[165]

Kwatha(Decoction)-Kwatha is main content of Basti.According to the disease & stages ,the drugs are selected for decoction.Water soluble & lipid soluble both drugs can be given by this way.Intestinal mucosa are lipoprotein in nature.Basti is absorbed by diffusion,filtration,osmosis or by absorption,it depends upon substance in it.After absorption,lipophilic analogs beomes less soluble in aqueos plasma.Then it binds more quickly to plasma proteins ,which leads to lower oncentration of drug available for diffusion into CNS and ocular tissue too.Hence by delivering drug via circulatory system,a delicate balance between cerebral vascular permeability & plasnma solubility is required.[165]So the kwatha is used in basti for optimal drug delivery.

Thus this justifies the administration of basti with various properties drugs can be administrated in stages of Diabetic retinopathy.

REPORT OF DRUG ANALYSIS –

Standarisation of all drug involved in Meshashrungyadi basti done in authentic pharmacy.

1) ***MESHASHRUNGI-***

ANALYTICAL REPORT : MESHASHRINGI (Gymnema sylvestre)

TEST	SPECIFICATIONS	RESULT
APPEARANCE	Dry Bharad	Dry Bharad
COLOR	Light green	Light green
TASTE	Bitter and Acrid	Bitter and Acrid
ODOUR	Unpleasant	Unpleasant
MOISTURE CONTENT	NMT 5 %	3.5 %
ASH	NMT 12 %	6.41 %
ACID INSOLUBLE ASH	NMT 2 %	1.20 %
ALCOHOL SOLUBLE EXTRACT	NLT 7 %	7.89 %
WATER SOLUBLE EXTRACT	NLT 28 %	30.15 %

MACROSCOPY

The sample complies with the standards as per Ayurvedic pharmacopoeia Part I Volume V page 110.

2)*MUSTA-*

ANALYTICAL REPORT : MUSHTA (*Cyperus rotundus*)

TEST	SPECIFICATIONS	RESULT
APPEARANCE	Dry rhizome	Dry rhizomes
COLOUR	Brownish black	Brownish Black
ODOUR	Pleasant	Pleasant
TASTE	Characteristic	Bitter
MOISTURE CONTENT	NMT 5 %	3.8 %
ASH	NMT 8 %	5.30 %
ACID INSOLUBLE ASH	NMT 4 %	1.61 %
ALCOHOL SOLUBLE EXTRACTIVE	NLT 5 %	6.42 %
WATER SOLUBLE EXTRACTIVE	NLT 11 %	12.54 %

MACROSCOPY

The sample complies with the standards as per Ayurvedic pharmacopoeia Part I Volume III page 129.

3)*AMALAKI* –

ANALYTICAL REPORT: AMALAKI(*Emblica officinals*)

TEST	SPECIFICATIONS	RESULT
APPEARANCE	Dry Fruits	Dry Fruits
COLOUR	Grayish black	Light Brown
ODOUR	Sour & Astringent	Sour and Astringent
TASTE	Rough	Rough
MOISTURE CONTENT	NMT 5 %	3.8 %
FOREIGN MATTER	NMT 2 %	NIL
ASH	NMT 7 %	4.34 %
ACID INSOLUBLE ASH	NMT 2 %	0.62 %
ALCOHOL SOLUBLE EXTRACTIVE	NLT 40 %	41.32 %
WATER SOLUBLE EXTRACTIVE	NLT 50 %	51.20 %

MACROSCOPY

The sample complies with the standards as per Ayurvedic pharmacopoeia Part I Volume I page 05.

4)*HARITAKI* –

ANALYTICAL REPORT: HARITAKI(*Terminalia chebula*)

TEST	SPECIFICATIONS	RESULT
APPEARANCE	Dry Fruits	Dry Fruits
COLOUR	Yellowish Brown	Yellowish Brown
TASTE	Astringent	Astringent
TEXTURE	Rough	Rough
MOISTURE CONTENT	NMT 5 %	3.4%
FOREIGN MATTER	NMT 2 %	NIL
ASH	NMT 5 %	3.61%
ACID INSOLUBLE ASH	NMT 5 %	1.04 %
ALCOHOL SOLUBLE EXTRACT	NLT 40 %	40.47%
WATER SOLUBLE EXTRACT	NLT 60 %	61.20%

MACROSCOPY

The sample complies with the standards as per Ayurvedic pharmacopoeia Part I Volume Ipage 47.

5)*BIBHITAKI –*

ANALYTICAL REPORT:BIBHITAKI (*Terminalia belerica*)

TEST	SPECIFICATIONS	RESULT
APPEARANCE	Dry Fruits Bharad	Dry Fruits Bharad
COLOUR	Brownish	Yellowish Brown
TASTE	Astringent	Astringent
TEXTURE	Rough	Smooth
FOREIGN MATTER	NMT 2 %	NIL
MOISTURE CONTENT	NMT 5 %	3.5 %
ASH	NMT 7 %	4.48 %
ACID INSOLUBLE ASH	NMT 1%	0.53 %
ALCOHOL SOLUBLE EXTRACTIVE	NLT 8 %	10.26 %
WATER SOLUBLE EXTRACTIVE	NLT 35 %	38.15 %

MACROSCOPY

The sample complies with the standards as per Ayurvedic pharmacopoeia Part I Volume I page 26.

6)*GUDUCHI –*

ANALYTICAL REPORT: GUDUCHI (Tenospora cordifolia)

TEST	SPECIFICATIONS	RESULT
APPEARANCE	Dry Bharad of Stem	Dry Bharad of Stem
COLOUR	Light Brown	Light Brown
ODOUR	Characteristic	Characteristic
TASTE	Bitter	Very Bittert
MOISTURE CONTENT	NMT 5 %	3.6 %
ASH	NMT 16 %	8.21 %
ACID INSOLUBLE ASH	NMT 3%	1.02 %
ALCOHOL SOLUBLE EXTRACTIVE	NLT 3 %	6.78 %
WATER SOLUBLE EXTRACTIVE	NLT 11 %	14.69 %

MACROSCOPY

The sample complies with the standards as per Ayurvedic pharmacopoeia Part I Volume I page 41.

7)*VASA* –

ANALYTICAL REPORT: VASA (Adathoda vasika)

TEST	SPECIFICATIONS	RESULT
APPEARANCE	Dry Bharad of Panchang	Dry Bharad of panchang
COLOUR	Dull brown above Light greyish brown below	Dull brown above Light greyish brown below
ODOUR	Characteristic	Characteristic
TASTE	Bitter	Bitter
MOISTURE CONTENT	NMT 5 %	3.4 %
ASH	NMT 21 %	10.21 %
ACID INSOLUBLE ASH	NMT 1 %	0.62 %
ALCOHOL SOLUBLE EXTRACT	NLT 3 %	6.87 %
WATER SOLUBLE EXTRACT	NLT 22 %	25.36 %

MACROSCOPY

The sample complies with the standards as per Ayurvedic pharmacopoeia Part I Volume page 122.

8)*VARUN* –

ANALYTICAL REPORT: VARUN (*Crataeva nurvala*)

TEST	SPECIFICATIONS	RESULT
APPEARANCE	Fine Powder	Fine Powder
COLOUR	Grayish Brown	Dark Gray
ODOUR	Faint	Faint
TASTE	Slightly Bitter	Bitter
MOISTURE CONTENT	NMT 5 %	3.5 %
ASH	NMT 13 %	8.20 %
ACID INSOLUBLE ASH	NMT 1 %	0.61 %
ALCOHOL SOLUBLE EXTRACTIVE	NLT 1 %	3.87 %
WATER SOLUBLE EXTRACTIVE	NLT 8 %	10.12 %

MICROSCOPY

FIBER SCLERIDES TRACHIDS

The sample complies with the standards as per Ayurvedic pharmacopoeia Part I Volume I page 159.

9)*PATOL* –

ANALYTICAL REPORT: *PATOL (Tricosanthes dioica)*

TEST	SPECIFICATIONS	RESULT
APPEARANCE	Dry Bharad	Dry bharad
COLOUR	Brownish Green	Brownish Green
ODOUR	Herbaceous	Herbaceous
TASTE	Bitter	Bitter
TEXTURE	Rough	Rough
MOISTURE CONTENT	NMT 5 %	3.8 %
ASH	NMT 15 %	9.32 %
ACID INSOLUBLE ASH	NMT 5 %	2.10 %
ALCOHOL SOLUBLE EXTRACTIVE	NLT 10 %	11.26 %
WATER SOLUBLE EXTRACTIVE	NLT 20 %	22.30 %

MACROSCOPY

10)*SHATAVARI* –

ANALYTICAL REPORT:SATAVARI(*Asparagus racemosa*)

TEST	SPECIFICATIONS	RESULT
APPEARANCE	Dried Root	Dried Root
COLOUR	Yellowish cream	Yellowish cream
ODOUR	Faint	Faint
TASTE	Sweetish	Sweet, Bitter
MOISTURE CONTENT	NMT 5 %	4.0 %
ASH	NMT 5 %	3.75 %
ACID INSOLUBLE ASH	NMT 0.5 %	0.30 %
ALCOHOL SOLUBLE EXTRACTIVE	NLT 10 %	12.85 %
WATER SOLUBLE EXTRACTIVE	NLT 45 %	47.84 %

MACROSCOPY

The sample complies with the standards as per Ayurvedic pharmacopoeia Part I Volume IV page 109.

A)*MADHU* –

ANALYTICAL REPORT: MADHU (HONEY)

TEST	SPECIFICATIONS	RESULT
APPEARANCE	Thick Syrupy Opaque Liquid	Thick Syrupy Liquid.
COLOUR	Yellow to yellowish Brown	YELLOWISH
ODOUR	Pleasant	PLEASENT
TASTE	Sweet	SWEET
DENSITY	NLT 1.35	1.40
LOD	NMT 25 %	10.70%
RDUCING SUGAR	NMT 65 %	60.65 %
ASH	NMT 0.5 %	0.22 %
ACIDITY	NMT 0.2 %	NIL
FRUCTOSE GLUCOSE RATIO	NLT 1 %	1.7 %
WATER DROP TEST	Should sink to the bottom and dissolve very slowly.	Complies

The sample complies with the standards as per Ayurvedic pharmacopoeia Part I Volume VI page 224.

B)TEEL TAILA –

ANALYTICAL REPORT : TIL OIL (*Sesamum indicum*)

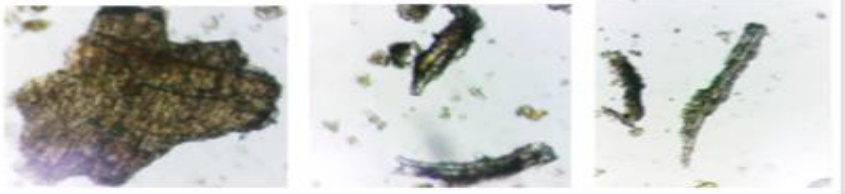
TEST	SPECIFICATIONS	RESULT
APPEARANCE	Clear Transparent Oil.	Clear Transparent Oil
COLOUR	Yellow	Light Yellow
ODOUR	Characteristic	Characteristic
TASTE	Characteristic	Characteristic
SOLUBILITY	Soluble in chloroform, ether, petroleum ether, carbon disulfide; slightly soluble in alcohol; insoluble in water	Complies
DENSITY	0.915-0.925 g/ml	0.9203 gm / ml
Iodine Value	103 - 116	109
Saponification Value	188-195	189
Refractive Index	1.4650-1.4690 at 40°C	1.4660

REMARKS : *The sample complies with prescribed standards.*

C)*SHATAPUSHPA CHURNA –*

ANALYTICAL REPORT: SHATAPUSHPA CHURNA (Anethum sowa)

TEST	SPECIFICATIONS	RESULT
APPEARANCE	Fine Powder	Fine Powder
COLOUR	Brown	Brown
ODOUR	Faintly aromatic	Faintly armatic
TASTE	Sweet	Sweet
MOISTURE CONTENT	NMT 5 %	4.2 %
FOREIGN MATTER	NMT 2 %	NIL
ASH	NMT 14 %	6.54 %
A I A	NMT 1.5 %	0.65 %
A S E	NLT 4 %	5.95 %
W S E	NLT 15 %	17.58 %
VOLATILE OIL	NLT 3 %	3.5 %
MICROSCOPY		
ALURONE GRAIN	TRACHIDS	FIBERS



The sample complies with the standards as per Ayurvedic pharmacopoeia Part I Volume II page 153.

C)*SAINDHAV-*

ANALYTICAL REPORT : SAINDHAV (Rock salt)

TEST	SPECIFICATIONS	RESULT
APPEARANCE	Dry stone of salt	Dried hard stone
COLOUR	Reddish white	Reddish white
ODOUR	Unpleasant	Unpleasant
TASTE	Saline	Salty
TEXTURE	Smooth	Smooth
pH of 10 % Solution	Between 6 to 6.8	6.6
Moisture Content	NMT 10 %	7.15 %
Water Insoluble matter	NMT 0.5 %	0.20 %
Total Dissolved Salts	NLT 96 %	99.05 %

D)*MESHASHRUNGYADI PREPARED BASTI –*

ANALYTICAL REPORT : MESHASHRUGYADI BASTI

TEST	RESULT
APPEARANCE	Oily Hazy Liquid
COLOUR	Light brown colour
ODOUR	Oily
TASTE	Bitter
DENSITY	1.0200 gm/ml
PH	4.9
TOTAL SOLID	8.51 %

FUNDUS

PHOTOGRAPH(BEFORE AND AFTER TREATMENT)

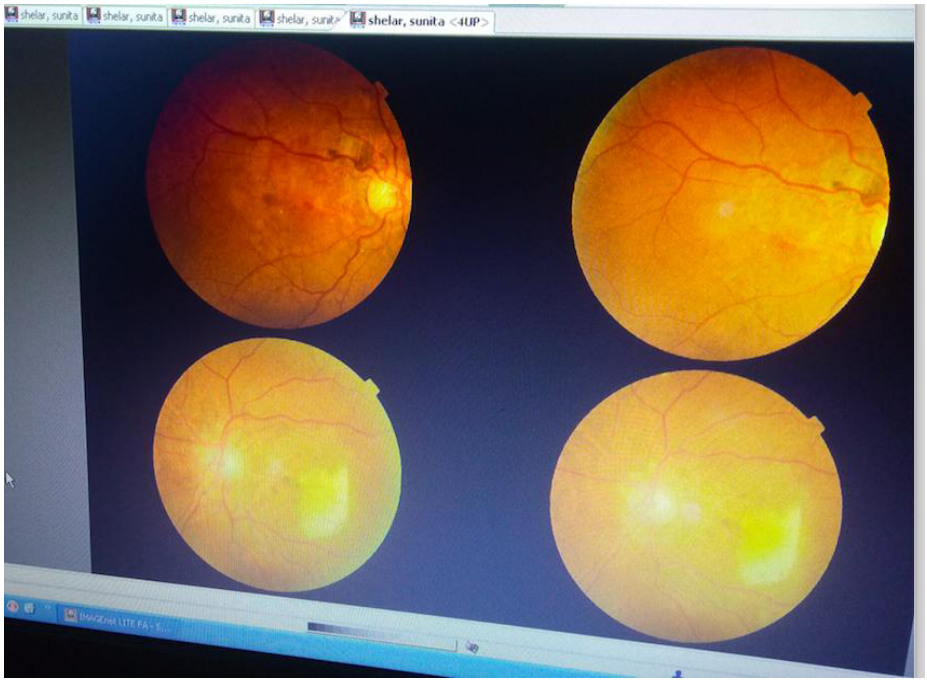


Figure 1 (both right and left fundus)

Figure 1 & 2 (right fundus) (before and after)

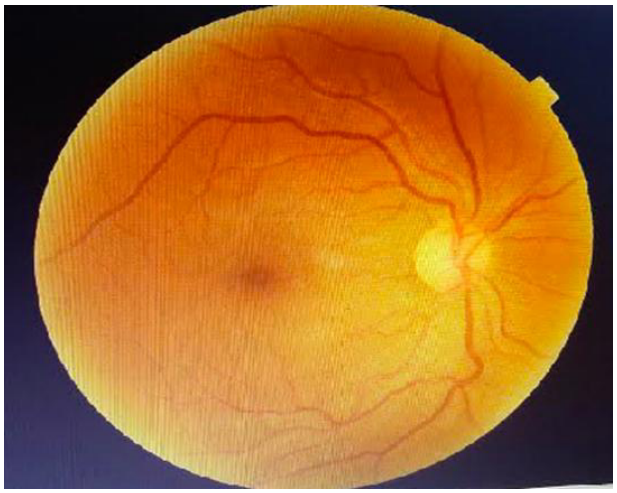


Figure 2(right fundus after treatment)

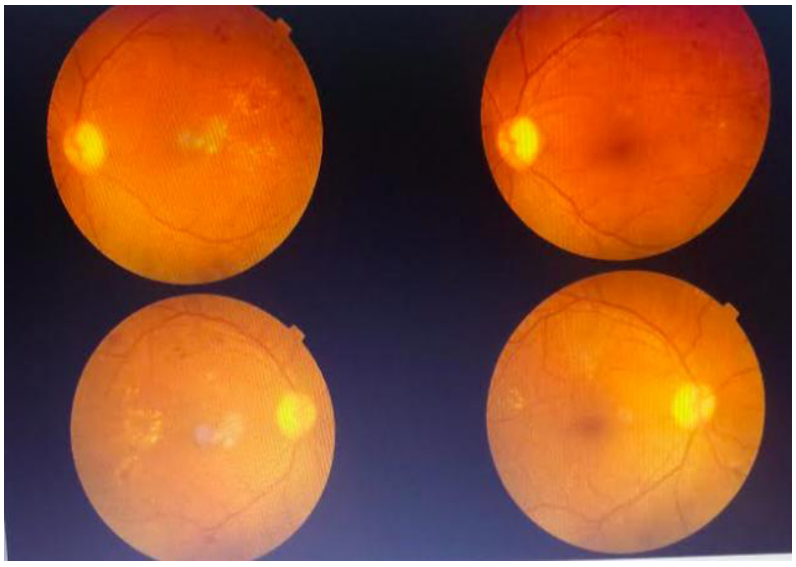


Figure 3 (both right and left fundus)

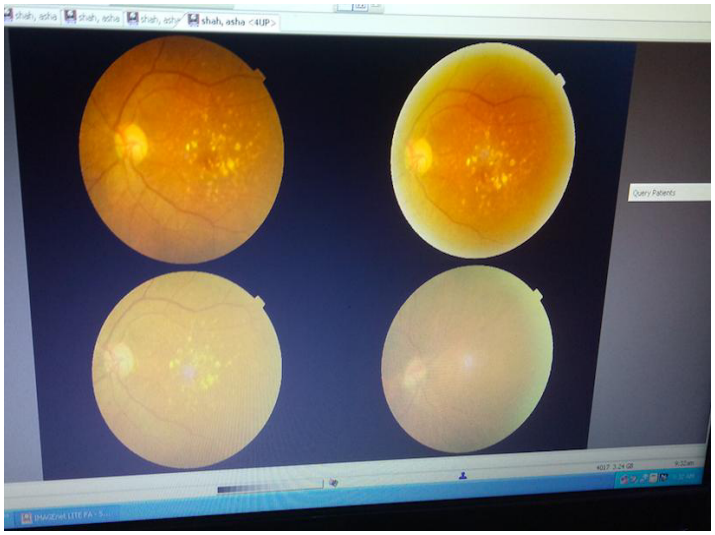


Figure 4 (left fundus)

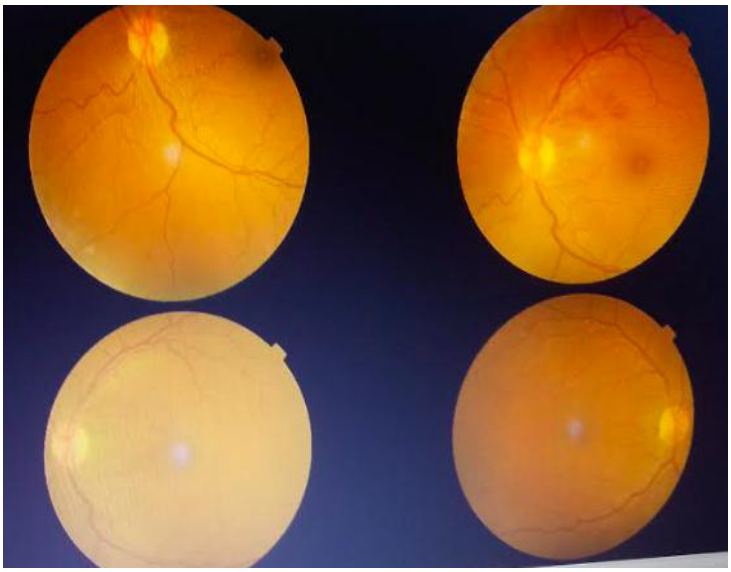


Figure 5 (both right and left fundus)

Figure 6 (both right and left fundus)

Figure 7 (right fundus)

Folllowing are the Optical coherence Tomography reports of patients having Npdr which were taken during study.

