



## Research Article

### A COMPARATIVE CLINICAL STUDY TO EVALUATE THE EFFICACY OF *TRIPHALA CHOORNA* WITH *KRISHNADI ANJANA* AND *TRIPHALA CHOORNA* IN THE MANAGEMENT OF *TIMIRA* W.S.R. TO SENILE IMMATURE CATARACT

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**KEYWORDS:** *Timira*, Cataract, *Triphala choorna*, *Krishnadi varti anjana*.

#### ABSTRACT

**Background & Objectives:** *Timira* is one among the *Drishtigata nerta roga* explained by our ancient *Acharyas*. If proper care is not taken, *Timira* leads to *Kaca* which in turn to *Linganasha*. Any opacity in the lens or its capsule, whether developmental or acquired is called as cataract. There are no non-surgical measures which delay, prevent or reverse the development of cataract in conventional system of medicine; the only definite management is lens extraction once it reaches matured stage.

Objectives are to evaluate the efficacy of *Triphala choorna* with *Krishnadi anjana* and *Triphala choorna* in the management of *Timira* and to compare the clinical efficacies of both the groups.

**Methods:** A randomized clinical study was taken up. 40 patients of *Timira* were selected from OPD/IPD of the Shalakyatantra department of SKAMCH&RC, Bengaluru and made into two groups. Patients of Group A were treated with *Krishnadi varti anjana* along with *Triphala choorna* internally for 48 days. Patients of Group B were treated with *Triphala choorna* internally for 48 days. The effect of treatment was statistically analyzed using unpaired and paired student's 't'-test.

**Results:** The group with both *Krishnadi varti anjana* and *Triphala choorna* responded better when compared to the group with only *Triphala choorna* based on statistical analysis indicating the added effect of *Krishnadi varti anjana* in Group A.

**Interpretation and Conclusion:** *Krishnadi varti anjana* and *Triphala choorna* are the two effective modalities of treatment which can be adopted in *Timira* w.s.r. to senile immature cataract.

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#### INTRODUCTION

Ayurveda is the most ancient science of life and *Shalakyatantra* is one of the branches of *Ashtanga Ayurveda* which deals with the prevention and treatment of *Urdhwajatrugata rogas* including *netra*.

*Timira* is one among the *Drishtigata nerta roga* explained, if proper care is not taken leads to *Kaca* which in turn to *Linganasha*.<sup>[1]</sup> It can be correlated to cataract and if any opacity in the lens or its capsule, developed or acquired is called as cataract.<sup>[2]</sup>

Eyes are the most precious gift of the God to the living beings. Good vision is crucial for social and intellectual development of a person. According to Ayurveda, "*sarvendriyanaam nayanam pradhanam*" i.e., among all the sense organs, eyes are the most important. "Everyone should be dedicated enough to protect their vision, throughout the period of life because for an individual who is blind, day and night are the same and the beautiful world is useless to him even if he possess lot of wealth."<sup>[3]</sup>

*Acharya Sushruta* explains seventy six *Netrarogas*.<sup>[4]</sup> Among them *Timira* is an important disease, explained under *Drushtigata rogas*. Clinical features of *Dwiteeya patalagatha timira* and some features of *Triteeya patalagata timira* such as *Avyakta darshana*, *Gochara vibhrama* and *Dwidhabahudha drushti* is simulated to that of signs and symptoms of immature cataract. The early symptoms of cataract include blurriness of vision, glare, polyopia and colour halos.<sup>[5]</sup>

According to WHO "In spite of the progress made in surgical techniques in many countries during the last ten years, cataract (47.9%) remains the leading cause of visual impairment in all areas of the world, except for developed countries."<sup>[6]</sup> As per National Programme for Control of Blindness of Govt. of India about 62.60% blindness is due to cataract.<sup>[7]</sup>

If proper care is not taken at time, *Timira* leads to *Kaca* which in turn to *Linganasha*.<sup>[8]</sup> There are no non-surgical measures which delay, prevent or reverse the development of senile cataract in conventional system of medicine, the only definite management is lens extraction once it reaches matured stage or complete opacification. The success rate of cataract surgery is more than 90%,<sup>[9]</sup> but complications such as sensitivity to anaesthesia, injury to the cornea and iris, vitreous loss, expulsive choroidal haemorrhage, uveitis, retinal detachment, secondary cataract etc may occur which cause loss of vision.<sup>[10]</sup>

The treasure of ancient wisdom depicted in our classical texts has to be considered at this critical juncture which provides potentiality in probing of disease and its management through vast scientific advancements.

Ocular therapeutic like *Anjana karma*<sup>[11]</sup> and internal administration of *Triphala choorna*<sup>[12]</sup> are mentioned in Ayurvedic classics for the management of *Timira roga*. Thus the present study is being undertaken to scientifically study and validate the effect of *Triphala choorna* and *Krishnadi varti anjana* in the management of *Timira*.

#### AIM AND OBJECTIVES

- ❖ To evaluate the efficacy of *Triphala choorna* with *Krishnadi Anjana* in the management of *Timira* w.s.r. to Senile Immature Cataract.
- ❖ To evaluate the efficacy of *Triphala choorna* in the management of *Timira* w.s.r. to Senile Immature Cataract.

- ❖ To compare and evaluate the clinical efficacies of both the groups.

#### MATERIALS AND METHODS

##### Sample source

Patients with clinical features of *Timira* (Immature cataract) coming under the inclusion criteria approaching the OPD and IPD of *Shalaky Tantra*, SKAMCH & RC, Bengaluru were selected for the study.

##### Drug source

The identified raw drugs required for the preparation of *Krishnadi varti anjana* and *Triphala choorna* were purchased from approved vendors. Post purchase, the raw drugs were authenticated by the faculty of *Dravya Guna*, SKAMCH & RC, Bengaluru.

##### Study design

Randomized, Active controlled, Double arm, Open label clinical study.

##### Sampling technique

The subjects who fulfilled the inclusion and exclusion criteria and complying with the informed consent (IC) were selected using random sampling technique.

##### Diagnostic criteria

- Patients with *Lakshanas* of *Timira*.
- Clinical feature of senile immature cataract.
- Diminished visual acuity up to 6/12 and N12.
- Immature cataract confirmed by Ophthalmoscopy and Slit lamp biomicroscopy.

##### Inclusion criteria

- Patients with *Lakshanas* of *Timira*.
- Patients with signs and symptoms of Senile immature cataract.
- Patients in between the age group of 40 to 70 years.

##### Exclusion criteria

- Post surgical cataract
- Mature cataract
- Sluggish pupillary reaction
- Patients with systemic disorders that may interfere with the course of the study.
- Associated with any inflammatory and infective ocular conditions.