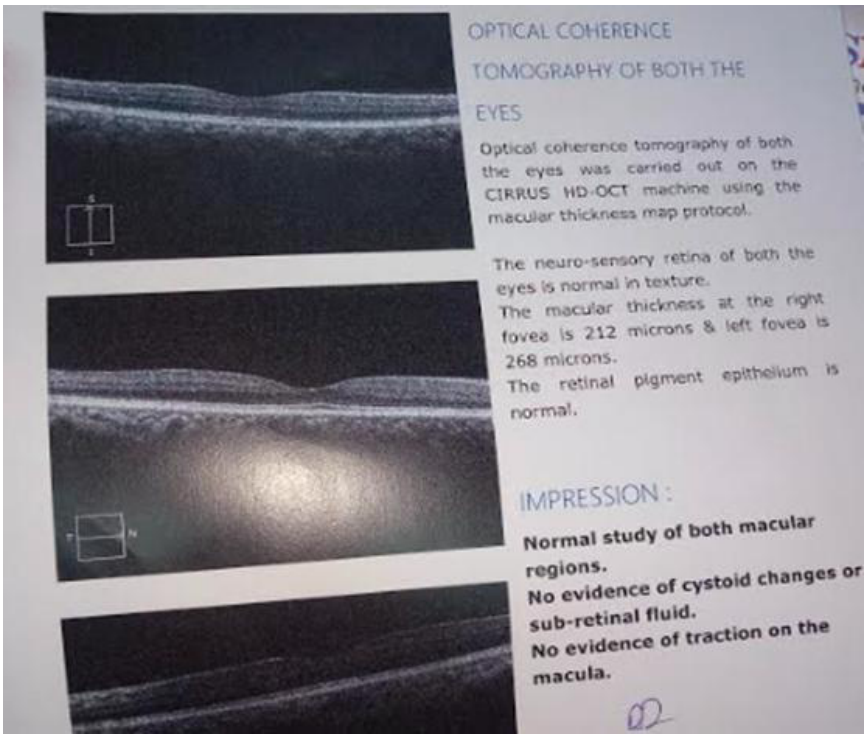


Figure 8

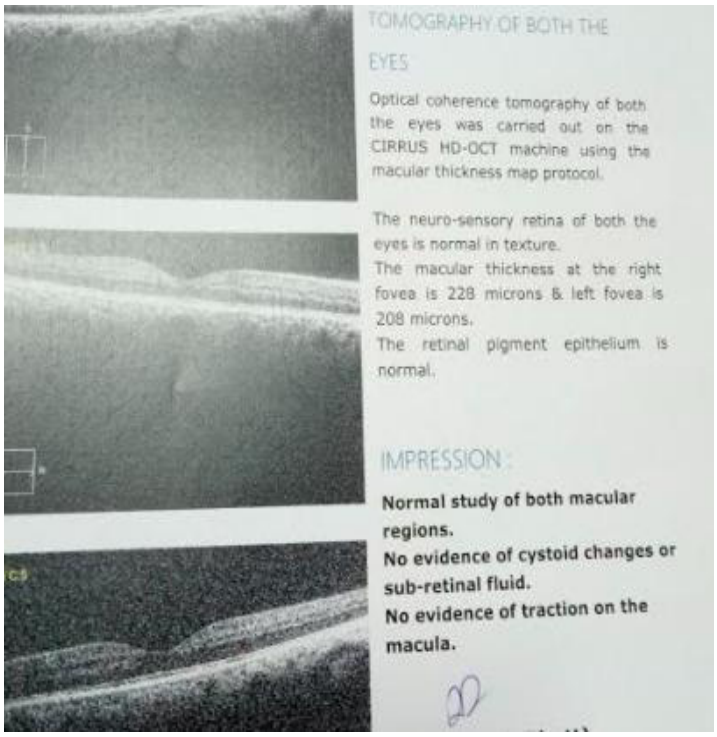
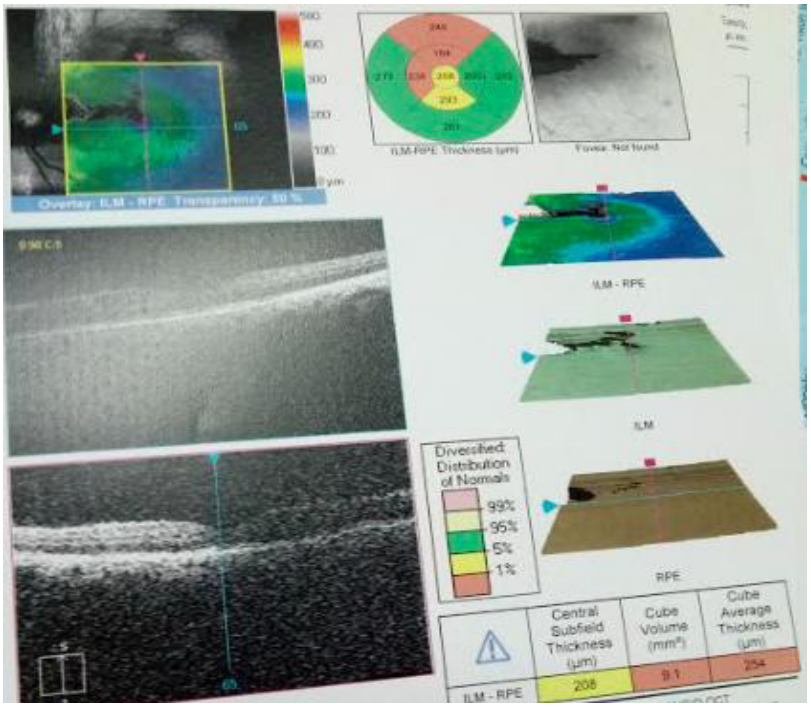


Figure 9



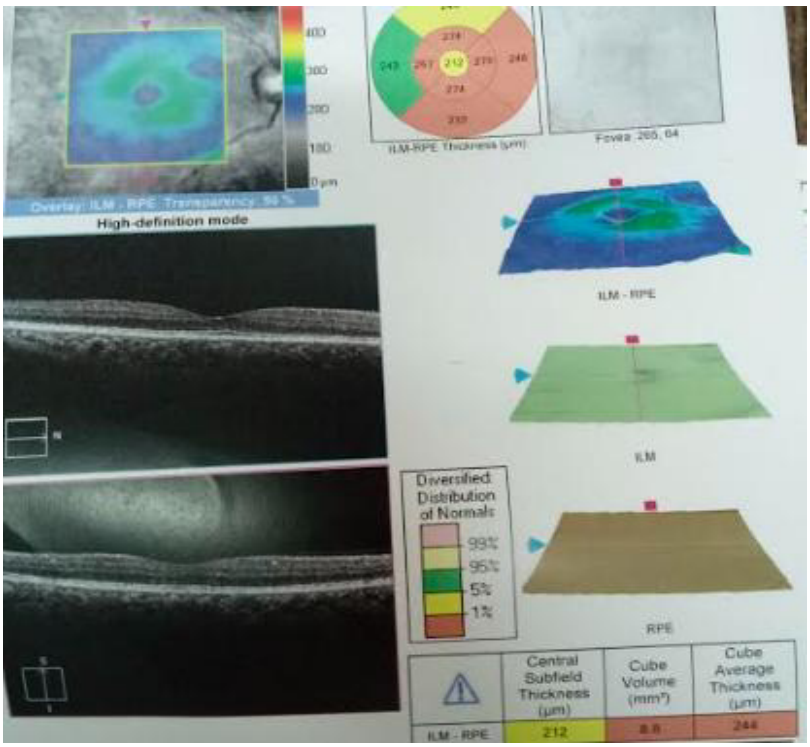


Figure 10 nd 11

MATERIALS AND METHODOLOGY

MATERIALS –

Literary data –The literary source of the present study was obtained from the classical texts of *Ayurveda*, modern texts & published arteicles in the indexed journals.

Appropriate study instruments/Data collection tools –

- Torch
- Snellen Chart, Jaegers chart
- Schiotz tonometer(German)
- Slit lamp-Appasamy associates, Chennai
- Non mydriatic retinal camera –Topcon TRC NW8F
- Direct Opthalmoscope –Hein Beta 200 LED
- Indirect Ophthalmoscope (if needed) –Appasamy Associate
- Streak Retinoscope –Hein beta 200
- OCT – Carl Zeiss Meditec

DRUG INFORMATION –

Meshashrungyadi Basti contains following drugs -

- *Meshashrungi –*
- *Musta –*
- *Amalaki –*
- *Haritaki –*
- *Bibhitak –*
- *Guduchi –*
- *Patol –*
- *Vasa –*
- *Shatatavari–*

Each 12 gm bharad – Total 120 gm

- *Varuna –*
- *Kalka Dravya -*

Shatpushpa churna – 5 gm

Madhu– 80 gm

Teell tailal (as sneha) -120ml

Saindhav –5 gm

Total Niruha Basti -450 ml[166-169]

Anuvasan basti (Teel Taila) -60 ml

The above component of drugs were purchased from local market and were identified by the experts of the dravyaguna of our college.

Meshshrungyadi Basti will be prepared by according to the *,Ashtang hridhay Samhita & Sharandhar Samhita* method –

- *Bharad dravya* of above mentioned contents i.e Bharad dravya of *Meshashrungi,Musta,Amalaki,Haritaki,Bibhitak,Guduchi,Patol,Vasa,Shatavari ,Varuna*; all this ingredients are taken in same quantity i.e 12 gm each (Total 120 gram) mix ingredient bharad.Then adding 16 parts of water ,it is boiled at medium flame of heat.After some point of boiling,reducing 1/8th part of it ,what remain is the form of decoction i.e kwatha .
- Then as mentioned on *ashtang hruday adhyay* 19 shlok 45,the*karma of niruha sanyojan vidhi-First Madhu(*Honey) 80gm is taken,adding 5gm of *Saindhav Lavana* to it .Afterwards adding 120ml of tilteel as sneha to it.Then shatpushpa kalka measuring 5gm will be taken .Then this all in bowl after mixing it well will added to the 240ml of Kwath.
- Detail procedure is as follows –

  माक्षिक लवण स्नेह कल्क क्वाथमिति क्रमात।। अष्टांग हृदय १९/४५

All above mentioned ingredients must be mixed in successive order.For the preparation of Basti,procedure is as follows –Intially Honey must put in *Khalva Yantra,Saindhav* is then added in thin stream triturating properly ,until the uniform consistency is attended.Then *Ghrit & Taila* in mentioned quantity is added slowly by the side and stirred properly.Then *Kalka dravya* is added while grinding the mixture.Then this mixture is added to Kwath and mixed properly.After the mixtureis filtered through sieve.Then by double boiler method or keeping over hot water bath,slightly it is made lukewarm as per the comfortness of the patient.Transfering it to specially prepared Basti putak or Enema pot ,Basti is given following *poorva karma,Pradhan karma & Paschat karma.*

METHOD OF STUDY –

30 patients were examined. And only those who were qualified for the selection criteria were selected for clnical trial. Benefits and disadvantages along with objectives and methodology of the trial were explained after showing patients information sheet.

HISTORY AND EXAMINATION –

- Detailed history were asked to patients of any ocular disorder or any previous illness, socio-economic status, occupation ,dietary habits ,pakriti ,history of diabetes .
- Diagonis of patients were done on the basis of signs and symptoms of Tritiya chaturtha patalgat dosha dushti ,Diabetic retinopathy and clinical examination.
- Ophthalmic detailed examinations were carried out.

METHODOLOGY –

A) Type of Study – Open clinical prospective study.

B) Medium of dissertation –. Thesis has been written in English ,by using Ayurvedic terminology in sanskrit wherever neccessary.

C) Ethical Clearance– Clearance from Ethical Committee of concerned institute was taken.

D) Total no. of patients /Sample size : -

$$N = \frac{4(SD)^2}{l^2}$$

where n = no. of patients

SD = standard of Deviation

l = allowable errors

$$n = \frac{4(0.5)^2}{(0.2)^2} = 25$$

10% of Dropouts

Hence Total no. of patients (round figure)- 30

Also, for any Research of clinical study, minimum patients to be included is 30 as per Proff.B. K.Mahajan. [18]

E)Consent– An Informed written consent of all patients included in study was taken in language best understood by them, their disease & line of treatment was explained to them.

F) Subject recruitment- Patient was selected from OPD and IPD of our institute

G) Study Centre – Research centre of our Institute.

H) Clinical Examination –Complete Clinical examination was done to diagnose & assess the condition of patient.

I) Case Record Form –Records of all subjects included in the study was documented and maintained in the case record form.

J)Criteria for selection of patients –Patients were diagnosed clinically on the basis of history of Diabetes mellitus and ophthalmoscopic examination.

K)Drugs Standarization- Standarisation and authentification of all drug involved in Meshashrungyadi basti done in laboratory before starting the clinical trial .

L)Duration of study – 3 months

Inclusion – Exclusion Criteria: -

INCLUSION: -

- Patients having signs and symtoms of Non-Proliferative Diabetic Retinopathy (Background Retinopathy)
- Diabetic Mellitus patients having (Range of Hb1AC- 6-7%)
- Age-30 yrs to 70 yrs
- Gender – Both Male & Female
- Patients having signs and symtoms of NPDR with controlled HTN

  Systolic range (120-140mmHg)

  Diastolic range(70-90mmHg)

- **Exclusion: -**
- Age less than 30 years and more than 70 years.
- Having more than above the mentioned range of HTN, Glaucoma etc
- Patients having Proliferative Diabetic Retinopathy.
- Having more than above mentioned range of Diabetic Mellitus patients.
- Traumatic Injury to eye.
- Infective & Inflammatory ophthalmic disease like conjuctivities, episcleritis, scleritis.

- HbsAg and HIV patients.
- Mature Cataract
- Patients having Jaundice, Typhoid, Malaria, T.B.
- Pregnant lady & Lactating mothers.
- Mentally & physically disabled patients.
- Patients who are not willing to take the treatment.

❖ **STUDY DESIGN /PLAN OF WORK:-**

Clinical Trial

⇓

Screening of subject for inclusion

⇓

Initial Assessment

⇓

selection of patients

⇓

Meshashrungyadi Basti for 1 week

⇓

1 ANUVASAN and 2 NIRUHA followed respectively for 1 week

⇓

4 cycles of basti with one week gap

⇓

Follow up weekly

⇓

observation after one month with direct ophthalmoscopy

⇓

Assessment at end of treatment

⇓

Final Assessment

⇓

Statistical Analysis

⇓

Discussion

⇓

Conclusion

Investigation

Before treatment, patients will undergo following examination.

- Hb%
- CBC
- ESR
- Hb1AC

- BSL – → F
  → PP (This will be done monthly)
- RFT
- LFT
- Urine – Routine and microscopic
- Lipid Profile

- **(Ophthalmic Examination)**
- Refractive Test (vision) i.e. by snellen's chart
- Tonometry (by schiotz tonometer)
- Direct ophthalmoscopy
- Fundus photograph at 'O' stage and after completion of treatment.
- OCT i.e Optical Coherence Tomography
- Fundus Flourescein Angiography

- **CLINICAL PARAMETERS FOR STUDY**

The study was based on clinical – Ophthalmological examinations, fundoscopic findings and patients narration.

Subjective –

- Dimness of vision

Objective –

FUNDOSCOPIC FINDINGS –

- Micro aneurysms
- Dot and blot spots
- Soft exudates
- Cotton wool spots
- CSME (Clinically Significant Macular Edema)

Degree of severity of Non-proliferative Diabetic Retinopathy will include –

- Mild NPDR (Non-proliferative Diabetic Retinopathy)

- At least one micro-aneurysm or intra retinal haemorrhage.
- Hard/soft exudates may or may not be present.

- Moderate NPDR

- Moderate microaneurysms / intraretinal haemorrhage.
- Early intra retinal microvascular abnormalities.
- Hard/soft exudates may or may not be present.

- Severe NPDR(4-2-1 rule)

- Any one of the following should be present
- Four quadrants of microaneurysms/intraretinal haemorrhages.
- Venus beading which is more marked in atleast 2 quadrants.
- Intra-retinal micro vascular abnormalities which are more severe in at least 1 quadrant.[11]

- Very severe NPDR-Two or more of the criteria for severe NPDR

CRITERIA OF ASSESSMENT

- **Subjective criteria**
- **1.Distant diminish Vision (Durastha Avyakta Darshana)**
- Unaided visual acuity (UAVA) will be measured using snellen's chart and will be recorded as following Grades –

DECIMAL	**Visual Acuity**
1.0	6/6 - 6/6p
0.7	6/9 - 6/9p

0.5	6/12 - 6/12p
0.3	6/18 - 6/18p
0.25	6/24 - 6/24p
0.2	6/36 - 6/36p
0.1	6/60 - 6/60p
0.0	Finger counting 3ft - 6ft

2.Near vision-Unaided visual acuity (UAVA) will be measured using Jaegger's's chart and will be recorded as following Grades –

DECIMAL	**Visual Acuity**
0.5	N8
0.5	N8
0.3	N10
0.25	N12
0.25	N18
0.1	N24
0.1	N36
0.1	Less than N36

- **(Objective Parameters)**

Sr. No.	**Signs**	**Gradation**
1	Micro-aneurysm	0 – No aneurysm 1 – Minimum 1 Micro-aneurysm present in 1 quadrant of retina 2 – Minimum 1 Micro-aneurysm present in 2 quadrants 3 - Minimum 1 Micro-aneurysm present in 3 quadrants 4 - Minimum 1 Micro-aneurysm present in all 4 quadrants
2	Dot and blot	0 – No hemorrhages

	hemorrhages	1 – Minimum 1 Dot and blot hemorrhage present in 1 quadrant 2 - Minimum 1 Dot and blot hemorrhages in 2 quadrants 3- Minimum 1 Dot and blot hemorrhages in 3 quadrants 4- Minimum 1 Dot and blot hemorrhages in all 4 quadrants
3	Soft exudates	0– No exudates 1– Minimum 1 Soft exudate present in 1 quadrants 2- Minimum 1 Soft exudates in 2 quadrants 3- Minimum 1 Soft exudates in 3 quadrants 4- Minimum 1 Soft exudates in all 4 quadrants
4	Cotton wool spots	0– Absent 1– Minimum 1 Cotton wool spot present in 1 quadrants 2-Minimum 1 Cotton wool spot in 2 quadrants 3-Minimum 1 Cotton wool spot in 3 quadrants 4 – Multiple deep round Cotton wool spots
5	CME and maculopathy	0 – Absent 1 – Here Focal exudative maculapathy are present (Micro-aneurysm, hemorrhages, macular edema which are usually arranged in circulate pattern) 2 – Here Diffuse exudative maculopathy are present (Diffused retinal edema and thickening throughout posterior pole) 3 – Here Ischemic maculopathy are present (Marked visual loss with micro-aneurysms, hemorrhages, macular edema.

Determination of severity-

0- No diabetic retinopathy

1 to 6- Mild diabetic retinopathy

7 to 12- Moderate diabetic retinopathy

13 to 19 – Severe diabetic retinopathy [18]

OBSERVATION AND RESULTS

OBSERVATION AND RESULTS –

Statistical procedures (Mention in materials & Methods at the end)

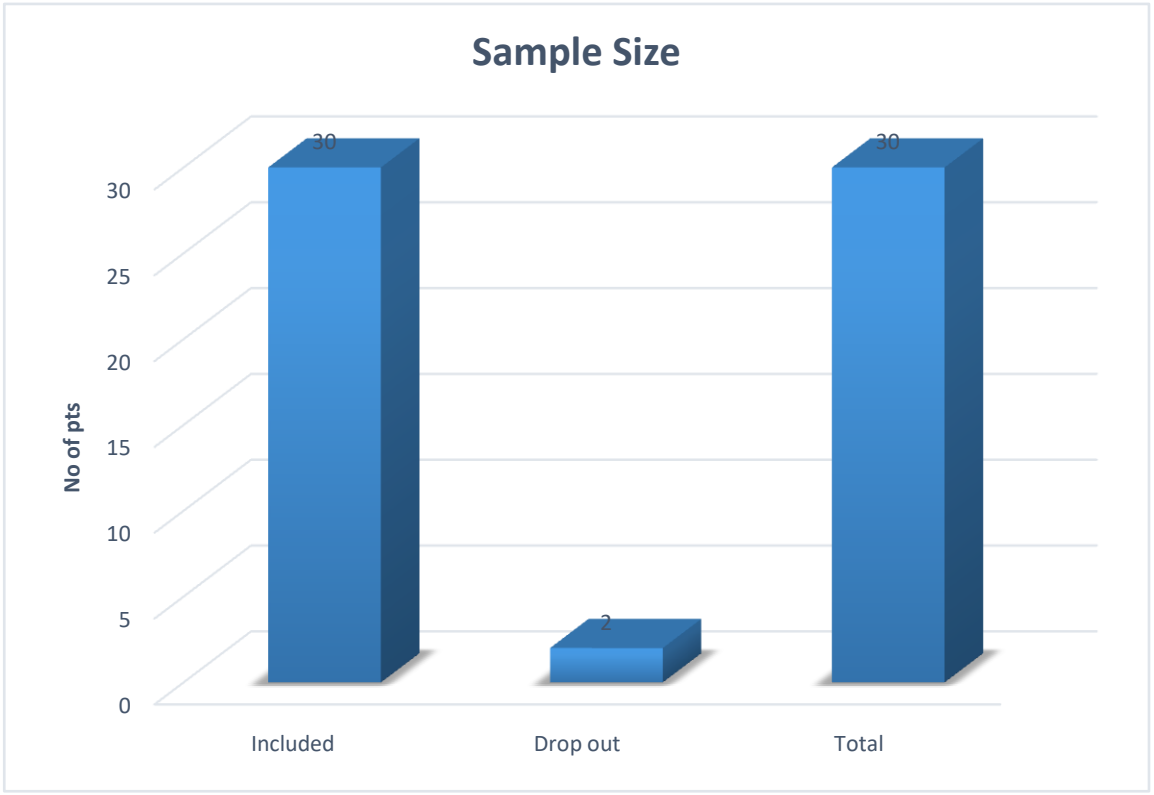
General Observations

A) Distribution of Patients

Table: Shows distribution of Patients

Head	No of Patients
Included	32
Drop out	02
Total	**30**

Figure: Shows distribution of Patients



Total 30

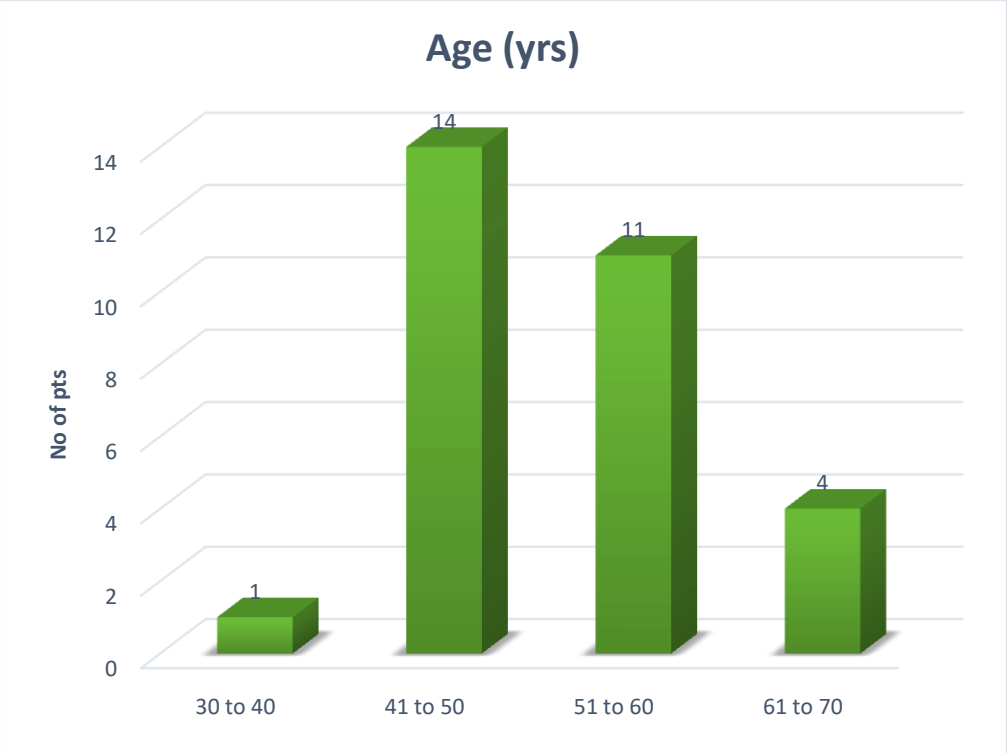
patients were treated in the study with Meshashrungyadi basti.2 patients were dropouts,Total 30 patients data was collected,results were assesses on the basis of changes in assessment criteria recorded during study

B) Age

Table: Shows Age wise distribution

Sr. No.	Age (yrs.)	No. of Patients	%
1	**30 to 40**	1	3.33
2	**41 to 50**	14	46.7
3	**51 to 60**	11	36.7
4	**61 to 70**	4	13.3
5	**Total**	**30**	**100.00**

Figure: Shows Age wise distribution



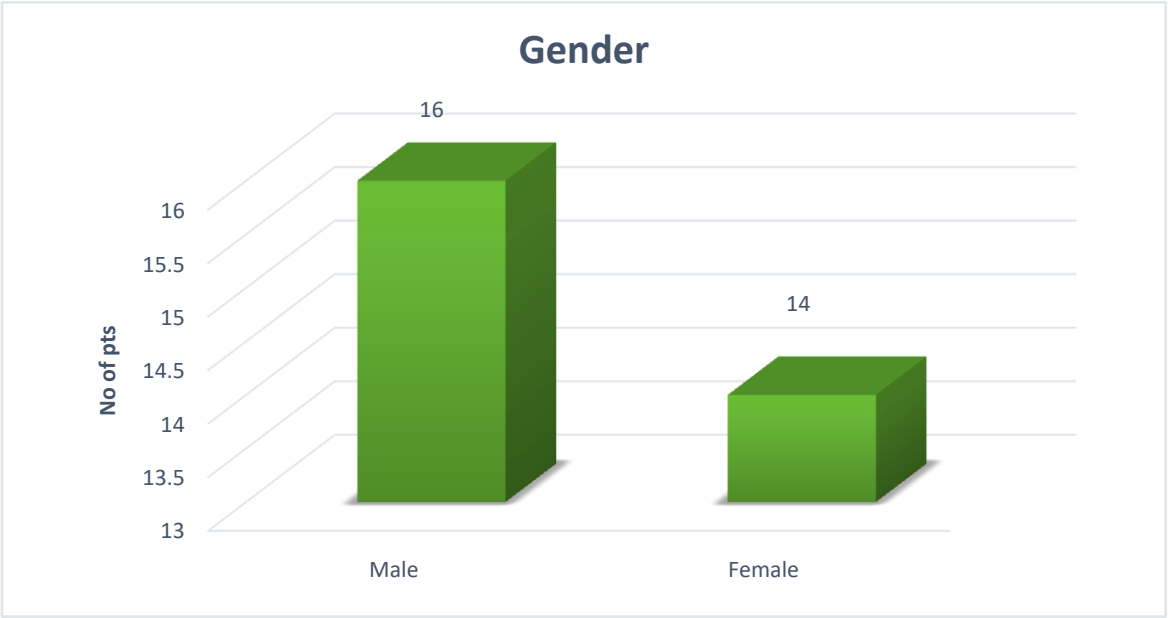
According to the inclusion criteria for the age group 30 to 70 years,four groups were made.Out of 30 patients included,1 patient (3.33%) was between 30 to 40 years of age group,14 patients (46.7%) were between the age group of 41 to 50 years, 11 patients (36.7%) were between the age group of 51 to 60 years, 4 patients (13.3%) were between the age group of 61 to 70 years.

C) Gender

Table: Shows Gender wise distribution

Sr. No.	Gender	No. of Patients	%
1	**Male**	16	53.3
2	**Female**	14	46.7
3	**Total**	**30**	**100.00**

Figure: Shows Gender wise distribution



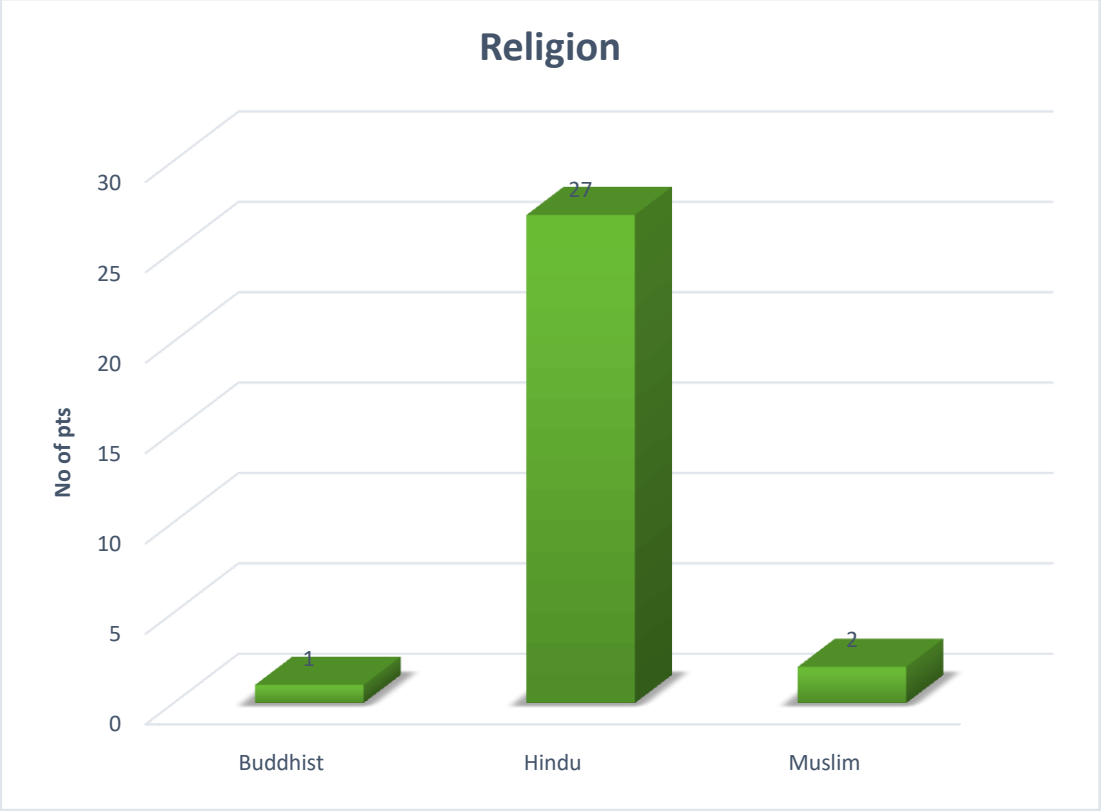
Out of 30 patients included 16 patients(53.3%) were male and14 patients(46.7%) were female patients.

D) Religion

Table: Shows Religion wise distribution

Sr. No.	Religion	No. of Patients	%
1	**Buddhist**	1	3.33
2	**Hindu**	27	90
3	**Muslim**	2	6.67
4	**Total**	**30**	**100.00**

Figure: Shows Religion wise distribution



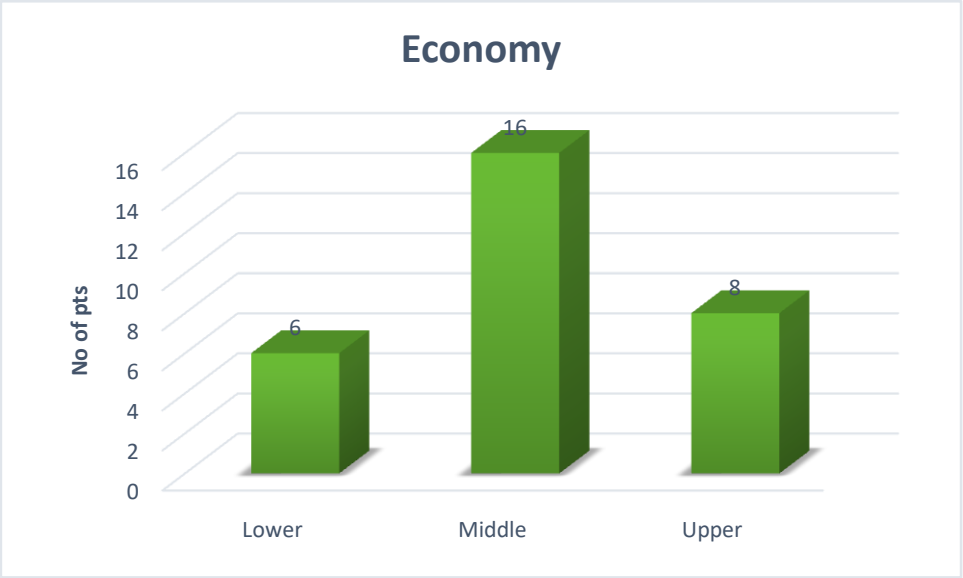
Out of 30 patients included 27 patients(90%) were hindu,1 patient (3.33%) was Buddhist,2 patients (6.67%) were muslim religion.

E) Economy

Table: Shows Economy wise distribution

Sr. No.	Economy	No. of Patients	%
1	**Lower**	6	20
2	**Middle**	16	53.3
3	**Upper**	8	26.7
4	**Total**	**30**	**100.00**

Figure: Shows Economy wise distribution



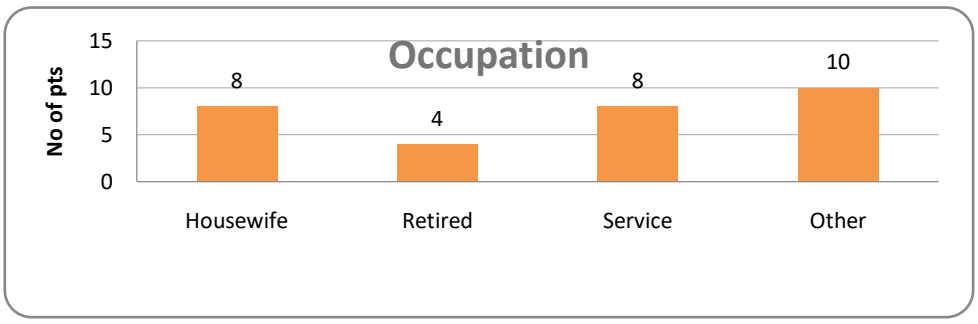
Out of 30 patients included 6 patients(20%) were belonging to lower class,16 patient (53.3%) was belonging to middle class,8 patients (26.7%) were belonging to upper class.

F) Occupation

Table: Shows Occupation wise distribution

Occupation	No of patients
Housewife	**8**
Retired	**4**
Service	**8**
Other	**10**

Figure: Shows Occupation wise distribution



Out of 30 patients included, 8 patients were House wives,4 patient Retired,8 patients doing service,10 patients were doing other jobs such as shopkeeper,tailor,small business etc.

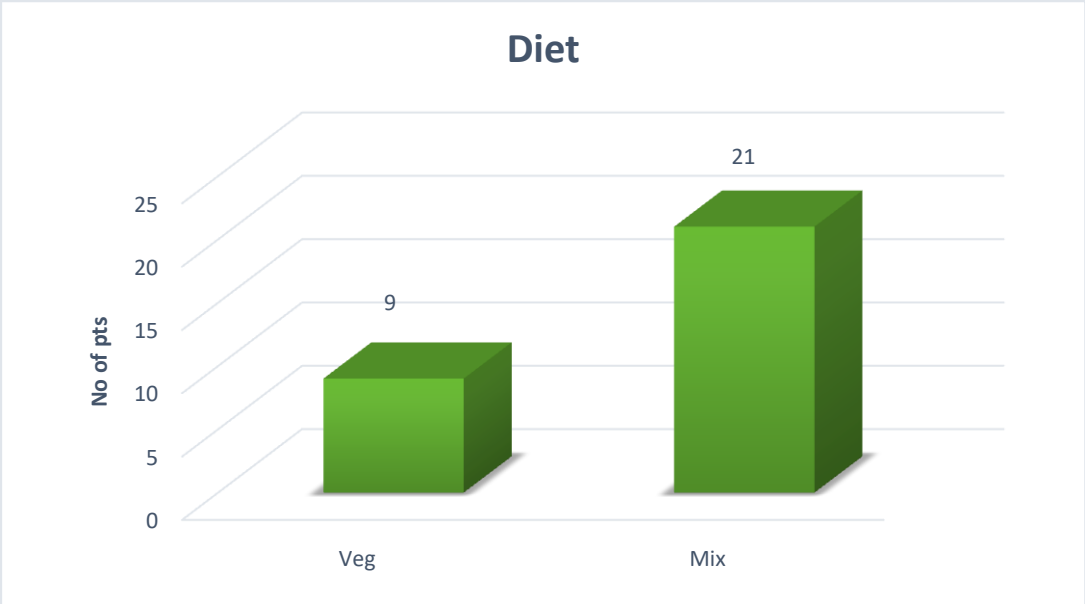
G) Diet

Table: Shows Diet wise distribution

Sr. No.	Diet	No. of Patients	%
1	**Veg**	09	30
2	**Mix**	21	70
3	**Total**	**30**	**100.00**

Out of 30 patients included 09 patients(30%) were having veg diet,21 patient (70%) were having both veg and nonveg in their diet.

Figure: Shows Diet wise distribution



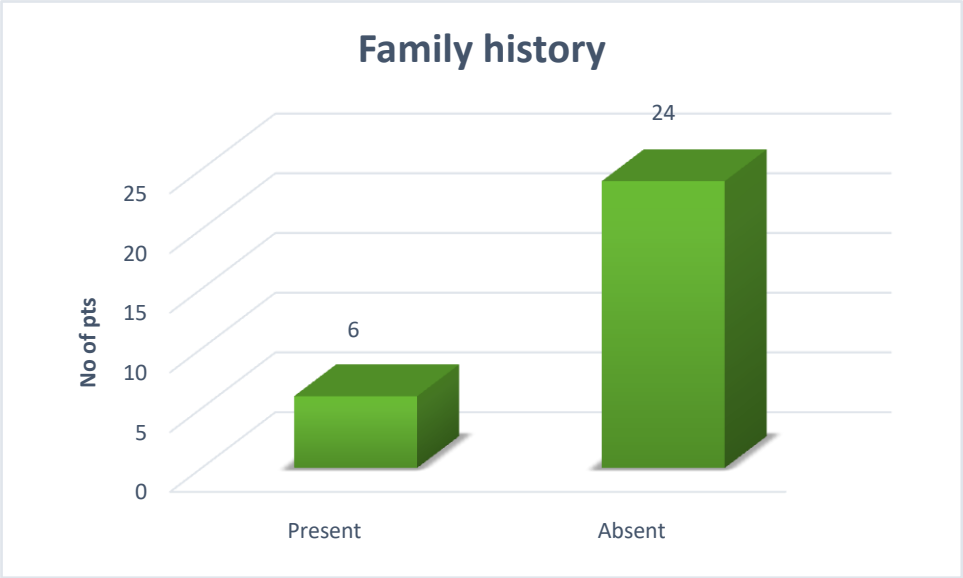
H) Family History

Table: Shows Family History wise distribution

Sr. No.	FHO	No. of Patients	%
1	**Present**	6	20
2	**Absent**	24	80
3	**Total**	**30**	**100.00**

Out of 30 patients included 6 patients(20%) were having family incidence of diabetic retinopathy,24 patient (80%) were not having family incidence.