##### Sample size

A comparative clinical study where in 40 Patients diagnosed as *Timira* of either sex were randomly assigned into two groups i.e., Group A and Group B comprising of 20 patients each.

**Intervention****Table 1: The study was intervened in one treatment phase**

Group	Treatments	Dose	Duration
A	1. <i>Krishnadi anjana</i>	-1 <i>Harenu matra</i>	-Once daily at Morning for 48 days
	2. <i>Triphala choorna</i> internally	-05 Grams with sufficient amount of <i>Goghrita</i> .	-Once daily at night after food for 48 days
B	1. <i>Triphala choorna</i> internally	-05 Grams with sufficient amount of <i>Goghrita</i>	-Once daily at night after food for 48 days

**Duration of the study**

The total duration of the study in both the groups was 49days.

**Method of preparation of medicaments required for the study****A. Krishnadi varti**

**Ingredients and Quantity:** *Pippali tandula*- 350 grams, *Haritaki*- 700 grams and *Bhringaraja Swarasa*- 4 litres (was extracted from fresh *Bhringaraja panchanga*- fresh plant).

**Method:** The raw drugs were washed thoroughly and allowed to dry up. After drying the drugs were crushed and finely powdered separately in a mixer grinder. Then a homogenous mixture was prepared by adding these powders.

The procured *Bhringaraja* fresh plant was washed thoroughly and was subjected to grinding using wet grinder until *Bhringaraja* was completely grinded. The paste was placed in a clean cloth and allowed for squeezing by which *Bhringaraja swarasa* was extracted and collected in a clean container.

The above mixture was subjected for *Bhavana* using *Bhringaraja swarasa*. The *Bhavana* procedure was continued till it attained the form of *Kalka* fulfil the *Subhavita lakshanas* as per classics and then it rolled into *Varti aakar*. Each prepared *Varti* was 2 inches long and about 5 grams weight. The prepared *Vartis* were dried in shade. After complete drying, *Vartis* were stored in a clean air tight container.

**B. Triphala choorna**

**Ingredients and Quantity:** *Amalaki*- 5 kgs, *Haritaki*- 5 kgs and *Vibhitaki*- 5 kgs

**Method:** The dry drugs were thoroughly washed to remove the impurities and were dried completely. Each of the drugs was crushed separately using *Khalwa yantra* and made fine powder using mixture grinder. The powders were sieved and a homogenous mixture was prepared by mixing these powders.

**Anjana procedure**

The patients of Group A were subjected to *Anjana karma* with *Krishnadi varti*.

- In a clean and well light room patient was seated comfortably with head rest.
- The eye lids and area around the eyes were wiped with wet sterile gauze dipped in water.
- Under aseptic precautions, the tapered end of the *Krishnadi varti* was rubbed against a *Gharshana shila* with sufficient quantity of *Madhu* to get a soft paste.
- The patient was asked to open the eyes widely and eye lids were pulled down with thumb or index finger and the *Anjana* paste was taken on a *Shalaka* in the dose of one *Harenu* and applied from *Kaninika sandhi* to *Apanga sandhi* in a jerk free manner and the same is repeated for other eye.
- The patient was then advised to close his eyes and rotate the eye ball in clock wise and anti clockwise direction once for the uniform spreading of medicine.
- Wet cotton gauze was kept over each eye after closing, in order to soothe the burning sensation due to the medicament applied.
- When the burning sensation and lacrimation stopped, eyes were washed with clean water.
- Eyes were checked for any remnants of medicament or accumulated *Akshimala* and if present it was removed with sterile gauze in order to avoid any irritation to the eyes.
- Patient was advised to avoid exposure to dust and excessive eye strain.

**Assessment Criteria**

Assessment criteria were designed based on parameters as per the proforma by adapting a scoring pattern. The clinical findings were noted in specially prepared case proforma and assessment was done on Day 1-Before treatment (BT) and Day 49- After treatment (AT).

The parameters considered for the study were graded based on the scoring pattern 0-3 for subjective parameters and 0-6 for distant vision and near vision visual acuity for the purpose of statistical analysis.

**Table 2: Scoring index**

<b>Avyaktadarshana</b> (Blurriness of vision)	0-Absent 1-Blurred vision present but can make out the features of an object clearly 2-Blurred vision present but can make out the features of an object with straining of eyes 3-Blurred vision present and cannot make out the features of an object
<b>Gocharavibhrama</b>	0-Can assess the distance 1-Can assess the distance for near objects easily and far objects on straining the eyes 2-Can assess the distance for both near objects and far objects on straining the eyes 3-Cannot assess the distance for either far or near objects on straining the eyes
<b>Vihwala darshana</b> (Visualization of non-existing things like dots, lines, threads)	0-Absent 1-Perception on exposure to bright light but not disturbing the visualization of objects 2-Perception on exposure to bright light and disturbing the visualization of objects 3-Perception on exposure to dim light and disturbing the visualization of objects
<b>Dwidha-bahudha darshana</b> (Diplopia/Polyopia)	0-No diplopia/polyopia 1-Occasionally present in primary gaze or reading position 2-Frequently present in primary gaze or reading position 3-Continuous present in primary gaze or reading position
<b>Glare</b>	0- Absent 1- Present in direct light 2- Present in reflected light 3- Present in dim light
<b>Distant vision</b> (Snellen's chart)	0 - 6/6 1 - 6/9 2 - 6/12 3 - 6/18 4 - 6/24 5 - 6/36 6 - 6/60
<b>Near vision</b> (Jaegear's chart)	0 - N6 1 - N9 2 - N12 3 - N18 4 - N24 5 - N36 6 - N60

**Statistical Analysis**

- ❖ For the statistical analysis the data obtained in both the groups were recorded, presented in tabulations and drawings.
- ❖ The Statistic Mean, Standard Deviation (SD), Standard Error of Mean (SEM) and Standard Error of difference between two means (SE) were employed for descriptive statistics.
- ❖ To infer the clinical study and draw conclusion, paired't'-test was applied for within the group analysis and unpaired't'-test was applied for between the group analysis.