Figure: Shows Family History wise distribution



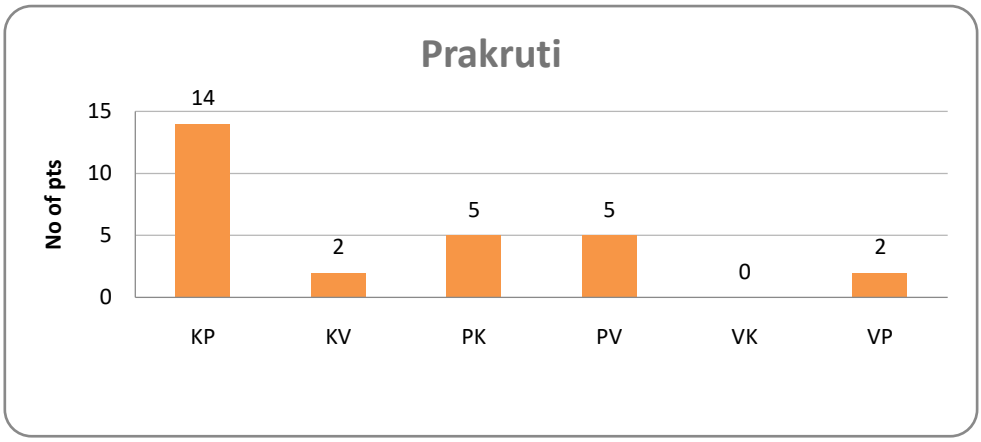
I) Prakruti

Table: Shows Prakruti wise distribution

Sr. No.	Prakruti	No. of Patients	%
1	**KP**	14	46.7
2	**KV**	2	6.67
3	**PK**	5	17%
4	**PV**	7	23%
5	**VK**	0	0
6	**VP**	2	6.67
7	**Total**	**30**	**100.00**

Figure: Shows Prakruti wise distribution

Out of 30 patients included 14 patients(46.7%) were belonging to kapha-pitta prakurti,2 patients (6.67%) were belonging kapha vata prakurti,5 patients (17%) were belonging topitta kapha prakurti.7 patients(23%) were belonging to pitta vata prakurti,2 patients were belonging to vata pitta prakurti. 2 patients (6.67) were belonging to Vata Pitta prakurti.



ANALYSIS OF ASSESSMENT OF CRITERIA

5.2. Changes in Subjective Parameters (Both eyes)

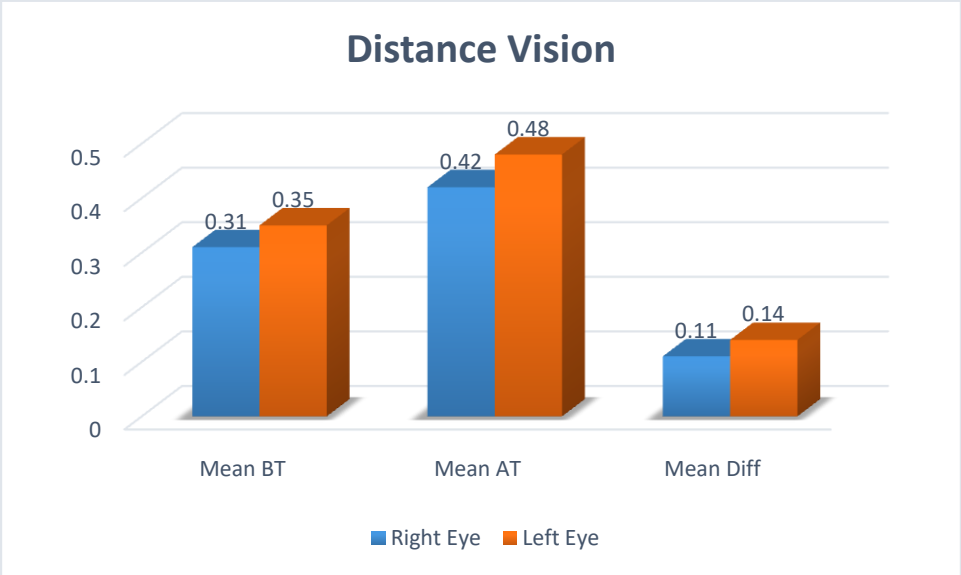
A) Distance Vision without spectacles(Both eyes)

The frequency distribution of patients according to UAVA Using Snellen's chart.Right eye and Left eye with its bar graph is given below.

Table: Shows changes in Distance Vision (Both eyes)

Sr. No.	Distance vision	Mean BT	Mean AT	Mean Diff
1	Right Eye	0.31	0.42	0.11
2	Left Eye	0.35	0.48	0.14

Figure: Shows changes in Distance Vision (Both eyes)



Unaided visual acuity (UAVA) was measured and converted into decimal equivalent and then statistical results were drawn.

- Meanvalues of Distance vision without spectacles ,Before treatment of right eye is 0.31.After treatment Which get increased to value of 0.42 in the range of 0 to 0.4 decimal .That is average change in distance vision without spectacles of patients right eye is 0.11.
- Meanvalues of Distance vision without spectacles ,Before treatment of Left eye is 0.31 .After treatment Which get to mean value of 0.42 .That is average change in distance vision without spectacles of patients right eye is 0.14.

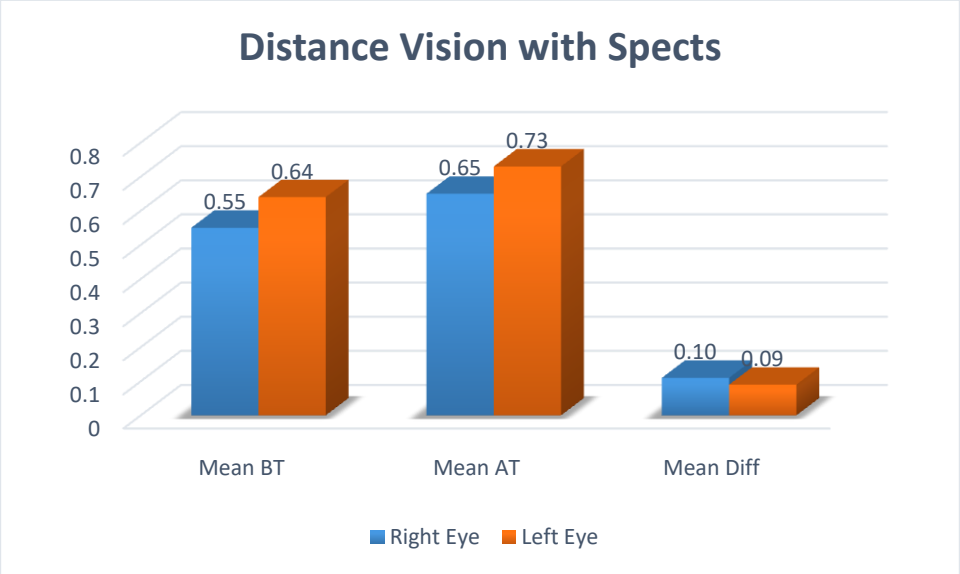
5.3. Changes in subjective Parameters (Both eyes)

B) Distance Vision with spectacles

Table: Shows changes in Distance Vision with spectacles (Both eyes)

Sr. No.	Distance vision (with spectacles)	Mean BT	Mean AT	Mean Diff
1	**Right Eye**	0.55	0.65	0.11
2	**Left Eye**	0.64	0.73	0.09

Figure: Shows changes in Distance Vision with spectacles (Both eyes)



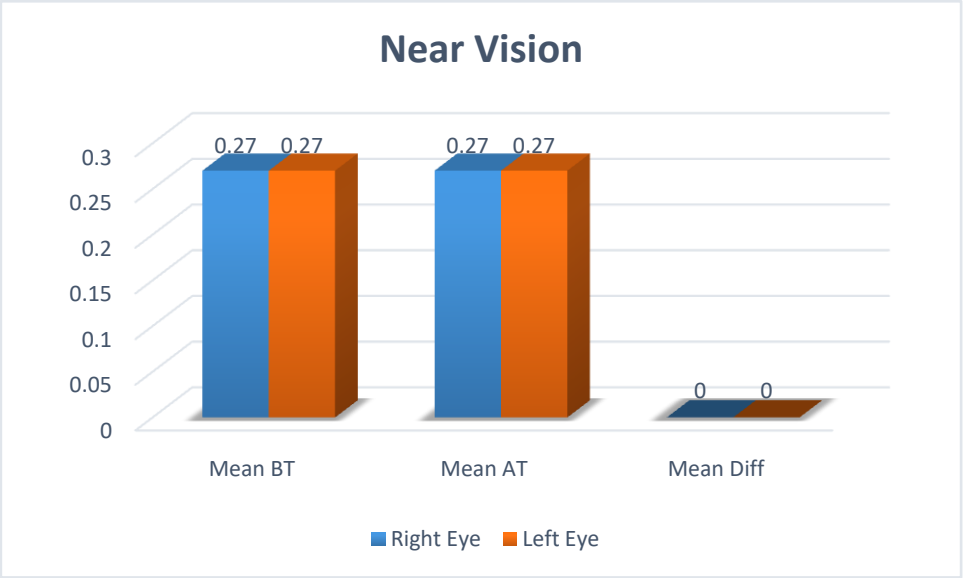
- Mean values of Distance vision with spectacles,Before treatment of right eye is 0.55.After treatment Which get to value of 0.65.That is average change in distance vision with spectacles of patients right eye is 0.10.
- Mean average values of Distance vision without spectacles,Before treatment of Left eye is 0.64 .After treatment Which get to mean value of 0.73 .That is average change in distance vision without spectacles of patients right eye is 0.09

C) Near Vision (Both eyes)

Table: Shows changes in Near Vision (Both eyes)

Sr. No.	Near vision	Mean BT	Mean AT	Mean Diff
1	**Right Eye**	0.27	0.27	0
2	**Left Eye**	0.27	0.27	0

Figure: Shows changes in Near Vision (Both eyes)



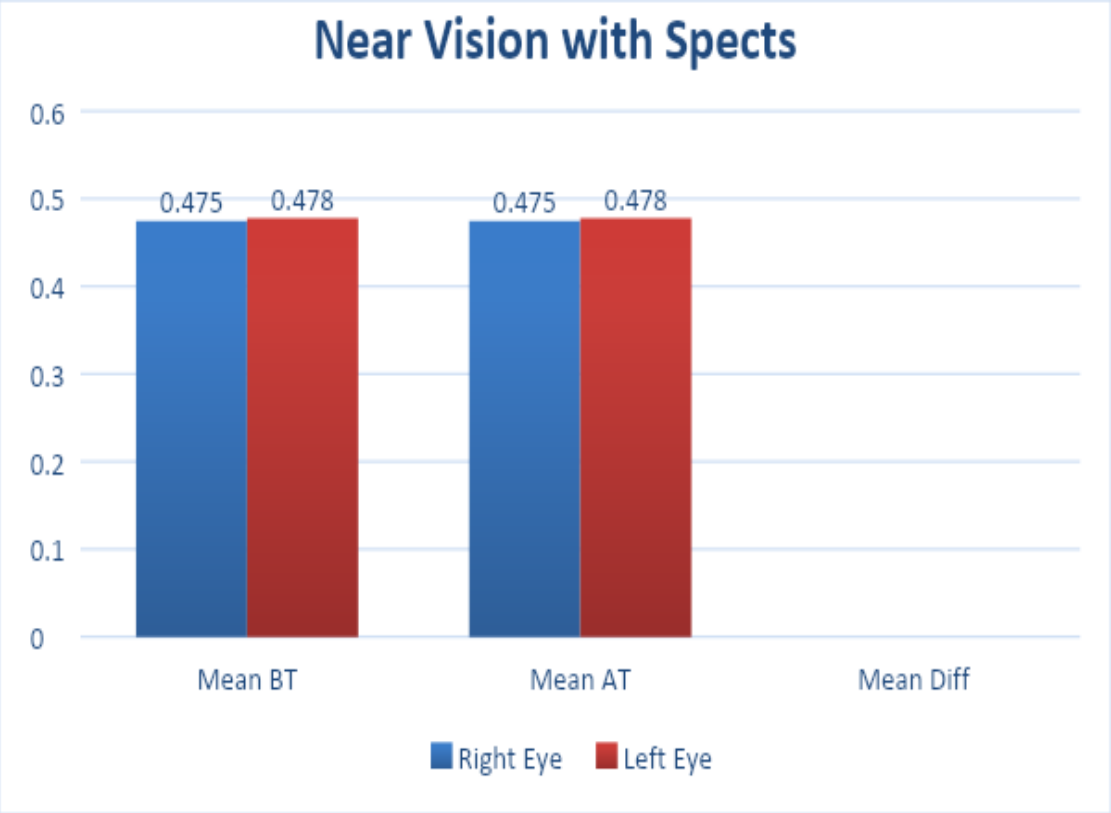
- Meanvalues of Near vision without spectacles ,Before treatment of right eye is 0.27.After treatment the value of 0.27 .No change in Near vision without spectacles of patients right eye .
- Mean average values of Near vision without spectacles ,Before treatment of Left eye is 0.27 .After treatment the 0.27 .No change in near vision without spectacles of patients left eye is .

D) Near Vision with spectacles (Both eyes)

Table: Shows changes in Near Vision with spectacles (Both eyes)

Sr. No.	Distance vision (with spectacles)	Mean BT	Mean AT	Mean Diff
1	**Right Eye**	0.475	0.475	0.00
2	**Left Eye**	0.478	0.478	0.00

Figure: Shows changes in Near Vision with spectacles (Both eyes)



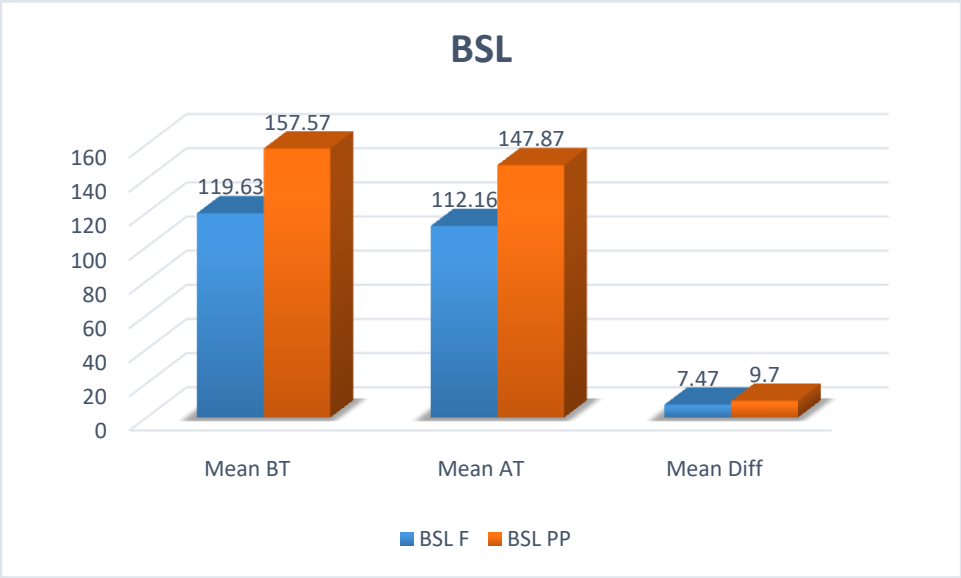
- Meanvalue of Near vision with spectacles, Before treatment of right eye is 0.475.After treatment the value of 0.475 .No change in Near vision with spectacles of patients right eye .
- Meanvalue of Near vision with spectacles,Before treatment of Left eye is 0.478 .After treatment the 0.478 , No change in near vision with spectacles of patients left eye .

E) BSL (F & PP)

Table: Shows changes in BSL (F & PP)

Sr. No.	BSL	Mean BT	Mean AT	Mean Diff
1	**BSL F**	119.63	112.16	7.47
2	**BSL PP**	157.57	147.87	9.70

Figure: Shows changes in BSL (F & PP)



- Mean of all values of Blood sugar level (Fasting) ,Before treatment is 119.63 .After treatment Which reduced to mean value of 112.16 .That is average change is 7.47.
- Mean of all values of Blood sugar level(Post prandial),Before treatment is 157.57 .After treatment Which get to mean value 147.87.That is change is 9.7.

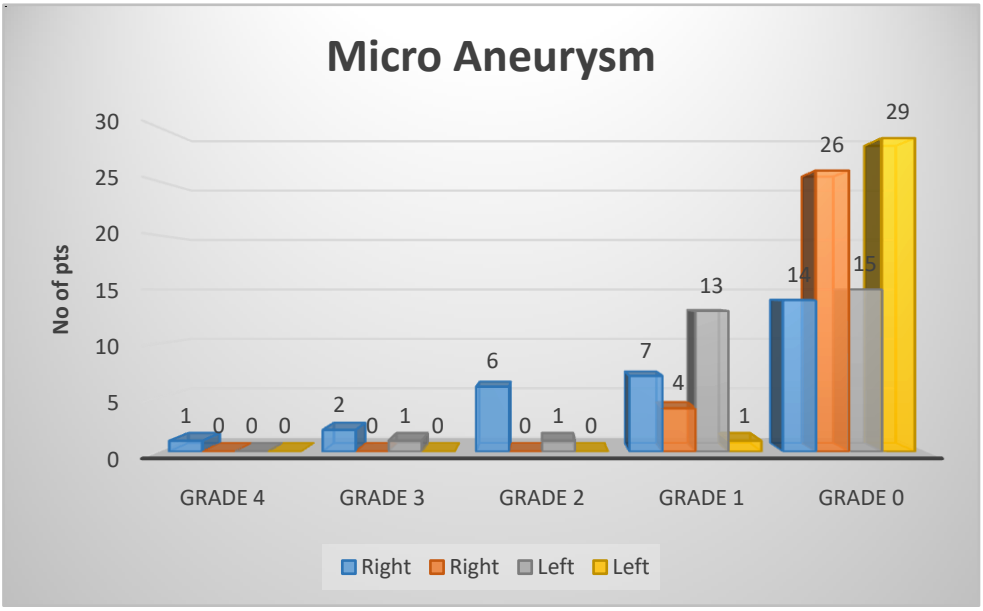
5.3. Changes in symptoms Before and After treatment

A) Changes in Microaneurysm (Both eyes)

Table: Shows changes in Microaneurysm (Both eyes)

No. of Patients of Grade				
Grade	**Right Retina**		**Left Retina**	
	BT	**AT**	**BT**	**AT**
Grade 4	1	0	0	0
Grade 3	2	0	1	0
Grade 2	6	0	1	0
Grade 1	7	4	13	1
Grade 0	14	26	15	29
Total	**30**	**30**	**30**	**30**

Figure: Shows changes in Microaneurysm (Both eyes)



- Number of patients having symtoms of micro aneurysm in Right Retina,

1)Before treatment – Out of 30 patients,1 patient was having Grade 4 that means microaneurysms were present in all 4 quadrants of right retina,2 patients were having Grade 3 that means microanuerysms were present in 3 quadrants of right retina,6 patients were having Grade 2 that means microaneurysm present in 2 quadrants of retina,7 patients were having Grade 1 that means microaneurysm present in 1 quadrant of retina.