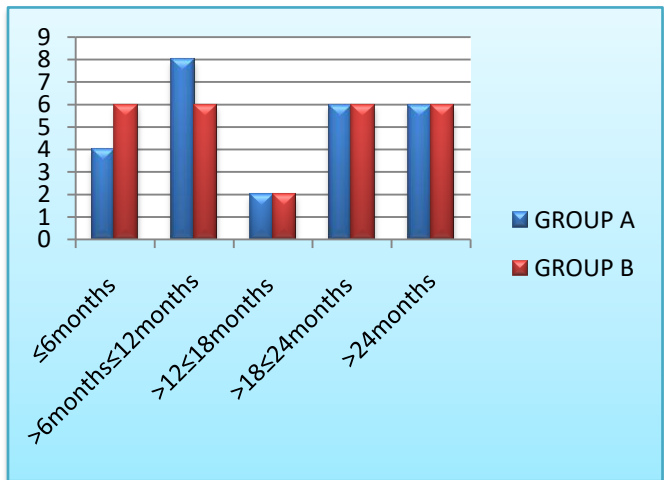
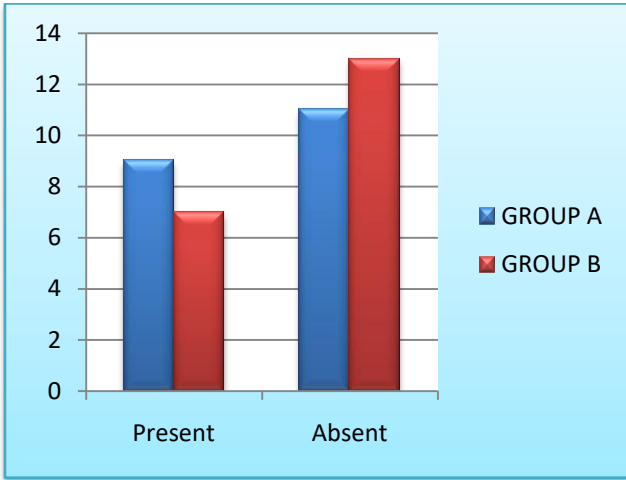
**OBSERVATIONS**

A total number of 45 Patients of *Timira* w.s.r. to Senile Immature Cataract fulfilling the inclusion criteria were registered for this clinical study. The observations of the present study are elaborated below:

Number of Patients registered for the Study - 45

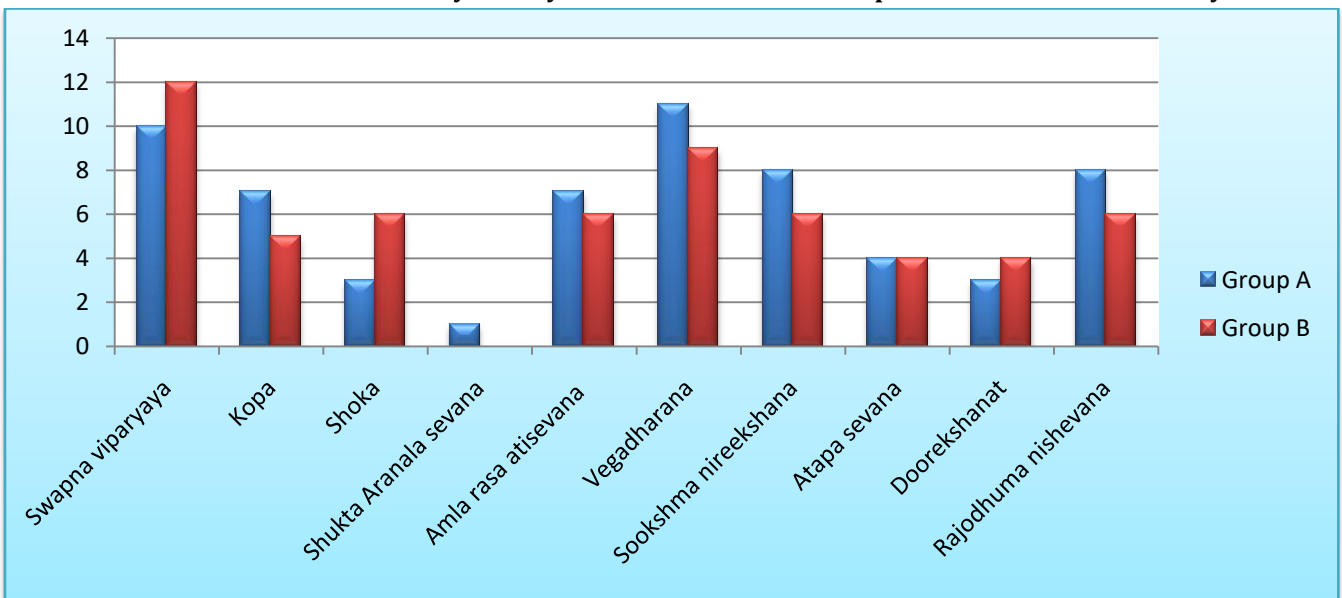
Number of Patients completed the Study - 40

Number of Patients discontinued in between the Study – 5

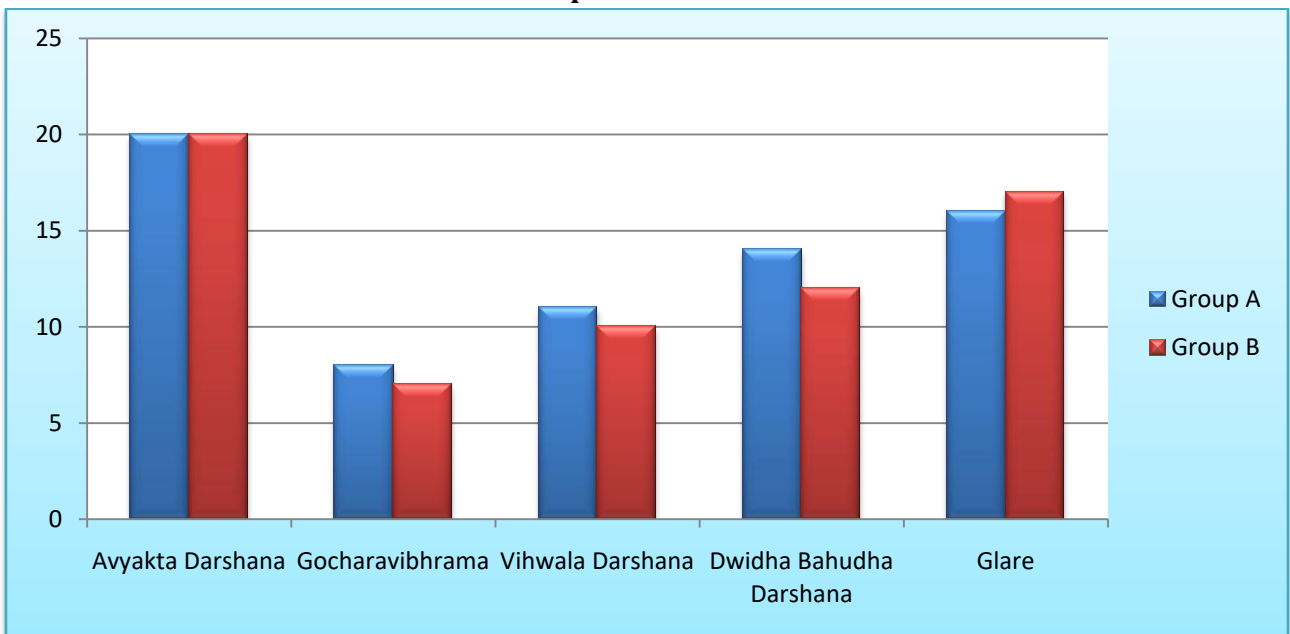


Distribution based on Family history

Distribution of patients based on Chronicity



Distribution of patients based on Nidanas



Distribution of patients based on visual acuity-Distant vision



**RESULTS**

The parameters considered for the Clinical study were subjected to Student's paired 't' test to compare the Mean values within the groups and Unpaired 't' test to compare the Mean difference values between the groups. The differences in the mean values were considered Highly Significant at  $p < 0.01$  and  $p < 0.001$ , Significant at  $p < 0.05$  and Non-significant at  $p > 0.05$ .

**Table 3: Effect of treatment on *Avyakta darshana* within the groups**

Within Group A								
Group A	Mean		Mean diff.	Paired 't'- test				
	Before	After		SD	SE	t-value	p- value	Re
BT-AT	2.35	0.8	1.55	0.510	0.114	13.580	<0.001	HS
Within Group B								
Group B	Mean		Mean diff.	Paired 't'- test				
	Before	After		SD	SE	t-value	p- value	Re
BT-AT	2.2	1.35	0.85	0.489	0.109	7.767	<0.001	HS

**Table 4: Effect of treatment on *Avyakta darshana* between the groups**

Phase	Group A			Group B			Unpaired 't' test			
	MD	SD	SEM	MD	SD	SEM	PSE	t-value	p- value	Re
BT-AT	1.55	0.510	0.114	0.85	0.489	0.109	0.158	4.427	<0.001	HS

**Table 5: Effect of treatment on *Gochara vibhrama* within the groups**

Within Group A								
Group A	Mean		Mean diff.	Paired 't'- test				
	Before	After		SD	SE	t-value	p- value	Re
BT-AT	1.75	0.125	1.625	0.517	0.183	8.879	<0.001	HS
Within Group B								
Group B	Mean		Mean diff.	Paired 't'- test				
	Before	After		SD	SE	t-value	p-value	Re
BT-AT	1.857	1.428	0.428	0.534	0.202	2.120	<0.05	S

**Table 6: Effect of treatment on *Gochara vibhrama* between the groups**

Phase	Group A			Group B			Unpaired 't' test			
	MD	SD	SEM	MD	SD	SEM	PSE	t-value	p- value	Re
BT-AT	1.625	0.517	0.183	0.428	0.534	0.202	0.272	4.389	<0.001	HS

**Table 7: Effect of treatment on *Vihwala darshana* within the groups**

Within Group A								
Group A	Mean		Mean diff.	Paired 't'- test				
	Before	After		SD	SE	t-value	p-value	Re
BT-AT	1.636	0.090	1.545	0.5222	0.157	9.813	<0.001	HS
Within Group B								
Group B	Mean		Mean diff.	Paired 't'- test				
	Before	After		SD	SE	t-value	p-value	Re
BT-AT	1.6	1.2	0.4	0.516	0.163	2.449	<0.05	S

**Table 8: Effect of treatment on *Vihwala darshana* between the groups**

Phase	Group A			Group B			Unpaired 't' test			
	MD	SD	SEM	MD	SD	SEM	PSE	t-value	p- value	Re
BT-AT	1.545	0.522	0.157	0.4	0.516	0.163	0.226	5.049	<0.001	HS

**Table 9: Effect of treatment on *Dwidha bahudha darshana* within the groups**

Within Group A									
Group A	Mean		Mean diff.	Paired 't'- test					
	Before	After		SD	SE	t-value	p- value	Re	
BT-AT	1.571	0.142	1.428	0.513	0.137	10.406	<0.001	HS	
Within Group B									
Group B	Mean		Mean diff.	Paired 't'- test					
	Before	After		SD	SE	t-value	p- value	Re	
BT-AT	1.666	1	0.666	0.492	0.142	4.690	<0.001	HS	

**Table 10: Effect of treatment on *Dwidha bahudha darshana* between the groups**

Phase	Group A			Group B			Unpaired 't' test			
	MD	SD	SEM	MD	SD	SEM	PSE	t-value	p- value	Re
BT-AT	1.428	0.513	0.137	0.666	0.492	0.142	0.197	3.856	<0.001	HS

**Table 11: Effect of treatment on Glare within the groups**

Within Group A									
Group A	Mean		Mean diff.	Paired 't'- test					
	Before	After		SD	SE	t-value	p- value	Re	
BT-AT	1.937	0.437	1.5	0.516	0.129	11.618	<0.001	HS	
Within Group B									
Group B	Mean		Mean diff.	Paired 't'- test					
	Before	After		SD	SE	t-value	p- value	Re	
BT-AT	1.705	0.941	0.764	0.664	0.161	4.746	<0.001	HS	

**Table 12: Effect of treatment on Glare between the groups**

Phase	Group A			Group B			Unpaired 't' test			
	MD	SD	SEM	MD	SD	SEM	PSE	t-value	p- value	Re
BT-AT	1.5	0.516	0.129	0.764	0.664	0.161	0.206	3.561	<0.001	HS

**Table 13: Effect of treatment on Distant vision within the groups**

Within group A									
Group A	Mean		Mean diff.	Paired 't'- test					
	Before	After		SD	SE	t-value	p- value	Re	
BT-AT	3.65	1.95	1.70	0.563	0.089	19.066	<0.001	HS	
Within Group B									
Group B	Mean		Mean diff.	Paired 't'- test					
	Before	After		SD	SE	t-value	p- value	Re	
BT-AT	3.20	2.07	1.13	0.607	0.096	11.718	<0.001	HS	

**Table 14: Effect of treatment on Distant vision between the groups**

Phase	Group A			Group B			Unpaired 't' test			
	MD	SD	SEM	MD	SD	SEM	PSE	t-value	p- value	Re
BT-AT	1.70	0.563	0.089	1.13	0.607	0.096	0.131	4.388	<0.001	HS

**Table 15: Effect of treatment on Near vision within the groups**

Within Group A								
Group A	Mean		Mean diff.	Paired 't'- test				
	Before	After		SD	SE	t-value	p- value	Re
BT-AT	3.1	1.675	1.425	0.500	0.079	18.000	<0.001	HS
Within Group B								
Group B	Mean		Mean diff.	Paired 't'- test				
	Before	After		SD	SE	t-value	p-value	Re
BT-AT	2.65	1.525	1.125	0.563	0.089	12.630	<0.001	HS

**Table 16: Effect of treatment on near vision between the groups**

Phase	Group A			Group B			Unpaired 't' test			
	MD	SD	SEM	MD	SD	SEM	PSE	t-value	p- value	Re
BT-AT	1.425	0.500	0.079	1.125	0.563	0.089	0.119	2.517	<0.01	HS

## DISCUSSION

Cataract is opacification of the lens of the eye which disturbs the clarity of the vision. Although most cases of cataract are related to the ageing process, occasionally children can be born with the condition, or a cataract may develop after eye injuries, inflammation, drug induced and due to some other local, focal or systemic diseases.