2)After treatment - Out of 30 patients,0 patient was having Grade 4 ,0 patients were having Grade 3,0 patients were having Grade 2 ,4 patients were having Grade 1.Thus after treatment patients distributed from various grades, increased from 14 patients to 26 patients in Grade 0 that means 26 patients were having no microaneurysm in any of the four quadrants

- No.of patients having symtoms of micro aneurysm in Left Retina,

1)Before treatment – Out of 30 patients, ,1 patient was having Grade 3 that means microanuerysms were present in 3 quadrants of right retina,1 patient was having Grade 2 that means microaneurysm present in 2 quadrants of retina,13 patients were having Grade 1 that means microaneurysm present in 1 quadrant of retina.

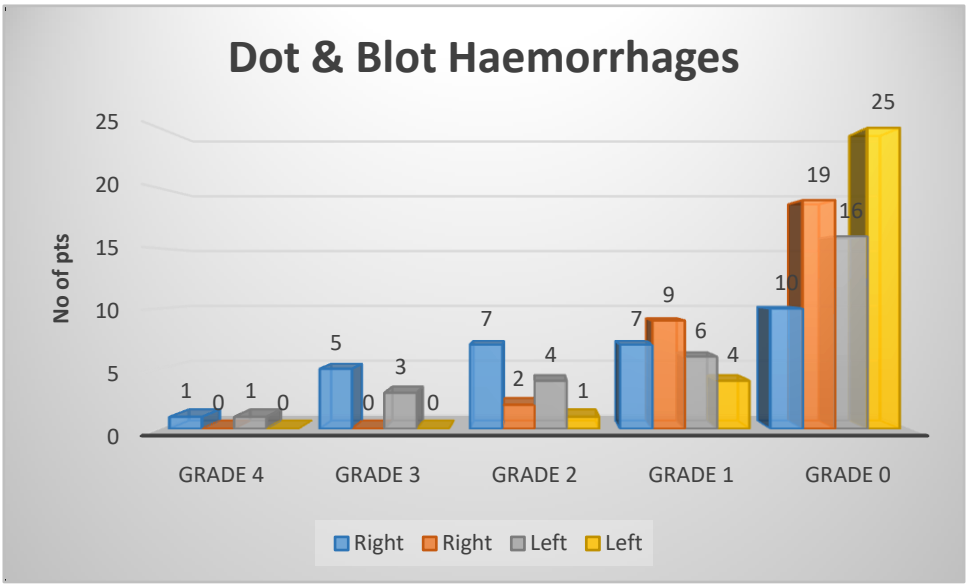
2)After treatment - Out of 30 patients,1 patient was having Grade 3,0 patients were having Grade 2 ,1patient was having Grade 1. Thus after treatment patients distributed from various grades, increased from 15 patients to 29 patients in Grade 0 that means 29 patients were having no microaneurysm in any of the four quadrants

B) Changes in Dot & Blot Haemorrhage (Both eyes)

Table: Shows changes in Dot & Blot Haemorrhage (Both eyes)

No. of Patients of Grade				
Grade	**Right Retina**		**Left Retina**	
	BT	**AT**	**BT**	**AT**
Grade 4	1	0	1	0
Grade 3	5	0	3	0
Grade 2	7	2	4	1
Grade 1	7	9	6	4
Grade 0	10	19	16	25
Total	**30**	**30**	**30**	**30**

Figure: Shows changes in Dot & Blot Haemorrhage (Both eyes)



- Number of patients having symtoms of Dot & Blot haemorrhage inRight Retina,
- 1)Before treatment – Out of 30 patients,1 patient was having Grade 4 that means Dot & Blot haemorrhage were present in all 4 quadrants of right retina,5 patients were having Grade 3 that means Dot & Blot haemorrhage were present in 3 quadrants of right retina,7 patients were having Grade 2 that means Dot & Blot haemorrhage present in 2 quadrants of right retina,7 patients were having Grade 1 that means Dot & Blot haemorrhage present in 1 quadrant of right retina.

- 2)After treatment - Out of 30 patients,0 patient was having Grade 4 ,0 patients were having Grade 3,2 patients were having Grade 2 ,9 patients were having Grade 1. Thus after treatment patients distributed from various grades, increased from 10 patients to 19 patients in Grade 0 that means 19 patients were having no Dot & Blot haemorrhage in any of the four quadrants
- No.of patients having symtoms of Dot & Blot haemorrhage Left Retina,
- Before treatment – Out of 30 patients,1 patient was having Grade 4 that means Dot & Blot haemorrhage were present in all 4 quadrants of left retina,3 patients were having Grade 3 that means Dot & Blot haemorrhage were present in 3 quadrants of left retina,4 patients were having Grade 2 that means Dot & Blot haemorrhage present in 2 quadrants of left retina,6 patients were having Grade 1 that means Dot & Blot haemorrhage present in 1 quadrant of left retina.

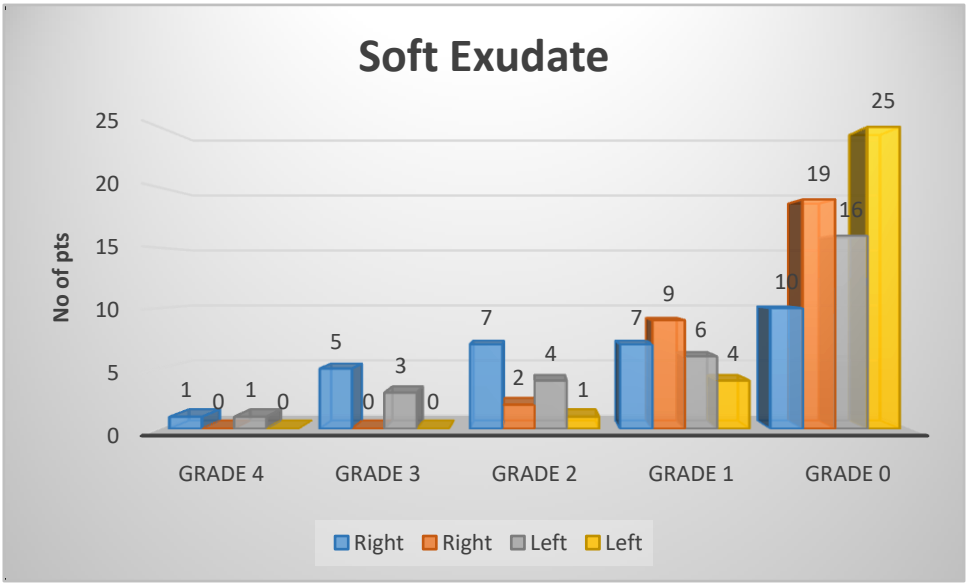
  2)After treatment - Out of 30 patients,0 patient was having Grade 4 ,0 patients were having Grade 3,1 patient was having Grade 2 ,4 patients were having Grade 1. Thus after treatment,patients distributed from various grades, increased from 16 patients to 25 patients in Grade 0 that means 25 patients were having no Dot & Blot haemorrhage in any of the four quadrants

C) Changes in Soft exudate (Both eyes)

Table: Shows changes in Soft exudate (Both eyes)

No. of Patients of Grade				
Grade	**Right**		**Left**	
	BT	**AT**	**BT**	**AT**
Grade 4	0	0	0	0
Grade 3	9	1	5	1
Grade 2	9	12	14	12
Grade 1	8	12	6	11
Grade 0	4	5	5	6
Total	**30**	**30**	**30**	**30**

Figure: Shows changes in Soft exudate (Both eyes)



- Number of patients having symtoms of Soft Exudates in Right Retina ,

  1)Before treatment – Out of 30 patients,9 patients were having Grade 3 that means Soft Exudates were present in 3 quadrants of right retina,9 patients were having Grade 2 that means Soft Exudates present in 2 quadrants of right retina,8 patients were having Grade 1 that means Soft Exudates present in 1 quadrant of right retina.

  2)After treatment - Out of 30 patients,0 patient was having Grade 4 soft exudates,1 patient was having Grade 3 soft exudates,12 patients were in having Grade 2 soft exudates,12 patients were in having Grade 1 soft exudates. Thus after treatment patients distributed from various grades, increased from 4 patients to 5 patients in Grade 0 that means 5 patients were having no Dot & Blot haemorrhage in any of the four quadrants.

- Number of patients having symtoms of Soft Exudates in Left Retina,

  1)Before treatment – Out of 30 patients,5 patients were having Grade 3 that means Soft Exudates were present in 3 quadrants of Left retina,14 patients were having Grade 2 that means Soft Exudates present in 2 quadrants of left retina,6 patients were having Grade 1 that means Soft Exudates present in 1 quadrant of right retina.

  2)After treatment - Out of 30 patients,1 patient was having Grade 3 soft exudates,12 patients were in having Grade 2 soft exudates,12 patients were having Grade 1 soft exudates. Thus after treatment patients distributed from various grades, increased from 4 patients to 5 patients and 6 patients to 11 patients in Grade 0,Grade 1 respectively.

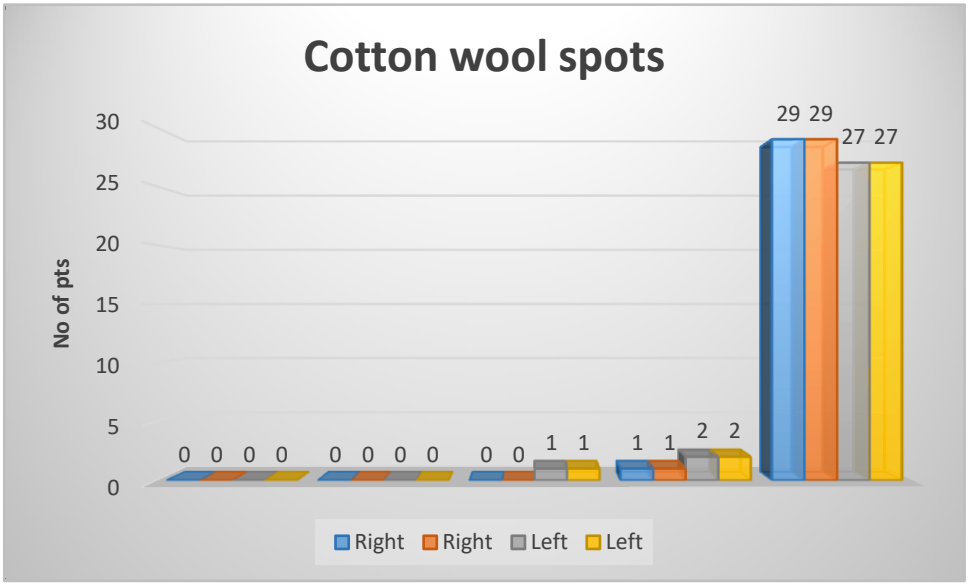
Changes in Cotton wool spots (Both eyes)

Table: Shows changes in Cotton wool spots (Both eyes)

No. of Patients of Grade				
Grade	**Right Retina**		**Left Retina**	
	BT	**AT**	**BT**	**AT**
Grade 4	0	0	0	0
Grade 3	0	0	0	0
Grade 2	0	0	1	1
Grade 1	1	1	2	2
Grade 0	29	29	27	27
Total	**30**	**30**	**30**	**30**

Figure: Shows changes in Cotton wool spots (Both eyes)

Total no of patients are 30,among them 1 patient in right eye & 2 patient in left eye was having symptom of cotton wool spot before the treatment.And from that After the treatment remains same as 1 Patient of Right retina & 2 patients of Left Retina respectively in Grade 1.

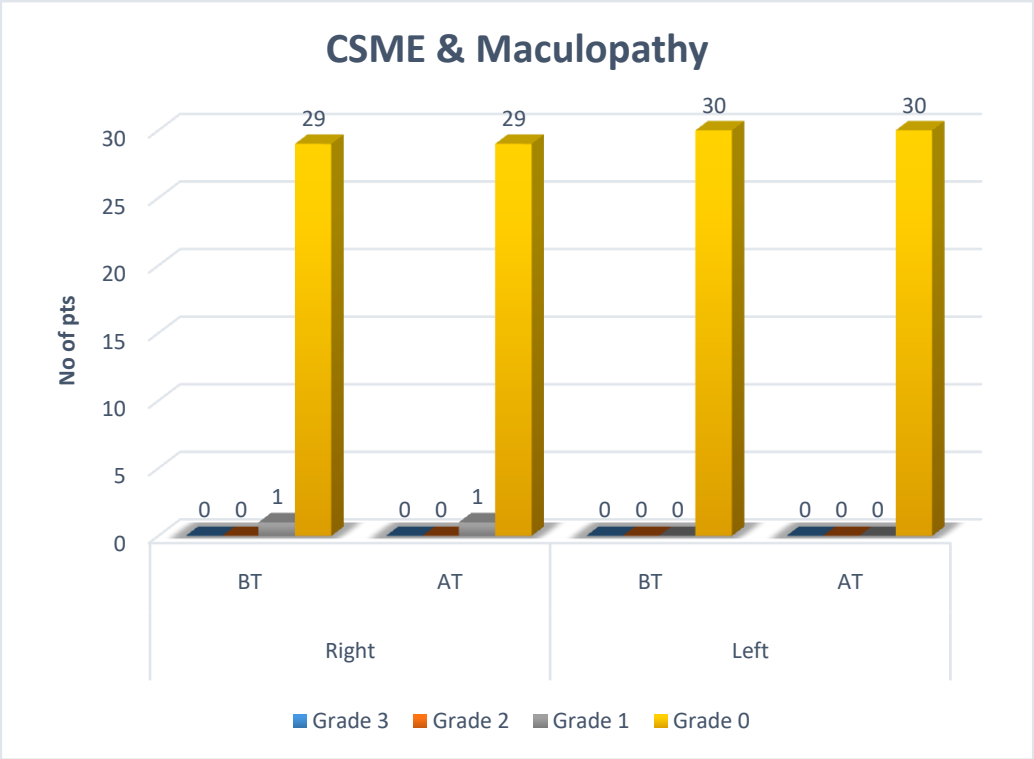


E) Changes in CSME & Maculopathy (Both eyes)

Table: Shows changes in CSME & Maculopathy (Both eyes)

No. of Patients of Grade				
Grade	**Right Retina**		**Left Retina**	
	BT	**AT**	**BT**	**AT**
Grade 3	0	0	0	0
Grade 2	0	0	0	0
Grade 1	1	1	0	0
Grade 0	29	29	30	30
Total	**30**	**30**	**30**	**30**

Figure: Shows changes in CSME & Maculopathy (Both eyes)



Total no of patients are 30,among them only 1 patient in right Retina was having symptom of CSME in Grade 1,before the treatment .And treatment remain same 1 patient in Grade 1.

5.4. Statistical Analysis

5.4.1 Objective Parameters (By Wilcoxon Singed Rank Test)

A) Micro Aneurysm

Table: Wilcoxon Signed Rank Test

Eye	BT/AT	N	Mean	Median	W	P
Right	**BT**	**30**	0.966	1	136	<0.0001
	AT	**30**	0.133	0		
Left	**BT**	**30**	0.600	0.5	120	<0.0001
	AT	**30**	0.033	0		

As value of p is less than 0.05, significant difference was observed between mean of Before treatment and after treatment score in Micro Aneurysm (Both eyes). Hence it is concluded that 'Meshashrungyadi Basti' is significantly effective to reduce Micro Aneurysm in Tritiya-Chaturtha patalgat doshdushti (Non-Proliferative Diabetic Retinopathy).

B) Dot & Blot Haemorrhages

Table: Wilcoxon Signed Rank Test

Eye	BT/AT	N	Mean	Median	W	P
Right	**BT**	**30**	1.133	1	190	<0.0001
	AT	**30**	0.433	0		
Left	**BT**	**30**	0.900	0	105	0.0001
	AT	**30**	0.200	0		

As value of p is less than 0.05, significant difference was observed between mean of Before Treatment and After Treatment score in Dot & Blot Haemorrhages (Both eyes). Hence it is concluded that 'Meshashrungyadi Basti' is significantly effective to reduce Dot & Blot Haemorrhages in Tritiya-Chaturtha patalgat doshdushti (Non-Proliferative Diabetic Retinopathy).

C) Soft Exudate

Table: Wilcoxon Signed Rank Test

Eye	BT/AT	N	Mean	Median	W	P
Right	**BT**	**30**	1.767	2	78	0.0001
	AT	**30**	1.300	1		
Left	**BT**	**30**	1.633	2	55	0.0020
	AT	**30**	1.267	1		

As value of p is less than 0.05, significant difference was observed between mean of Before Treatment and After Treatment score in Soft Exudate (Both eyes). Hence it is concluded that 'Meshashrungyadi Basti' is significantly effective to reduce Soft Exudate in Tritiya-Chaturtha patalgat doshdushti (Non-Proliferative Diabetic Retinopathy).

D) Cotton wool spots

Before Treatment and After Treatment columns of both eyes contain same values. Hence, statistical test is not applicable.

E) CSME & Maculopathy

Before Treatment and After Treatment columns for right eye contain same values and in case of left all readings are '0'. Hence, statistical test is not applicable.

5.4.2 Subjective parameters (By Student's t Test for Paired Data)

A) Distance Vision (UAVA)

Table: Student's t Test for Paired Data

Eye	BT/AT	N	Mean	SD	T	P
Right	**BT**	**30**	0.306	0.173	4.309	0.0002
	AT	**30**	0.416	0.217		
Left	**BT**	**30**	0.346	0.189	4.466	0.0001
	AT	**30**	0.483	0.235		

As value of p is less than 0.05, significant difference was observed between mean of Before Treatment and After Treatment score in Distance vision (Both eyes). Hence it is concluded that 'Meshashrungyadi Basti' is significantly

effective to improve Distance vision in Tritiya-Chaturtha patalgat doshdushti (Non-Proliferative Diabetic Retinopathy).

A) Distance Vision with Spectacles (UAVA)

Table: Student's t Test for Paired Data

Eye	BT/AT	N	Mean	SD	T	P
Right	**BT**	**30**	0.545	0.258	3.013	0.0053
	AT	**30**	0.650	0.245		
Left	**BT**	**30**	0.643	0.247	4.077	0.0003
	AT	**30**	0.731	0.243		

As value of p is less than 0.05, significant difference was observed between mean of Before Treatment and After Treatment score in Distance vision with spectacles (Both eyes). Hence it is concluded that 'Meshashrungyadi Basti' is significantly effective to improve Distance vision with spectacles in Tritiya-Chaturtha patalgat doshdushti (Non-Proliferative Diabetic Retinopathy).

B) Near Vision

Table: Student's t Test for Paired Data

Eye	BT/AT	N	Mean	SD	T	P
Right	**BT**	**30**	0.265	0.142	0.000	1.000
	AT	**30**	0.265	0.142		
Left	**BT**	**30**	0.273	0.148	0.000	1.000
	AT	**30**	0.273	0.148		

As value of p is greater than 0.05, insignificant difference was observed between mean of Before Treatment and After Treatment score in Near vision (Both eyes). Mean values suggest that Near vison of both eyes is not changed at all. Hence it is concluded that 'Meshashrungyadi Basti' is not at all effective to improve Near vision in Tritiya-Chaturtha patalgat doshdushti (Non-Proliferative Diabetic Retinopathy).

E) Near Vision with Spectacles

Table: Student's t Test for Paired Data

Eye	BT/AT	N	Mean	SD	T	P
Right	**BT**	**30**	0.475	0.076	0.000	1.000
	AT	**30**	0.475	0.076		
Left	**BT**	**30**	0.478	0.084	0.000	1.000

	AT	**30**	0.478	0.084		

As value of p is greater than 0.05, insignificant difference was observed between mean of Before Treatment and After Treatment score in Near vision with spectacles (Both eyes). Mean values suggest that Near vison of both eyes is not changed at all. Hence it is concluded that 'Meshashrungyadi Basti' is not at all effective to improve Near vision with spectacles in Tritiya-Chaturtha patalgat doshdushti (Non-Proliferative Diabetic Retinopathy).