Development of cataract can be prevented or delayed by avoiding exposure to ultraviolet light and smoking. The additional risk factors considered are Diabetes Mellitus and high body mass index.

*Timira* is a disease included under *Drishtigata vikaras* by Ayurvedic scientists. The degree of blurredness may vary from a lesser extent to a greater level depending upon the stage of the disease. As per *Acharya Sushruta*, the involvement of first three *Netra patalas* can be considered as *Prathama*, *Dwiteeya* and *Triteeya patalagata Timira* respectively. Once the *Doshas* reach the fourth *Patala*, there will be complete absence of vision, which is termed as *Linganasha*. *Prathama* and *Dweetiya patalagata timira* are easily curable. *Treetiya patalagata timira* is *yapya* and when the *Doshas* reach to *Chaturtha patala* all the *Timira* attain the stage of *Asadhyata* except that of *Kaphaja* variety, which may be curable with the help of surgical intervention.

### Discussion on procedure

#### *Anjana*

*Anjana* is the one of ocular therapeutics of *Ayurveda* which is very helpful in the treating various eye disorders, *Timira* is one among them. Application of *Anjana* is advisable both in healthy and diseased person. In healthy person as a part of *Dinacharya* and in case of diseased person there is a broad range of indications such as *Timira*, *Abhishyanda*, *Adhimantha*, *Arma*, *Shuklagata rogas* and *Krishnagata netrarogas*. There are different

types of *Anjana* depending on their mode of action. The basic aim of *Anjana prayoga* is, eye being an organ which is "*Tejomayam*" i.e., one which is predominant with *Tejomahabhuta* can easily get afflicted by *Kapha dosha* and by *Anjana prayoga* as a daily regimen the accumulated *Kapha* can be normalised. The *Anjana* used in *Timira* will be of *Lekhana* among its varieties i.e., *Snehana*, *Ropana*, *Lekhana* or *Prasadana*. In case of cataract, the *Lekhana Anjana* is helpful because the lens is hydrated and hard due to denaturated lens fibres.

### Discussion on drugs

#### *Triphala choorna*

*Triphala choorna* contains *Haritaki*, *Vibhitaki* and *Amalaki*. It has *Tridoshahara* property that helps to normalise the vitiated *Doshas* which are pathologically lodged in the *Netra patala* and obstructs the vision. *Chakshushya* and *Rasayana* properties of *Triphala* helped in delaying the aging process along with nourishing the ocular tissues. *Deepana* property enhanced the *Agni* which helps in maintaining normal metabolic reactions of the lens. *Triphala* has anti-cataract property which helps in maintaining transparency of the lens. It acts as a free radical scavenger and removes free radical which is helpful in the arrangement of the lens fibres. Antioxidant property of *Triphala* helps in delaying degenerative process in the lens. Vitamin C helps in the maintaining the normal level of glutathione which is very necessary for normal metabolism of the lens. All these are beneficial in preventing the progression of cataract.

#### *Krishnadi varti*

*Krishnadi varti* contains *Pippali*, *Haritaki* and *Bhringaraja*. It has been mentioned to be useful in *Timira* in *Ayurvedic* classics, as the drug possess *Teekshna guna*, *Ushna veerya* which are beneficial in *Samprapti vighatana* of *Timira*.



The *Lekhana* (scraping) property of the formulation helped to clear the hydrated lens. Antioxidant property of ingredients helped in delaying the degenerative process. Ingredients having *Chakshushya*, *Rasayana*, *Balya* properties helped in revitalizing and restoring normal ocular functions. Cysteine present in *Bhringaraja* essential for maintaining glutathian of the lens which is a vital factor for lens transparency. *Deepana* property of ingredients enhanced the *Agni* which helps in maintaining normal metabolic reactions of the lens. *Katu rasa* of *Bhringaraja* is *Netra virechaka*, removes *Doshas* from ciliary muscles, also it has the property of *Vedana sthapana*, inturn remove strain of ciliary muscles, thereby gives strength and helps in physiological accommodation.

**Goghrita**

In this clinical study *Goghrita* was taken as *Anupana* for *Triphala choorna* which has *Tridosahara* property that helped in normalising the pathologically lodged *Vatadi dosha* in *Netra patala*.

*Rasayana*, *chakshusya*, *Rasavardhaka*, *Balya*, *indriyabalavridhikara* and *Vayahsthapana* properties of *Goghrita* have delayed the degeneration process and nourished the ocular tissues.

**Madhu**

*Madhu* was taken for rubbing the *Ajnana varti*. *Lekhana* and *Kaphahara* property of *Madhu* helped in removing of water droplets from the lens. *Sukshma*, *Laghu* and *Yogavahi gunas* promoted deeper penetration of drugs and cross the barriers. It has *Srotovishodhana* property that cleared the

minute channels and helped in the exchange of nutrients from the aqueous humor. *Chakshushya* property helped in nourishing the ocular tissues. It enhanced the *Agni* that helped in maintaining the lens metabolism which is important for lens transparency. It has property of minimising scar so helped in the removing the opaque area on the lens which hampered the clarity of vision.

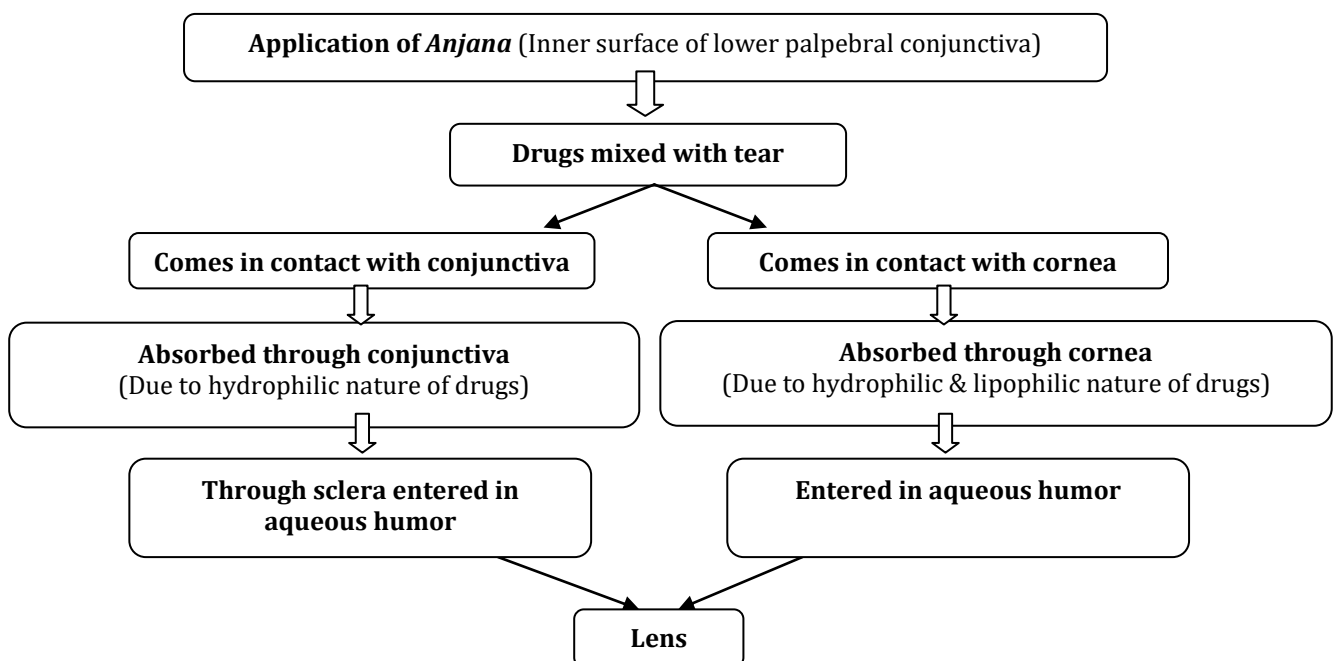
**Probable mode of action of Anjana**

As described in *Paribhasha*, “*anakti anena ithi anjanam*” meant for the spreading and propagation of *Anjana*. After application of *Anjana* in inner surface of lower palpebral conjunctiva, it comes in contact with tear and due to blinking of eyelids the drugs get mixed with tear. The tear mixed drugs now come in contact with conjunctiva and cornea. Due to hydrophilic nature of conjunctiva the drugs get directly absorbed through conjunctival sac by the trans cellular pathway. The absorbed drugs through scleral route entered into the aqueous humor and through aqueous humor reached lens. Due to liphophilic and hydrophilic nature of *Krishnadi varti anjana* the tear mixed drugs directly absorbed through the cornea and entered into the aqueous humor and through aqueous humor reached lens.

**Discussion on observations**

**Age**

In this clinical study, more number of patients i.e., 40% patients belonged to the age group of 61–70 years followed by 37.5% patients belonged to the age group of 41–50 years and 22.5% patients belonged to the age group of 51–60 years.



The concentration of glutathione falls with advancing age which maintains the lens transparency and also metabolic activities of lens decrease with age. It may be a cause to initiate cataract during the fourth decade of life. According to Ayurveda the *Ishat-parihani avastha* starts after the age of 40 years. By the influence of *Kala swabhava* in this period, *Dhatukshaya* and *Indriya vishaya grahana asamarthya* occurs which can have an impact on aging lens.

### Gender

In this clinical study, more number of patients i.e., 65% were females and 35% were males.

The present study supports the higher incidence of *Timira*- Cataract in females. Lens capsule is made up of collagen. Recent researchers have discovered that collagen disorders are more often seen in females after the age of 40 years, this is due to the imbalance in the oestrogen level affecting the collagen and hence resulting in higher risk of Cataract in females. The higher incidence in females as seen in this study is thus justifiable.

### Religion

In the present clinical study 75% of the patients were Hindus and 25% were Muslims. There is no reference available that establishes the relation between religion and its associated cultural practices with the incidence of *Timira*- Cataract. Thus no conclusion can be drawn from this observation apart from geographical representation.

### Educational status

More number of the patients i.e., 52.5% were below graduation, 25% of patients were graduates, 17.5% of patients were uneducated and 5% of patients were post graduates.

As there is no direct relationship between educational status and the incidence of Cataract, no definite conclusion can be drawn in relation to education and Cataract.

### Socio-economic status

In present study more number of patients i.e., 57.5% belonged to the middle class followed by 32.5% belonged to lower class and 10% were from upper class.

There is no evidence available regarding the relationship between socio-economic status and the incidence of cataract.

The percentage of patients in the middle class and lower class were more, it is possible that they might be taking low nutritious diet, which

progresses the degeneration of the lens leading to Cataract.

### Occupation

In the occupational category 65% were housewives, 15% were businessmen, 15% were professionals (Government/Private employee) and 5% were drivers.

Relation between the cataract and the occupation can be ascertained here. In house wives exposure to heat while cooking acts as predisposing factor for *Netra rogas* especially *Timira*- Cataract. In professionals (Government/Private employee) and business men *Kopa*, *Kleshla*, *Swapna viparyaya* along with improper food habits like intake of food at irregular timings and excess of junk foods were found to be the *Nidanas* which increases risk of cataract by disturbing the normal metabolism of lens. In drivers more exposure to sunlight acts as a risk factor for Cataract.

These above mentioned *Nidanas* are causative factors for the eye diseases which are mentioned by ancient ayurvedic scientists and hence the data of present study supports the same.

### Diet

More number of patients in this study i.e., 52.5% was consuming vegetarian diet and 47.5% were consuming mixed diet.

Intake of low proteins and minerals deficits diet causes earlier development of Cataract and recent researches have proved that nutrition can prevent cataract, due to the small sample size, no conclusion can be made based on this observation. The reasons could be that many of the patients had faulty food habits like intake of food without proper nutrients (proteins, vitamins and minerals) along with *Adhyashana* and *Vishamashana*. The above said reasons hasten formation of Cataract.

### Sleep

More number of patients i.e., 45% were having sound sleep, 42.5% were having disturbed sleep and 12.5% were having delayed sleep in this study.

Sound sleep and disturbed sleep depends on the *Prakruti*, circumstances, Life style and Stress. The disturbed sleep as discussed in the *Nidana* of *Timira* will impair the metabolic reactions of the lens which accelerates the degenerative process and leads to opacification of the lens.

### Family history

In the present clinical study, 60% patients had no family history of cataract and 40% had family history of cataract.