C) BSL (F & PP)

Table: Student's t Test for Paired Data

BSL	**BT/AT**	**N**	**Mean**	**SD**	**T**	**P**
F	**BT**	**30**	119.63	19.53	3.890	0.0005
	AT	**30**	112.17	16.84		
PP	**BT**	**30**	157.57	27.30	3.275	0.0027
	AT	**30**	147.87	17.64		

As value of p is less than 0.05, significant difference was observed between mean of Before Treatment and After Treatment score in BSL fasting & post prandial. Hence it is concluded that 'Meshashrungyadi Basti' is significantly effective to reduce BSL fasting & post prandial in Tritiya-Chaturtha patalgat doshdushti (Non-Proliferative Diabetic Retinopathy).

5.5. Effect of therapy

5.5.1. According to % Relief in Patients(Objective parameters)

Table: Relieved score and % Relief in Patients

Pt. No.	**Right eye**				**Pt. No.**	**Left eye**			
	B.T.	**A.T.**	**Relief**	**%Relief**		**B.T.**	**A.T.**	**Relief**	**%Relief**
1	6	4	2	33.33	**1**	5	2	3	60
2	3	2	1	33.33	**2**	4	2	2	50
3	7	2	5	71.43	**3**	6	3	3	50
4	3	1	2	66.67	**4**	4	3	1	25
5	4	3	1	25	**5**	4	2	2	50
6	2	1	1	50	**6**	3	1	2	66.67

7	3	1	2	66.67	**7**	1	0	1	100
8	3	1	2	66.67	**8**	5	3	2	40
9	3	2	1	33.33	**9**	3	1	2	66.67
10	6	2	4	66.67	**10**	6	1	5	83.33
11	5	3	2	40	**11**	2	1	1	50
12	5	2	3	60	**12**	3	2	1	33.33
13	2	2	0	0	**13**	1	1	0	0
14	5	2	3	60	**14**	5	3	2	40
15	6	3	3	50	**15**	3	2	1	33.33
16	5	1	4	80	**16**	5	1	4	80
17	4	2	2	50	**17**	6	2	4	66.67
18	2	1	1	50	**18**	2	1	1	50
19	3	1	2	66.67	**19**	1	1	0	0
20	4	2	2	50	**20**	4	2	2	50
21	11	5	6	54.55	**21**	0	0	0	0
22	6	4	2	33.33	**22**	4	3	1	25
23	3	1	2	66.67	**23**	0	0	0	0
24	3	1	2	66.67	**24**	1	0	1	100
25	6	3	3	50	**25**	8	6	2	25
26	3	0	3	100	**26**	2	0	2	100
27	2	1	1	50	**27**	3	1	2	66.67
28	3	2	1	33.33	**28**	2	2	0	0
29	4	3	1	25	**29**	3	2	1	33.33
30	4	2	2	50	**30**	3	2	1	33.33

5.5.3. According to Avg. Change in parameters

Table: Avg. Change in Subjective parameters

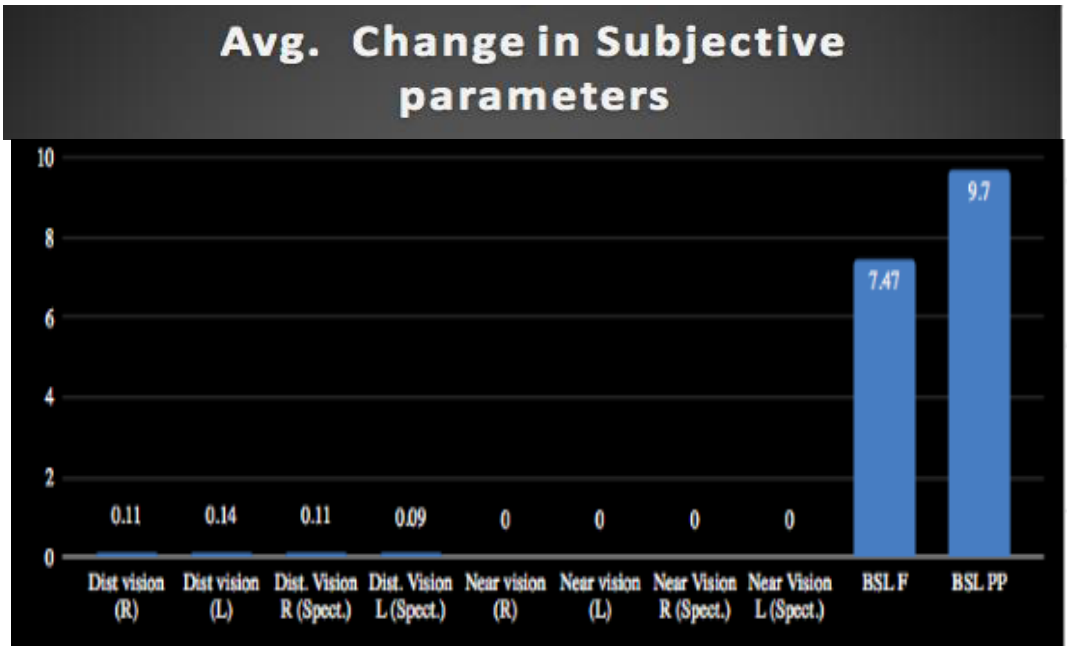
Sr. No.	Subjective parameters	Avg. Change
1	**Distance vision (R)**	0.11

2	**Distance vision (L)**	0.14
3	**Dist. Vision R (Spect.)**	0.10
4	**Dist. Vision L (Spect.)**	0.09
5	**Near vision (R)**	0.00
6	**Near vision (L)**	0.00
7	**Near Vision R (Spect.)**	0.00
8	**Near Vision L (Spect.)**	0.00
9	**BSL F**	7.47
10	**BSL PP**	9.70

Average change in subjective parameters

- 0.11 mean difference got for Distance vision without spectaclesin right eye.
- 0.14 mean difference got for Distance Vision without spectacles in Left eye.
- 0.10 mean difference got for Distance vision without spectaclesin right eye.
- 0.09mean difference got for Distance vision without spectaclesin right eye.
- 0.00 mean difference got for Near vision without spectacles in right eye.
- 0.00 mean difference got for Near vision without spectacles in Left eye.
- 0.00 mean difference got for Near vision with spectacles in right eye.
- 0.00 mean difference got for Near vision with spectacles in left eye.
- 0.00 mean difference got for Near vision without spectacles in right eye.
- 7.47 mean difference got for blood sugar level (fasting)
- 9.70 mean difference got for blood sugar level (post prandial)

Figure: Avg. Change in Subjective parameters

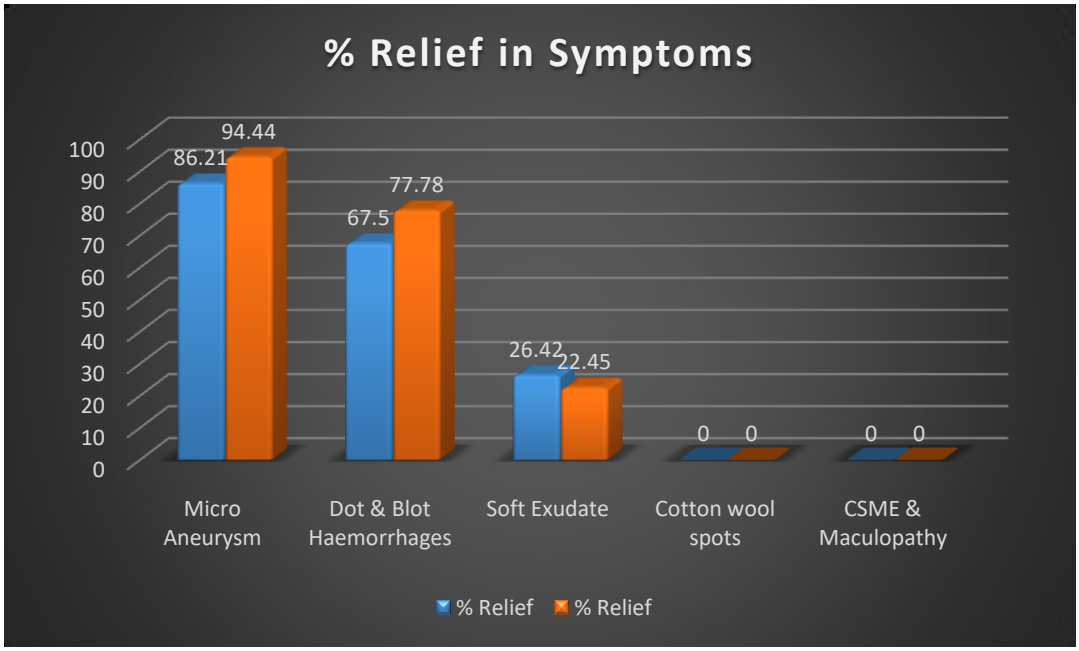


5.5.2. According to % Relief in Symptoms

Table: % Relief in Objective parameters (Symptoms)

Sr. No.	Symptoms	% Relief	
		Right	Left
1	Micro Aneurysm	86.21	94.44
2	Dot & Blot Haemorrhages	67.50	77.78
3	Soft Exudate	26.42	22.45
4	Cotton wool spots	0.00	0.00
5	CSME & Maculopathy	0.00	0.00

Figure: % Relief in Subjective parameters (Symptoms)



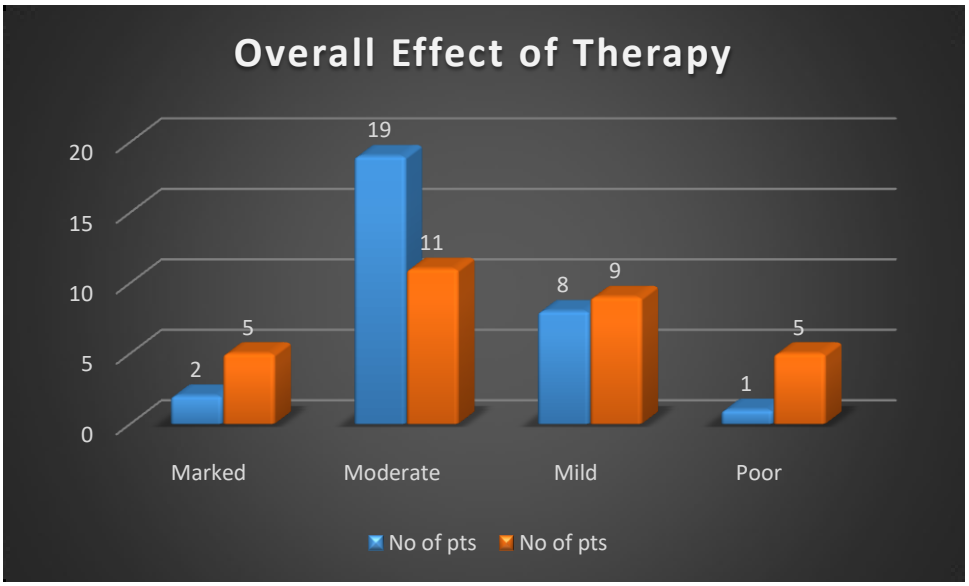
5.6. Overall Effect of Therapy

5.6.1. According % Relief

Table: Overall Effect of Therapy according % Relief

Sr. No.	Criteria	Improvement Grade	No of pts	
			Rt Eye	Lt Eye
1	76 to 100%	Marked	02	05
2	50 to 75%	Moderate	19	11
3	25 to 49%	Mild	08	09
4	0 to 24%	Poor	01	05

Figure: Overall Effect of Therapy according % Relief



5.6.2 According to statistical analysis

A. Student's paired t test

Subjective parameters

Table: Overall Effect of Therapy Statistical analysis

Sr. No.	Subjective Parameters	Paired t test
1	**Distance vision Rt**	Significant
2	**Distance vision Lt**	Significant
3	**Dist. Vision R (Spect.)**	Significant
4	**Dist. Vision L (Spect.)**	Significant
5	**Near vision Rt**	Insignificant
6	**Near vision Lt**	Insignificant
7	**Near Vision R (Spect.)**	Insignificant
8	**Near Vision L (Spect.)**	Insignificant
9	**BSL Fasting**	Significant
10	**BSL Post Prandial**	Significant

B.Objective Parameters

Table: Overall Effect of Therapy Statistical analysis (Subjective)

Sr. No.	Objective Parameters	Wilcoxon test
1	**Micro Aneurysm Rt**	Significant
2	**Micro Aneurysm Lt**	Significant
3	**Dot & Blot Haemorrhages Rt**	Significant
4	**Dot & Blot Haemorrhages Lt**	Significant
5	**Soft Exudate Rt**	Significant
6	**Soft Exudate Lt**	Significant
7	**Cotton wool spots Rt**	Insignificant
8	**Cotton wool spots Lt**	Insignificant
9	**CSME & Maculopathy Rt**	Insignificant
10	**CSME & Maculopathy Lt**	NA

DISCUSSION

DISCUSSION –

Discussion is said to the when we discuss the pros and cons, problems and achievement gain during/ while undergoing the study.

In India, Blindness is among main gigantic issue.

Diabetes Mellitus is one of the diseases causing damage to the eye. Detailed symtoms, pathophysiolgy,complications and its management has been described in modern texts,which are comparable to Prameha described in ancient texts. The group of disorders that occurs in the body in response to hyperglycemia is known as Diabetes mellitus. After some years despite of tight glycemic control, diabetes results in causing changes in metabolism of different organs including the eye and cause irreversible painless diminision of vision,retinopathies and even sometimes blindness.

Because of worry,hurry and curries;prevalence of diabetes is increasing in all socio economic groups.In early stages unfortunately there is no such symptom of retinopathies for which patient should consult to eyes specialist.In many cases patients got to know about having diabetes after development of retinopahy during the routine checkup of eyes or vice versa.There is no definite treatment .Also present medications are only supportive,after identifying Diabetic retinopathy.

- The place where our college is situated i.e where I carried out this study is a Metropolitian big city,here nobody got time to pay attention towards their own body's health,alarming minute signs till they become worse.
- As well as want to mentioned this ,the place wher I carried study is Anoop Pradesh known for ts natural humid condition(city situated near the sea) ,causing more sanchiti of kleda,doshsushti at sthanvaiguna and strotovaigunya.
- The locality is mainly hindu public (mostly having habits of eatinh fish,mutton,chicken,sweets etc).Also many of the patients among them were females (house wives),who do their household chores in morning without having time for breakfast then directly having lunch (lunch –dinner timing is irregular),then having diwaswap .Again after taking 2-3 times consumption of tea carrying on their work,then again dinner time is not fixed .Hence ultimately late to sleep.
- Also some patients were doing security jobs,heavy work,night shifts.There too daily routine was disturbed.Awakening at night and then taking diwaswap ,ultimately leading to vitiation of pitta-vata dosha
- Sanchiti of abnormal Meda is due to sedentary lifestyle.Also being diabetic patients and still not avoiding certain causcative factors are the reasons behind Non proliferative diabetic retinopathy

The present study was undertaken tostudy the*MESHASHRUNGYADI BASTI IN TRITIYA-CHATURTHA PATALGAT DOSHDUSHTI* WITH SPECIAL REFERENCE TO NON-PROLIFERATIVE DIABETIC RETINOPATHY.30 patients were completed a

single arm clinical trial of Meshashrungyadi Basti in NPDR.The patients were assessed on different parameters to obtain the effect of therapy.

All signs and symtoms were assessed on 0^{th} day,4^{th} week,8^{th} week,12^{th} weeks.

The results and observation during follow up and after completion of study are mentiond earlier and discussed as follows.

1)Observation and Results

2)General Discussion

3)Effect of therapy

4)Mode of action

General observations –

- **Age-** Group 30 to 70 years, four groups were made.Out of 30 patients included,1 patient (3.33%) was between 30 to 40 years of age group,14 patients (46.7%) were between the age group of 41 to 50 years, 11 patients (36.7%) were between the age group of 51 to 60 years, 4 patients (13.3%) were between the age group of 61 to 70 years.The survey shows that though DM is present in early ages,it takes time to develop Diabetic retinopathy.
- **Gender wise** - Out of 30 patients included 16 patients (53.3%) were male and 14 patients (46.7%) were female patients. This shows that prevalence of diabetic retinopathy does not count gender/sex and in both both groups it is approximately same.
- **Religion wise-** Out of 30 patients included 27 patients (90%) were hindu,1 patient (3.33%) was Buddhist,2 patients (6.67%) were muslim religion. As it depends on patients attending the hospital & community residing nearby.It might be because our institution is situated near hindu locality.Hence this cannot be said that Diabetic retinopathy is more prevalent in the hindus.
- **Occupation wise**-Out of 30 patients included, 8 patients were House wives,4 patient Retired,8 patients doing service,10 patients were doing other jobs such as shopkeeper, tailor,small business etc.It suggests the fact that the sedentary life,stressfull life and lack of exercise are more prone to develop diabetic retinopathy.
- **Diet wise** - Out of 30 patients included 09 patients (30%) were having veg diet,21 patient (70%) were having both veg and non veg(mix) in their diet. It can be said from the above data that patients taking mixed diet are more prone to develop diabetic retinopathy. As having Mansa sevan leads to mansa and medodushti.
- **Economical status**- Out of 30 patients included 6 patients (20%) were belonging to lower class,16 patient (53.3%) was belonging to middle class,8 patients (26.7%) were belonging to upper class. As this study is

carried out on the small sample size,firmly it cannot be said that middle class patients having more prevalence.But also it can be give a thought that stress,hurries,worries of the middle class to meet their family needs may induced the stress leading to the process of the disease.

- **Prakurti** - Out of 30 patients included 14 patients (46.7%) were belonging to kapha-pitta prakurti,2 patients (6.67%) were belonging kapha vata prakurti,5 patients (17%) were belonging to pitta kapha prakurti.7 patients (23%) were belonging to pitta vata prakurti, 2 patients (6.67%) were belonging to Vata pitta prakurti.The survey states that patients of Kapha pitta and secondly pitta vata are more prone to this disease.

Discussion of literary view –

Discussion on Tritiya chaturtha patalgat doshdushti and Npdr with its signs,symptoms,treatment is already done in literary view.

In 30 patients,different combinations were found of hetus.But mostly *Aahar-Vihar* such as *madhur rasa sevan,Mansasevan,*Sedentary lifestyle,not doing physical work, and some were having stress, Excessive intake of heavy , unctuous & new cereals,newly made fruit wines.Also Sedentary –luxurious lifestyle,not undergoing any kind of any de-toxification of body,obesity were mainly responsible for Dosha prakopa.

- *Nidana –Aharaj,Viharaj,*manas three are responsible for the disease formation.Among above three,***Ahar*** is the important factors .*Tridoshas ,Sevan dhatus* are created ,maintained and are destroyed by this ahara only.*Kulatha, masha,abhishandi ahar* like curd etc are harmful for our eyes.*Sukta, Arnala vidahi ahara*, baked items,over cooked items ,fried items,maansa sevan (meat,fish) are also harmful fo the eyes. Also preserved food items, tinned foods,alcohol like vihahi results into formation of *Kleda,Ama*,vitiation of *doshas and dhatu dushti*.All becauseof this abhisyanda is developed which is the root of *Tritiya chaturtha patalgat dosh dushti*.
- ***Vihara***- Keeping awake at night and day time sleeping *(diwaswap)* causes *sthansanshraya* in eyes. Smoking,drinking is harmful for eyes.Also improper *dhoompana* vitiate pitta and causes imbalance of other doshas also increasing its Tikshna,Ushna and laghu gunas.Sudden variation in the body due to cold water bath causes vitiation of doshas and eye diseases in particular.Vessels get dilated and there is increase in volume of fluids when the body is too hot.But when the temperature of the body dropped suddenly,the constriction of vessels occurs and they may get blocked;causing micro circulatory disturbances.Also it hampers to micro nunutrition of the tissues leading to eye diseases.

Supperession of natural urges i.e*Vegavidharana* vitiates direcly vata,resulting in many diseases.There are 14 urges,among them if *Nidra and ashru* have direct connection with the eye .*Kasa,Kshavathu,Jrimbha*etc are capable of developing eye diseases,five type of Vata are associated with these urges.When the action of these Vta becomes pratiloma due to the action of vegas,then according to the samnya samprapti,doshas are carried to the eyes.

Ocupation- It is the main cause of *doshdushti*.Due to the sedentary jobs,nearby work,stressful life,no exercise,diwaswap of house wives and retired persons,night duties of some private workers may cause Vikruti of *kleda,Kapha and sanchiti of dushta Meda*.

- *Manasa*- The most important cause of this disease is mental stress.Nidanarthak karan of *Netra rogas are kopa,shoka,Klesha*.This inducs stress to the mind and the body.Activation of various mediators of cellular response under stress and metabolic disturbances turns and results into Diabetic mellitus and ocular manifestations.

- ***Samprapti*** –

HETU SEVAN

⇓

PRAMEHA

⇓

KAPHA	*PITTA*	*VATA*
(DRAVA GUNATMAK)	*(USHNA GUNATMAK)*	*(ROOKSHA GUNATMAK)*

⇓

STHAN SANSHRAYA (AKSHI)

⇓

(INDRIYA PRADOSHA) CHAKSHUGAT STHAN DUSHTI

⇓

ACCORDING TO SAMANYA SAMPRAPTI OF NETRAROGA

⇓

TRITIYA-CHATURTHA PATAL BHAGI DOSH SANCHITI

⇓

STHANIK SIRA VIKRUTI (SIRA ABADDHA)

⇓

STHANIK SIRA VIKRUTI (SIRA ABADDHATA DUE TO KAPHA & MEDA)

⇓

DOSH *DOSH* *DOSH*

(VATA+KAPHA+MEDA) *(PITTA+KAPHA+MEDA)* *(VATA+PITTA+MEDA)*

⇓⇓⇓

SIRAGAT KARSHAN *SIRAGAT BHED* *NAVSIRA NIRMAN*

(THINNNING OF HAEMORAHAGE) *(RETINALVESSELS)* *(FORMATION OF NEWVESSELS)*

⇓⇓⇓

SIRAGAT *RAS-RAKT SNEHA*

VYASCHINIRMITTI *STRAVAN*

FORMS

(ANEURYSM) *(EXUDATES)*

↓↓↓

FORMS↓

NON PROLIFERATIVE DR *PROLIFERATIVE DR*

Therapeutic effectof Basti –

Delivering drug to the Tritiya chaturtha patal i.e posterior segment of eye been a challenging.Due to its immunological,anatomical and physiological properties to protect th eye.Trans-scleral,other tropical routes are used in posterior segment drug delivery,but they have their own limitations such as Blood retinal barrier (BRB) and Blood Aqueous Barrier(BAB). This delivery route has two major shortcomings i.e extremely poor bioavailability & short duration of action to inner coat of posterior segment.Oral route too has its own limitations such as low drug doses,due to gastric enzymes certain degradation of drugs,poor availability to the neural -ocular tissues.Currently used routes of drug administration to treat posterior segment diseases effectively are periocular(sub tenon's injection) and intraocular(intravitreal injection)routes.Intraocular drug delivery is most invasive and also involves penetrating the globe,thus has complicatiions.Comparatively,Basti prove to be effective way of therapy to treat posterior segment diseases of eye*(Tritiya chaturthapatalgat doshdushti)*.It has all properties to increase the drug permeation to ocular tissues and CNS.Through proper emulsification drug ionization,lipophilicity,molecular weight,pH & transit time of drugs are factors which influences bioavailability and absorption to the ocular tissues.In ocular conditions,Basti treatment meets all these properties

with unique anatomical characteristic of large surface area which deliver most of the drug to posterior segment of eye for therapeutic effect.Both *Shodhana and Shaman* is done by *Basti*,also with enhancement of nutritional status of dhatus in body (also applicable to dhatus or patalas in eye).Behind action of basti,stimulation of autonomic nervous system may be possible mechanism.With the colon specific drug delivery system(CSDDS) & strategies required for CNS drug delivery,there is close resemblance between *Basti* pharmacological actions.Described by moderm pharmacologists,methods like carrier drug delivery,prodrug,drug manipulation by lipophilic analogs and osmotic blood brain barrier disruption or Blood retinal barrier disruption strategies;fully compliment with classical Basti procedure.Hence Basti given new dimension in treating posterior segment disorder Non proliferative diabetic retinopathy.

- **PROBABLE MODE OF ACTION OF DRUGS-**

The drugs involved in the formation of MESHASHRUNGYADI BASTI' possess *DIPAN,PACHAN,KLEDAGNA,MEDOGHNA,RASAYAN,CHAKSHUSHYA,PRAMEHAGNA property. Overall effect of drug is Tridosha shamak* with *tikta kashay ras* predominantly.

In Diabetic patient there is metabolic disturbance. The drugs by its dipan, pachan property will correct the metabolism in the diabetic patient. i.e ultimately will help to improve *JATHARAGNI and DHATWAGNI. Tikta-Kashaya ras* will absorb the excess kleda from the dhatu and will helps to decrease the dhatushaithilya. Correction of metabolism and decrease in Dhatushaithilya will helps to improve health of dhatu. *Medogna* or dislipidemic property of drug will arrest further medodushti. Improved medo dhatu will give bala to blood vessels of body and ultimately retinal blood vessels. As Acharya Vagbhata said that siras are made from medo dhatu.*Guduchi, Aamalaki,Musta* has majjagamitwa property also drug has *laghu gunadhikya*,reaching upto retina of eye and act on it.*Meshashrungi,haritaki,aamalaki,guduchi has pramehagna* property.*Amalaki,musta has kledanashak,*while *musta,shatavari,patol* works on *rasa dhatu pachan ana rasa dhatu prasadhan;varun,musta is raktadoshahar* property.According to *Charak,Chakradatta Saidhav is Chakshushya*.According to Chakradatta,Madhu is Chakshushya,also has Anti-oxidants. Drug has *Tridoshamak*property so shaman of vata will arrest the further growth of micro aneurysm, pitta shaman prevent haemorrhage from bloodvessel.Kaphashaman reduce formation of exudate.By Rasayan and chakshushya property the drug will give strength to the body as well as eyes.The *Meshashrungyadi Basti* contains *Meshashrungi, Musta, haritaki, Amalaki, Bibhitaki, Guduchi, Vasa, Varun, Patol, Shatavari as kwath, shatapuspa as kalka and Madhu, saindhav and Til tel (seasame oil) as sneha.* These drugs collectively act as hypoglycemic, dyslipidemic, antioxidant, *chakshushya, medoghna, rasapachak, dipan, pachan, mastishka shamak, daahprashmana, rasayana*, anti-inflamatory.

DRUGS	CHAKSHUSHYA	DIPAN	PACHAN	ANTIOXIDANT	HYPO GLYCEMIC	DYSLIPIDEMIC
MESHA SHRUNGI	_	✓	✓	✓	✓	✓
MUSTA	_	✓	✓	_	✓	✓
AAMALAKI	✓	✓	✓	✓	✓	✓
HARITAKI	✓	✓	✓	✓	✓	✓
BIBHITAKI	✓	✓	_	✓	_	_
GUDUCHI	_	_	✓	✓	✓	✓
SHATAVARI	✓	_	_	✓	_	_
VASA	✓	_	_	✓	_	_
VARUN	_	_	_	✓	_	_
PATOL	✓	✓	✓	_	_	_
MADHU	✓	✓	_	✓	_	_
SAINDHAV	✓	✓	✓	_	_	_
TIL	_	✓	✓	✓	_	_
SHATPUSHPA	✓	✓	_	_	_	_

RASA –

DRUGS	MADHUR	AMLA	KATU	TIKTA	KASHAY	LAVANA
MESHA SHRUNGI	_	_	_	✓	✓	_
MUSTA	_	_	✓	✓	✓	_
AAMALAKI	✓	✓	✓	✓	✓	_
HARITAKI	✓	✓	✓	✓	✓	_
BIBHITAKI	_	_	_	_	✓	_
GUDUCHI	_	_	_	✓	✓	_

SHATAVARI	✓	_	_	✓	_	_
VASA	_	_	_	✓	✓	_
VARUN	_	_	_	✓	_	_
PATOL	✓	_	_	✓	_	_
MADHU	✓	_	_	_	✓	_
SAINDHAV	✓	_	_	_	_	✓
TIL	✓	_	_	✓	✓	_
SHATPUSHPA	_	_	✓	✓	_	_

GUNA AND DOSHASHAMAN

DRUGS	VATA	PITTA	KAPHA	LAGHU	RUKSHA	SNIGDHA
MESHA SHRUNGI	✓	_	✓	✓	_	✓
MUSTA	_	✓	✓	✓	✓	_
AAMALAKI	✓	✓	✓	✓	✓	_
HARITAKI	✓	✓	✓	✓	✓	_
BIBHITAKI	_	_	✓	✓	✓	_
GUDUCHI	✓	✓	✓	✓	_	✓
SHATAVARI	✓	✓	_	_	_	✓
VASA	_	✓	✓	✓	✓	_
VARUN	✓	_	✓	✓	✓	_
PATOL	✓	✓	✓	✓	_	_
MADHU	✓	_	_	✓	✓	_
SAINDHAV	✓	✓	✓	✓	_	✓
TIL	_	✓	✓	✓		_
SHATPUSHPA	✓	_	✓	✓	✓	_

VEERYA

DRUGS	USHNA	SHITA
MESHASHRUNGI	✓	
MUSTA	_	✓
AAMALAKI	_	✓
HARITAKI	✓	_
BIBHITAKI	✓	_
GUDUCHI	✓	_
SHATAVARI	_	✓
VASA	_	✓
VARUN	✓	_
PATOL	✓	✓
MADHU	_	✓
SAINDHAV	_	✓
TIL	✓	_
SHATPUSHPA	✓	_

Effect of Therapy on symptoms –

- 86.21% & 94.44 % of patients having microanuerysm in right and left eye respectively got relief.Hence it can besaid that it got significantly marked relief.
- 67.50% &77.78% of patients having Dot & Blot Haemorrhages in right and left eye respectively got relief. Hence it can be said that it got significantly moderate relief.
- 26.42% & 22.45% of patients having Soft exudates in right and left eye respectively got relief. Hence it can be said that it got mild significantly relief.
- Among them only 1 patient in right eye & 2 patient in left eye was having symptom of cotton wool spots, from that 1 patient of right eye & 2 patients in left eye with Cotton wool spots got insignificant relief i.e 0.00% relief.
- Among 30 them only 1 patient in right eye was having symptom of CSME,from that 1 patient with CSME got insignificant relief i.e 0.00% relief.

CONCLUSION

CONCLUSION –

Conclusion is a judgement or settlement or arrangement arrived after several considerations.Based on the results of the clinical study and discussion on the results the conclusion drawn are as follows –

- Tritiya Chaturtha patalgat doshadushti can be compared to non proliferative Diabetic retinopathy,on the basis of having similar samprapti & srotodushti rather than symptoms of the disease.
- The present study of Meshashrungyadi basti concluded that the basti is effective in treating and controlling symptoms of of Npdr according to the statistical analysis.
- To conclude the results obtained-

  Drugs exert significant effect on the symptoms if the diabetic retinopathy.

  Per Patient wiserelief got significantly in micro aneurysms, dot & blot haemorrhage and soft exudate, nDistance vision,Blood sugar level.Patient wise study concluded that Meshashrungyadi basti overall effect of therapy gives moderate relief in Non proliferative diabetic retinopathy ,when all symptoms are included.
- Drug gives 86.21 % in right eye & 94.44 % in left eye relief for micro aneurysms, 67.50 in right eye & 77.78 % in left eye relief for Dot & blot haemorrhages, 26.42% relief in right eye & 22.45% in left eye for soft exudates.
- Meshashrungyadi basti exerts positive marked effect on the symptoms of Npdr as Wilcoxan Signed rank test & Student t paired test is significant.
- Overall effect of Therapy Statistical Analysis for Subjective parameters (Distance vision with & without spectacles of both eyes, BSL fasting & Postprandial) according to Student paired t test are significant.
- Overall effect of Therapy Statistical Analysis for Objective parameters (Micro-anuerysm,Dot & Blot Haemorrhages,Soft exudate for both eyes) according to Wilcoxan Test are significant.
- Hence we can conclude that when overall effect of therapy is concerned,Meshashrungyadi Basti is effective in Non-proliferative Diabetic Retinopathy.

SCOPE FOR FURTHER STUDY-

- As these results are obtained are limited to very small population & so the study should carried out in large number of population.
- Study can be conducted for longer duration, to know the long lasting results.
- With help of new advanced technique in the modern medical science,study must be done to see the drug effect on the Proliferative diabetic retinopathy.

SUMMARY

SUMMARY-

The present dissertation entitled **"AN OPEN CLINICAL STUDY OF MESHASHRUNGYADI BASTI IN TRITIYA-CHATURTHA PATALGAT DOSHDUSHTI WITH SPECIAL REFERENCE TO NON-PROLIFERATIVE DIABETIC RETINOPATHY"** was undertaken to evaluate the efficacy of Meshashrungyadi basti in Tritiya Chaturtha patalgat doshdushti.

INTRODUCTION-

In this chapter of introduction, elaborated the importance of selection of the topic i.e Non proliferative diabetic retinopathy in present era.Its management,importance of eyes ,need of ayurvedic management for Non proliferative diabetic retinopathy with reasons behind selection of Meshashriungyadi basti are explained.

AIMS AND OBJECTIVES –

This chapter contains the Aims and objectives of the study.

REVIEW OF LITERATURE –

- Review of previous workdone are mentioned in this chapter.
- Review of disease contains ,Review of vyadhi,Sankhya samprapti of netrarog,Sharirrachna,Sharirkripa,nidan,purvaroop,roopa,samprapti,sadhy asashyatva,chikitsa of Tritiya chaturtha doshdushti,Modern review of Npdr,anatomy of the eyeball

Materials and methods-

Materials and methods include preparation procedure of Meshashrungyadi basti ,research design,sampling,inclusion & exclusion criteria,assessment criteria,30 patients included in study.1 anuvsan and 2 niruha followed respectively given for 1 week and 1 week gap .duration of tudy -3 months,4 cycles of basti given.

Assessment of subjective parameters(visual acuity,blood sugar lever) and objective criteria(micro aneurysms,dot and blot ,soft exudates,cotton wol spots and csme)was done on 0 day,4th week,8 th week and 12th week.

Observation and results –

The observation and results were tabulated and statistically analysed.

Respons to the treatment was assessed based on above parameter BT and AT.

The effect of treatment statistically evaluated

Variables subjected to Wilcoxon signed rank test nd student paired t test.

DISCUSSION-

Discussion was done on observation and results.

CONCLUSION –

In this chapter conclusion was drawn on the basis of the observations and data analysis

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ABBREVIATIONS

Abbreviations	FULL FORM
AGEs	Advanced Glycation end product
BSL	Blood Sugar level
DM	Diabetes Mellitus
DR	Diabetic Retinopathy
ETDRS	Early Treatment of Diabetic Retinopathy Study
FAZ	Foveal Avascular Zone
FFA	Fundus Flourescein Angiography
HbA1C	Glycated haemoglobin
HDL	High density lipoprotein
HRCs	
IDDM	Insulin dependent Diabetic mellitus
IRMA	Intra-retinal microvascular abnormilities
NADP	Nicotinamide adenine dinucleotide phosphate
NIDDM	Non –insulin dependent diabetic mellitus
NVD	New vessels on disc
NVE	New vesssels elsewhere
NPDR	Non proloferative diabetic retinopathy
PKC	Protein kinace C
PDR	Proliferative Diabetic retinopahy
PPDR	Pre proliferative diabetic retinopathy
TNF-alpha	Tumor necrosis factor
UDP-GlcNAc	uridine diphosphate N acetylglucosamine
VEGF	Vascular Endothelial growth factor
WHO	World Health Organisation
YAG	Yttrium aluminum Garnet

सुउ	सुश्रुतउत्तरतंत्र
सुसू	सुश्रुतसूत्रस्थान
वा उ	वाग्भट उत्तरस्थान
भाप्र	भावप्रकाश

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CASE RECORD FORM (CRF) FOR DISSERTATION :-

Proforma for **"AN OPEN CLINICAL STUDY OF MESHASHRUNGYADI BASTI IN TRITIYA-CHATURTHA PATALGAT DOSHDUSHTI WITH SPECIAL REFERENCE TO NON-PROLIFERATIVE DIABETIC RETINOPATHY."**

Case No. :-

OPD No. :-

Patient Name :-

Age/Sex :-

Height :-

Religion :-

Occupation :-

Education :-

Socio-economic status :-

Prakriti :-

Aahar-vihar :-

Postal Address :-

Date of commencement of trial :-

Date of completion/withdrawal/dropout :-

Present illness :-

Past history :-

1. Past Illness
2. Previous eye disorder
3. DM/HTN/Drug Allergy

Ashtavidha Parikshan –

Nadi

Mala

Mutra

Jivha

Druk

Shabda

Aakruti

Sparsh –

Ophthalmic Examination :

RT LT

1. Eyelids
2. Eye Lashes
3. Conjuctiva
4. Sclera
5. Iris
6. Cornea
7. A.C.
8. Pupil
9. Lens
10. Vision Dist Near

    With pin hole

    With glass
11. Slit Lamp examination
12. Fundus examination by

D/O or I/O or fundus camera

13. Fundus photograph
14. Investigation
15. OCT –
16. FFA-
17. Follow up chart

Sr. No.	Signs	Observation in gradation			
		0 day	4 weeks	8 weeks	12 weeks
1	Micro-aneurysm				
2	Dot and blot hemorrhages				
3	Soft exudates				
4	Cotton wool spots				
5	CSME & maculopathy				

Signature of Guide Signature of Student

INFORMED WRITTEN CONSENT SHEET :-

E-mail Id :

Phone no. :

Name of the Subject :

Date of birth :

Age/Sex :

Full Address :

Telephone no. :

Purpose of the trial –

To study the clinical efficacy of Meshashrungyadi Basti in (Non-proliferative) Diabetic Retinopathy.

Procedure to be followed –

In this trial, you will be examined at above said intervals. The Meshashrungyadi basti (1 ANUVASAN and 2 NIRUHA followed respectively for 1 week, with 1 week gap . Follow up weekly .And observation will be done after one month and Investigations will be done as per requirement. Fundus photograph will be taken at '0' stage and at every follow up.

Risk –

If any adverse reaction or intolerance is seen, the dose will be reduced or stopped.

Benefits –

It may improve your conditions. Of course, this can't be guaranteed or promised and you may not receive the active experiment treatement. Your participation in this trial will contribute in the enhancement of medical sciences and will help in providing scientific knowledge for the betterment of mankind.

Confidentiality and records –

Your medical records related to you trial will be maintained in confidentiality. If any problem develops you can contact. If any serious problem develops, you will receive prompt and appropriate medical attention.

Obtaining information –

You are encouraged to ask any question that occurs to you at this time or to ask question at any time during your participation in the trial. You will be given a copy of this agreement. If you desire more information at a later date can be given.

Right to withdrawal from the trial –

You have right to withdraw from the study at any time without giving any reason for doing so and it will not affect further management of your disease in any way in future.

Name and sign/Thumb impression of the Subject/legally acceptable relative.