Heredity has a considerable role in the incidence, age of onset and maturation of Cataract in different races and families. As 40% patients had family history of Cataract the observation of the present study supports the same.

### Chronicity

In this clinical study, 57.5% of patients were having chronicity more than 24months. Among others 12.5% were having the chronicity of >6 months ≤12months and 10% of the patients were having chronicity of ≤ 6months, >12≤18months and >18≤24months.

This emphasizes the chronicity of cataract. Most of the patients neglect to visit the doctor at early stages as it starts with mild blurriness of vision which does not hamper their routine activities. With spectacles correction from optician, patients get improvement in vision in early stages so they don't consult physician but when they experience more blurriness of vision even with the spectacles then they consult physician.

### Nidana

In the present clinical study, the probable *Nidanas* recorded for the manifestation of *Timira* possess the following percentages:

*Swapna viparyaya* (55%), *Vegadharana* (majority had *Mutra, Purisha & Nidra vegadharana*) (50%), *Sookshma nireekshana* (35%), *Rajodhuma nishevana* (35%), *Amla rasa atisevana* (32.5%), *Kopa* (30%), *Shoka* (22.5%), *Atapa sevana* (20%), *Doorekshanat* (17.5%) and *Shukta aranala sevana* (2.5%).

As per the literatures, these are the causative factors of *Netra rogas* and the present observation supports the same. Due to intake of above mentioned *Nidanas*, *Vatadi doshas* becomes vitiated and pathologically lodge in *Netra patalas* causing *Timira*. These causative factors may be responsible for altering the lens metabolism and increase the oxidative stress of the lens. Hence the denaturation of lens proteins occurs and ultimately manifests cataract.

### Lakshanas

In the clinical study, all the patients i.e. 100% had *Avyakta darshana*, 82.5% of patients had *glare*, 65% of patients had *Dwidha bahudha darshana*, 52.5% of patients had *Vihwala darshana*, 37.5% of patients had *Gocharavibhrama*.

*Avyakta darshana* is the cardinal feature of *Timira*- Cataract. In Cataract opacification of lens takes place. These opaque areas obstruct the rays of light coming from the objects to reach the retina and hence blurriness of vision is seen as early symptom. The velocity of light varies for different

colours and due to increased scattering of light patients develop glare. On opaque lens accumulation of water droplets causes irregular refraction. Hence double or multiple images are visualised by the patient. As per the literatures, these are the common changes that occur in the lens as a result of ageing, and the present observation supports the same.

### Visual acuity (distant vision)

In the clinical study, all the patients i.e. 100% had diminished visual acuity for distant objects.

It is due to de-arrangement of lens fibres and opacity of lens which obstruct the rays of light to reach retina hence visual acuity for distant objects becomes decreased.

### Visual acuity (near vision)

In the clinical study, all the patients i.e. 100% had diminished visual acuity for near objects. With advancing age, strength of ciliary muscles and accommodative power of opaque lens decrease, so patients experienced difficulty in near vision.

### Discussion on results

#### Effect of treatment on *Avyakta darshana*

The effect of treatment on *Avyakta darshana* within the group, before treatment and after treatment, the p value (<0.001) was statistically highly significant in both the groups. On comparing between the groups, before treatment to after treatment p value (<0.001) was statistically highly significant. Though both the groups showed good results, the t-value (13.580) of Group A was higher when compared to the t-value (7.767) of Group B, concluding that the effect of treatment on *Avyakta darshana* in Group A was better than Group B.

Cataract is caused by the degeneration and opacification of the lens fibres. There is an accumulation of water droplets in between the fibres, which disturbs its arrangement and leads to opacification of the lens. As age progresses glutathione content of the lens decreases, which is an important factor to maintain the transparency of the lens by controlling anti-oxidative process.

Anti-cataract property of *Triphala* delays the degeneration of the lens and *Vibhitaki* in *Triphala choorna* helps to remove the accumulated water droplets due to its *Kaphahara* property and maintain transparency of the lens.

Due to *Tikta, Kashaya rasa* and *Laghu, Ruksha guna* of *Haritaki* in *Krishnadi varti*, it acts as *Lekhya* and *Srotoshodhaka*. By its *Lekhana* (scraping) property it minimises the opacification and by virtue of its *Srotoshodhaka* property it helps



to clear the hydrated lens that would be the reason to form a better image on the retina.

#### **Effect of treatment on *Gochara vibhrama***

The effect of treatment on *Gochara vibhrama* within the group, before treatment and after treatment, the p value (<0.001) revealed statistically highly significant in Group A, before treatment to after treatment, the p value (<0.05) revealed statistically significant in Group B. On comparing between the groups, before treatment to after treatment p value (<0.001) was statistically highly significant. The t-value (8.879) of Group A was higher when compared to the t-values (2.120) of Group B thereby concluding, the effect of treatment on *Gochara vibhrama* in Group A was better than Group B.

Patients had difficulty to assess the distance of an object which occurred due to alteration in the accommodation caused by weak ciliary muscles and reduced accommodative power of lens due to opacity.

*Rasayana* property of *Triphala choorna* provides strength to ciliary muscles and Anti-oxidant activity of *Goghrita* minimises the degeneration of the lens which improves accommodative power.

Ciliary muscles are made up of proteins. Cysteine of *Bhringaraja* in *Krishnadi anjana* being a building block of proteins helps to strengthen the ciliary muscles so that there is an improvement in physiological accommodation. *Lekhana* (scraping) property of *Krishnadi anjana* maintains transparency of the lens and improves physical accommodation. In both the groups *Triphala choorna* rejuvenates the ciliary muscles and provides strength hence improvement is seen in both the groups.

#### **Effect of treatment on *Vihwala darshana***

The effect of treatment on *Vihwala darshana* within the group, before treatment and after treatment, the p value (<0.001) revealed statistically highly significant in Group A, before treatment to after treatment, the p value (<0.05) revealed statistically significant in Group B. On comparing between the groups, before treatment to after treatment p value (<0.001) was statistically highly significant. The t-value (9.813) of Group A was higher when compared to the t-values (2.449) of Group B thereby concluding, the effect of treatment on *Vihwala darshana* in Group A was better than Group B.

The vitiated *Doshas* pathologically lodged in *Netra patala* cause the visualisation of non-existing things in front of eyes like mosquitoes, flies, hair

and net. Irregular opaque areas on the lens obstructs the rays of light coming from an object which falls abruptly on retina so patients visualise false moving objects in front of the eye.

*Amalaki* and *Haritaki* in *Triphala choorna* are *Tridosahara dravyas*, they help to remove the pathologically lodged *Doshas* from the *Netra patalas*.