Name and Sign/Thumb impression of Witness

Name and Sign of Investigator

MASTER CHARTS

MASTER CHART OF NPDR

SR. NO	REGISTRATION NO	AGE	GENDER	RELIGION	OCCUPATION	FAMILY HISTORY	SOCIO ECONOMIC STATUS	DIET	PRAKURTI
1	73450	48	MALE	HINDU	BUSSINESS	N	UPPER	MIX	PV
2	17407	66	FEMALE	HINDU	HOUSEWIFE	N	MIDDLE	VEG	KV
3	42304	48	FEMALE	HINDU	HOUSEWIFE	Y	MIDDLE	MIX	KP
4	17674	48	MALE	HINDU	SECURITY	N	LOWER	MIX	PV
5	33433	53	FEMALE	HINDU	HOUSEWIFE	Y	UPPER	VEG	KP
6	65667	54	FEMALE	HINDU	SERVICE	N	UPPER	VEG	KP
7	40056	48	MALE	HINDU	SERVICE	N	MIDDLE	MIX	VP
8	40327	65	MALE	HINDU	RETIRED	N	MIDDLE	VEG	KP
9	39844	50	FEMALE	HINDU	HOUSEWIFE	N	MIDDLE	MIX	PV
10	28655	63	FEMALE	HINDU	RETIRED	Y	MIDDLE	VEG	PK
11	47590	54	FEMALE	MUSLIM	HOUSEWIFE	Y	LOWER	MIX	KP
12	73080	47	MALE	BUDDHIST	SECURITY	N	LOWER	MIX	VP
13	17107	50	FEMALE	HINDU	HOUSEWIFE	N	UPPER	MIX	KP
14	21636	53	FEMALE	MUSLIM	OTHER	N	MIDDLE	MIX	KP
15	32855	47	MALE	HINDU	SERVICE	N	MIDDLE	VEG	PK
16	84341	50	MALE	HINDU	OTHER	N	UPPER	VEG	KP
17	47428	45	MALE	HINDU	SERVICE	N	MIDDLE	MIX	KP
18	56298	53	FEMALE	HINDU	SERVICE	N	MIDDLE	MIX	PV
19	57468	50	MALE	HINDU	SERVICE	N	MIDDLE	MIX	PV
20	22807	59	MALE	HINDU	OTHER	N	MIDDLE	VEG	PK
21	560	48	MALE	HINDU	SERVICE	N	MIDDLE	VEG	KP
22	54428	59	MALE	HINDU	OTHER	Y	UPPER	VEG	KP

23	39157	38	MALE	HINDU	SERVICE	N	MIDDLE	VEG	PK
24	13613	51	FEMALE	HINDU	HOUSEWIFE	N	LOWER	VEG	PK
25	23887	60	MALE	HINDU	OTHER	N	LOWER	MIX	KP
26	13613	51	FEMALE	HINDU	HOUSEWIFE	Y	UPPER	VEG	PK
27	66949	50	MALE	HINDU	OTHER	N	UPPER	MIX	KV
28	3208	58	MALE	HINDU	RETIRED	N	MIDDLE	MIX	KP
29	14989 A	42	FEMALE	HINDU	SERVICE	N	LOWER	VEG	KP
30	67686	62	FEMALE	HINDU	RETIRED	N	MIDDLE	VEG	PK

SUBJECTIVE PARAMETERS

UAVA Using Snellen's chart

Sr.no	RIGHT EYE				LEFT EYE			
	0 DAY	4 WEEKS	8 WEEKS	12 WEEKS	0 DAY	4 WEEKS	8 WEEKS	12 WEEKS
1	0.3	0.3	0.5	0.5	0.3	0.3	0.5	0.5
2	0.2	0.2	0.2	0.25	0.25	0.25	0.25	0.25
3	0.2	0.2	0.2	0.3	0.05	0.05	0.05	0.05
4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
5	0.25	0.3	0.3	0.7	0.3	0.5	0.5	0.7
6	0.25	0.25	0.3	0.5	0.25	0.3	0.3	0.5
7	0.7	0.7	0.7	1.0	0.3	0.3	0.5	0.7
8	0.05	0.05	0.05	0.1	0.05	0.05	0.1	0.1
9	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.25
10	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
11	0.2	0.2	0.2	0.2	0.3	0.3	0.5	0.7
12	0.3	0.3	0.3	0.3	0.5	0.5	0.5	0.5
13	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
14	0.2	0.2	0.25	0.25	0.2	0.2	0.2	0.25
15	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
16	0.25	0.25	0.25	0.25	0.25	0.25	0.3	0.3

17	0.3	0.3	0.3	0.7	0.3	0.3	0.7	0.7
18	0.2	0.3	0.3	0.5	0.2	0.25	0.25	0.3
19	0.3	0.3	0.3	0.3	0.5	0.5	0.5	0.5
20	0.3	0.3	0.7	0.7	0.3	0.3	0.3	0.7
21	0.2	0.25	0.3	0.3	0.7	0.7	0.7	0.7
22	0.2	0.2	0.2	0.2	0.25	0.25	0.3	0.3
23	0.3	0.3	0.5	0.5	0.7	0.7	1.0	1.0
24	0.2	0.2	0.2	0.25	0.2	0.2	0.2	0.2
25	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
26	0.2	0.2	0.25	0.25	0.3	0.3	0.3	0.3
27	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
28	0.2	0.2	0.2	0.25	0.3	0.3	0.7	0.7
29	0.3	0.3	0.3	0.5	0.3	0.3	0.5	0.5
30	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.7

PATIENT WISE BEFORE AFTER CHART (Using UAVA Snellen's Chart)

Distance vision without spectacles

SR.NO	**RIGHTEYE**		**LEFTEYE**	
	BEFORE TREATMENT	**AFTER TREATMENT**	**BEFORE TREATMENT**	**AFTER TREATMENT**
1	0.3	0.5	0.3	0.5
2	0.2	0.25	0.25	0.25
3	0.2	0.3	0.05	0.05
4	0.5	0.5	0.5	0.5
5	0.25	0.7	0.3	0.7
6	0.25	0.5	0.25	0.5
7	0.7	1.0	0.3	0.7
8	0.05	0.1	0.05	0.1
9	0.3	0.3	0.2	0.25
10	0.3	0.3	0.3	0.3

11	0.2	0.2	0.3	0.7
12	0.3	0.3	0.5	0.5
13	0.7	0.7	0.7	0.7
14	0.2	0.25	0.2	0.25
15	0.7	0.7	0.7	0.7
16	0.25	0.25	0.25	0.3
17	0.3	0.7	0.3	0.7
18	0.2	0.5	0.2	0.3
19	0.3	0.3	0.5	0.5
20	0.3	0.7	0.3	0.7
21	0.2	0.3	0.7	0.7
22	0.2	0.2	0.25	0.3
23	0.3	0.5	0.7	1.0
24	0.2	0.25	0.2	0.2
25	0.2	0.2	0.2	0.2
26	0.25	0.3	0.3	0.3
27	0.7	0.7	0.7	0.7
28	0.2	0.25	0.3	0.7
29	0.3	0.5	0.3	0.5
30	0.2	0.3	0.3	0.7

DISTANCE VISION WITH SPECTACLES

	RIGHTEYE (with specs)		**LEFTEYE(with specs)**	
	BEFORE TREATMENT	**AFTER TREATMENT**	**BEFORE TREATMENT**	**AFTER TREATMENT**
1	0.7	1.0	0.7	1.0
2	0.3	0.7	0.5	0.7
3	0.3	0.7	0.1	0.1
4	0.7	0.7	1.0	1.0

5	0.5	0.7	0.7	0.7
6	0.5	0.7	0.5	0.7
7	1.0	1.0	0.7	1.0
8	0.2	0.25	0.2	0.25
9	0.5	0.7	0.7	0.7
10	0.7	0.7	0.7	0.7
11	0.25	0.25	0.5	0.7
12	1.0	1.0	1.0	1.0
13	1.0	1.0	1.0	1.0
14	0.3	0.5	0.3	0.5
15	1.0	1.0	1.0	1.0
16	0.7	0.7	0.7	0.7
17	0.7	1.0	0.7	1.0
18	0.5	0.7	0.5	0.7
19	0.7	0.7	0.7	0.7
20	0.7	0.7	0.7	0.7
21	0.3	0.5	0.7	1.0
22	0.25	0.3	0.3	0.5
23	0.7	0.7	1.0	1.0
24	0.3	0.5	0.5	0.5
25	0.25	0.3	0.3	0.3
26	0.3	0.7	0.7	0.7
27	0.7	1.0	1.0	1.0
28	0.3	0.5	0.7	0.7
29	0.7	0.7	0.7	0.7
30	0.3	0.5	0.5	0.7

NEAR (JAEGGER CHART)

SR.NO	RIGHTEYE		LEFTEYE	
	BEFORE TREATMENT	AFTER TREATMENT	BEFORE TREATMENT	AFTER TREATMENT
1	0.5	0.5	0.5	0.5
2	0.1	0.1	0.1	0.1
3	0.1	0.1	0.1	0.1
4	0.5	0.5	0.5	0.5
5	0.25	0.25	0.3	0.3
6	0.25	0.25	0.25	0.25
7	0.5	0.5	0.5	0.5
8	0.1	0.1	0.1	0.1
9	0.3	0.3	0.25	0.25
10	0.1	0.1	0.1	0.1
11	0.5	0.5	0.5	0.5
12	0.3	0.3	0.3	0.3
13	0.25	0.25	0.3	0.3
14	0.3	0.3	0.25	0.25
15	0.3	0.3	0.5	0.5
16	0.25	0.25	0.3	0.3
17	0.3	0.3	0.3	0.3
18	0.25	0.25	0.25	0.25
19	0.25	0.25	0.25	0.25
20	0.1	0.1	0.1	0.1
21	0.25	0.25	0.25	0.25
22	0.1	0.1	0.1	0.1
23	0.5	0.5	0.5	0.5
24	0.25	0.25	0.3	0.3
25	0.1	0.1	0.1	0.1

26	0.3	0.3	0.25	0.25
27	0.25	0.25	0.25	0.25
28	0.1	0.1	0.1	0.1
29	0.5	0.5	0.5	0.5
30	0.1	0.1	0.1	0.1

BLOOD SUGAR LEVEL

Sr.no	**BSL (FASTING)**				**BSL (POST PRANDIAL)**			
	0 DAY	**4 WEEKS**	**8 WEEKS**	**12 WEEKS**	**0 DAY**	**4 WEEKS**	**8 WEEKS**	**12 WEEKS**
1	120	122	110	107	190	178	176	152
2	77	90	86	77	195	190	173	175
3	152	160	155	138	238	200	176	164
4	112	121	105	109	135	130	137	131
5	125	112	118	118	146	150	144	142
6	128	126	130	122	170	174	180	174
7	107	112	108	104	150	152	148	145
8	76	82	79	76	138	135	130	134
9	121	118	120	122	135	138	134	136
10	138	134	130	128	126	132	129	124
11	140	138	140	136	188	188	180	176
12	122	120	118	118	165	164	160	156
13	115	110	123	117	178	165	170	160
14	130	131	118	118	140	138	142	136
15	138	130	126	122	174	165	161	154
16	90	98	94	92	135	132	126	128
17	124	120	112	100	126	130	134	123
18	86	90	88	88	118	120	122	116
19	126	118	115	109	155	152	154	148
20	132	126	128	116	165	168	159	150

21	130	136	138	132	190	188	182	174
22	125	130	126	122	186	180	168	162
23	98	92	94	86	135	137	134	134
24	128	132	124	120	145	149	142	146
25	150	146	152	128	172	170	166	164
26	108	104	106	100	146	142	140	139
27	128	122	116	90	138	138	126	122
28	123	126	132	124	144	150	156	146
29	139	161	140	126	178	250	174	176
30	101	118	126	120	126	124	150	149

BLOOD SUGAR LEVEL(FASTING)

SR.NO	**BEFORE TREATMENT**	**AFTER TREATMENT**
1	120	107
2	77	77
3	152	138
4	112	109
5	125	118
6	128	122
7	107	104
8	76	76
9	121	122
10	138	128
11	140	136
12	122	118
13	115	117
14	130	118
15	138	122
16	90	92

17	124	100
18	86	88
19	126	109
20	132	116
21	130	132
22	125	122
23	98	86
24	128	120
25	150	128
26	108	100
27	128	90
28	123	124
29	139	126
30	101	120

BLOOD SUGAR LEVEL (POST PRANDIAL)

SR.NO	BEFORE TREATMENT	AFTER TREATMENT
1	190	152
2	195	175
3	238	164
4	135	131
5	146	142
6	170	174
7	150	145
8	138	134
9	135	136
10	126	124
11	188	176
12	165	156

13	178	160
14	140	136
15	174	154
16	135	128
17	126	123
18	118	116
19	155	148
20	165	150
21	190	174
22	186	162
23	135	134
24	145	146
25	172	164
26	146	139
27	138	122
28	144	146
29	178	176
30	126	149

OBJECTIVE PARAMETERS –

Sr.no	**MICRO ANEURYSMS (RIGHT EYE)**				**MICRO ANEURYSMS(LEFT EYE)**			
	0 DAY	**4 WEEKS**	**8 WEEKS**	**12 WEEKS**	**0 DAY**	**4 WEEKS**	**8 WEEKS**	**12 WEEKS**
1	0	0	0	0	0	0	0	0
2	0	0	0	0	1	1	0	0
3	1	1	0	0	0	0	0	0
4	1	1	0	0	0	0	0	0
5	0	0	0	0	1	1	1	0
6	0	0	0	0	1	1	0	0

7	2	1	1	0	1	1	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	2	2	1	1	1	1	1	0
12	0	0	0	0	1	1	0	0
13	1	1	1	1	0	0	0	0
14	2	2	1	0	0	0	0	0
15	3	2	2	1	1	1	1	0
16	3	3	1	0	2	1	0	0
17	2	2	1	0	3	3	2	1
18	0	0	0	0	1	1	0	0
19	2	2	1	0	0	0	0	0
20	1	1	0	0	1	1	1	0
21	4	4	2	1	0	0	0	0
22	0	0	0	0	0	0	0	0
23	1	1	0	0	0	0	0	0
24	1	1	1	0	1	1	0	0
25	0	0	0	0	0	0	0	0
26	1	1	0	0	1	1	1	0
27	1	1	0	0	1	1	0	0
28	0	0	0	0	0	0	0	0
29	2	2	2	1	1	1	0	0
30	0	0	0	0	0	0	0	0

Sr.no	DOT & BLOT HAEMORRHAGES (RIGHT EYE)				DOT & BLOTHAEMORRHAGES (LEFT EYE)			
	0 DAY	4 WEEKS	8 WEEKS	12 WEEKS	0 DAY	4 WEEKS	8 WEEKS	12 WEEKS
1	3	3	2	1	3	2	1	1
2	0	0	0	0	0	0	0	0
3	3	2	2	1	2	2	1	0
4	0	0	0	0	2	2	1	1
5	2	2	1	1	1	1	1	0
6	1	1	1	0	0	0	0	0
7	1	1	1	1	0	0	0	0
8	2	2	1	0	3	2	2	1
9	1	1	1	0	2	1	1	0
10	3	3	2	1	3	2	1	0
11	0	0	0	0	0	0	0	0
12	2	2	1	0	0	0	0	0
13	0	0	0	0	1	1	1	1
14	1	1	0	0	1	1	1	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	1	1	1	0
17	0	0	0	0	1	1	0	0
18	2	2	1	1	0	0	0	0
19	0	0	0	0	0	0	0	0
20	2	2	2	1	0	0	0	0
21	4	4	3	2	0	0	0	0
22	3	3	3	2	2	2	1	1
23	1	1	1	0	0	0	0	0
24	1	1	0	0	0	0	0	0
25	3	2	2	1	4	3	3	2

26	1	1	0	0	0	0	0	0
27	0	0	0	0	1	1	1	0
28	2	2	2	1	0	0	0	0
29	0	0	0	0	0	0	0	0
30	2	2	1	0	1	1	0	0

Sr.no	**SOFT EXUDATES(RIGHT EYE)**				**SOFT EXUDATES(LEFT EYE)**			
	0 DAY	**4 WEEKS**	**8 WEEKS**	**12 WEEKS**	**0 DAY**	**4 WEEKS**	**8 WEEKS**	**12 WEEKS**
1	3	3	3	3	2	2	1	1
2	3	3	3	2	3	3	2	2
3	3	3	3	1	2	2	1	1
4	2	2	1	1	2	2	2	2
5	2	2	2	2	2	2	2	2
6	1	1	1	1	2	2	2	1
7	0	0	0	0	0	0	0	0
8	0	0	0	0	2	2	2	2
9	2	2	2	2	1	1	1	1
10	3	2	1	1	3	2	1	1
11	2	2	2	1	1	1	1	1
12	3	3	3	2	2	2	2	2
13	1	1	1	1	0	0	0	0
14	2	2	2	2	3	3	2	2
15	3	3	3	2	2	2	2	2
16	2	2	1	1	2	2	2	1
17	2	2	2	2	2	2	2	1
18	0	0	0	0	1	1	1	1
19	1	1	1	1	1	1	1	1
20	1	1	1	1	3	3	2	2

21	3	3	2	2	0	0	0	0
22	3	3	3	2	2	2	2	2
23	1	1	1	1	0	0	0	0
24	1	1	1	1	0	0	0	0
25	3	3	2	2	3	3	3	3
26	1	1	1	0	1	1	0	0
27	1	1	1	1	1	1	1	1
28	1	1	1	1	2	2	2	2
29	2	2	2	2	2	2	2	2
30	2	2	2	2	2	2	2	2

Sr.no	**COTTON WOOL SPOTS(RIGHT EYE)**				**COTTON WOOL SPOTS(LEFT EYE)**			
	0 DAY	**4 WEEKS**	**8 WEEKS**	**12 WEEKS**	**0 DAY**	**4 WEEKS**	**8 WEEKS**	**12 WEEKS**
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	2	2	2	2
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	1	1	1	1	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	1	1	1	1

15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	1	1	1	1
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0

Sr.no	**CSME&MACULOPATHY(RIGHT EYE)**				**CSME&MACULOPATHY(RIGHT EYE)**			
	0 DAY	**4 WEEKS**	**8 WEEKS**	**12 WEEKS**	**0 DAY**	**4 WEEKS**	**8 WEEKS**	**12 WEEKS**
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0

9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	1	1	1	1	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0

PATIENT WISE RELIEF (IN PERCENTAGE) (RIGHT EYE)

SR.NO	**BEFORE TREATMENT**	**AFTER TREATMENT**	**BT - AT**	**PERCENTAGE %**
1	6	4	2	33.33
2	3	2	1	33.33
3	7	2	5	71.42

4	3	2	5	66.66
5	4	3	1	25
6	2	1	1	50
7	3	1	2	66.66
8	3	1	2	66.66
9	3	2	1	33.33
10	6	2	4	66.66
11	5	3	2	40
12	5	2	3	60
13	2	2	0	0
14	5	2	3	60
15	6	3	3	50
16	5	1	4	80
17	4	2	2	50
18	2	1	1	50
19	3	1	2	66.66
20	4	2	2	50
21	11	5	6	54.54
22	6	4	2	33.33
23	3	1	2	66.66
24	3	1	2	66.66
25	4	3	1	25
26	3	0	3	100
27	2	1	1	50
28	3	2	1	33.33
29	4	3	1	25
30	4	2	2	50

PATIENT WISE RELIEF (IN PERCENTAGE) (LEFT EYE)

SR.NO	BEFORE TREATMENT	AFTER TREATMENT	BT - AT	PERCENTAGE %
1	5	2	3	60
2	4	2	2	50
3	4	1	3	75
4	6	5	1	16.66
5	4	2	2	50
6	3	1	2	66.66
7	1	0	1	100
8	5	3	2	40
9	3	1	2	66.66
10	6	1	5	83.33
11	2	1	1	50
12	3	2	1	33.33
13	1	1	0	0
14	5	3	2	40
15	3	2	1	33.33
16	5	1	4	80
17	6	2	4	66.66
18	2	1	1	50
19	1	1	0	0
20	4	2	2	50
21	0	0	0	0
22	4	3	1	25
23	2	2	0	0
24	1	0	1	100
25	8	6	2	25
26	2	0	2	100
27	2	1	1	50

28	2	2	0	0
29	3	2	1	33.33
30	3	2	1	33.33