*Pippali* in *Krishnadi anjana* due to its *Laghu* and *Snigdha guna* crosses the lipophilic layer of the cornea and through aqueous humour reaches the lens and helps in maintaining its transparency. Therefore patients got relief in *Vihwala darshana* in both the groups.

#### **Effect of treatment on *Dwidha bahudha darshana***

The effect of treatment on *Dwidha bahudha darshana* within the group, before treatment and after treatment, the p value (<0.001) was statistically highly significant in both the groups. On comparing between the groups, before treatment to after treatment p value (<0.001) was statistically highly significant. Though both the groups showed good results, the t-value (10.406) of Group A was higher when compared to the t-value (4.690) of Group B, concluding that the effect of treatment on *Dwidha bahudha darshana* in Group A was better than Group B.

In Cataract, cortical spoke opacities in conjunction with water clefts form radial wedges containing a fluid of lower refractive index than surrounding lens, this is the cause for diplopia and polyopia.

The *Kaphahara* property of *Vibhitaki* in *Triphala choorna* helps to remove the accumulated water droplets from the lens fibres and provides uniform refractive index which corrects the diplopia and polyopia.

*Srotoshodhana* property of *Madhu* which is used to rub the *Krishnadi anjana varti*, clears the channels, provides uniform refractive index thus minimizes diplopia and polyopia.

#### **Effect of treatment on Glare**

The effect of treatment on glare within the group, before treatment and after treatment, the p value (< 0.001) was statistically highly significant in both the groups. On comparing between the groups, before treatment to after treatment p value (<0.001) was statistically highly significant. Though both the groups showed similar effect, the t-value (11.618) of Group A was higher when compared to the t-value (4.746) of Group B, concluding that the effect of treatment on glare in Group A was better than Group B.

Glare is seen as a result of increased scattering of light rays through the opaque lens.

The anti-cataract and scavenging property of *Triphala choorna* arrests the degeneration process in the lens and removes free radicals thereby helps in maintaining its transparency.

*Lekhana* property of *Haritaki* and antioxidant property of *Bhringaraja* in *Krishnadi anjana*, minimizes the opacification of the lens hence scattering of light by lens is reduced and improvement is seen in both the groups.

#### Effect of treatment on distant vision

The effect of treatment on Distant vision within the group, before treatment and after treatment, the p value (<0.001) revealed statistically highly significant in both the groups. On comparing between the groups, before treatment to after treatment p value (<0.001) was statistically highly significant. Though both the groups showed good results, the t-value (19.006) of Group A was higher when compared to the t-value (11.718) of Group B, concluding that the effect of treatment on distant vision in Group A was better than Group B.

The concentration of glutathione falls with advancing age which is a vital for maintain the lens transparency by controlling its metabolic activities. Opacification of lens occurs as a result of decreased metabolic reactions and increased degeneration. These opaque areas of the lens obstruct the rays of light coming from an object so patients develop blurriness of vision for distant objects.

*Chakshushya* and *Rasayana* properties of *Triphala choorna* nourishes the lens and stops further degeneration. Glutathione and ascorbic acid of *Amalaki* in *Triphala choorna* keeps the normal level of glutathione in the lens thereby maintain its transparency.

*Lekhana*(scraping) and *Srotoshodhaka* properties of *Haritaki* in *Krishnadi varti anjana* helps to clear the hydrated lens and minimizes the obstruction of the light rays. Therefore improvement is seen in both the groups and the effect of treatment in Group A was better than Group B probably due to the added effect of *Krishnadi anjana*.

#### Effect of treatment on Near vision

The effect of treatment on near vision within the group, before treatment and after treatment, the p value (<0.001) revealed statistically highly significant in both the groups.

On comparing between the groups, before treatment to after treatment p value (<0.001) was statistically highly significant. Though both the groups showed similar effect, the t-value (18.000)

of Group A was higher when compared to the t-value (12.630) of Group B, concluding that the effect of treatment on near vision in Group A was better than Group B.

Altered physical and physiological accommodation makes deficient near vision. With the advancing age, strength of the ciliary muscles and accommodative power of the opaque lens decreases so patients experienced difficulty in near vision.

*Ruksha, Laghu guna* of *Vibhitaki* in *Triphala choorna* acts as *Kaphaghna* and *Shoshana* helps in dehydration of lens, which is a prime factor in maintaining its transparency. *Ushna virya* of *Vibhitaki* does *Deepana* and *Pachana*, enhances the metabolic activities of the lens and increases the contractility thereby improves physical accommodation.

*Katu rasa* of *Bhringaraja* in *Krishnadi anjana* is *Netra virechaka*, removes *Doshas* from ciliary muscles, also it has the property of *Vedana sthapana*, inturn removes strain of ciliary muscles, thereby gives strength and helps in physiological accommodation. In both the groups accommodative power is improving as the result of treatment.

#### CONCLUSION

- *Timira* is one among *Drushtigata netra rogas*, which is commonly encountered in the present clinical practice. The *Lakshanas* of *Timira* simulate to that of the clinical entity of Cataract.
- Senile Cataract is a geriatric condition which initially can be reversed. With the gradual development of opacifications, surgery becomes inevitable.
- The patients of Group A were subjected to internal administration of 5 grams *Triphala choorna* once daily at night after food with sufficient amount of *Goghrita* as *Anupana* along with *Anjana karma* with *Krishnadi varti* once daily at morning. The patients of Group B were subjected to internal administration of 5 grams *Triphala choorna* once daily at night after food with sufficient amount of *Goghrita* as *Anupana*.
- In the course of study majority of the patients were females.
- Predisposing factors described in modern texts and the *Nidanas* mentioned by our *ancient Acharyas* are very much similar.
- *Nidanas* like *Swapana viparyaya* and *Vegadharana* were observed more as *Nidana* in the present study.
- The effect of treatment was statistically assessed by Student's paired t test to analyse within the



group and unpaired t-test to analyse between the groups. In both the groups, within the group analysis, the effect of treatment was statistically highly significant in *Avyakta darshana*, *Dwidha bahudha darshana*, Glare, visual acuity for distant vision and near vision, and statistically significant in *Gochara vibhrama* and *Vihwala darshana*.

- Though both groups showed highly significant differences, within the group analysis however on comparing the t- values in between the groups, the t-values Group A was higher when compared to that of Group B which could be due to added effects of *Krishnadi varti anjana* which proved beneficial.
- *Anjana karma* is important procedure for treating diseases of eye. In the present study, the bio availability of the drugs helps in *Samprapti vighatana* as they act on the target tissues effectively. Thus procedure *Anjana* can be practised for clinical success.
- *Triphala choorna* has anti-cataract and anti-oxidant properties that help in delaying the degenerative process of the lens.

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