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Evaluation of phytochemical screening and Anti cataract activity of ethanolic extract ofTerminalia Arjuna bark.

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Abstract:

This study investigates the phytochemical properties and anti-cataract activity of the ethanolic extract of Terminalia arjuna bark. Terminalia arjuna, a medicinal plant traditionally used in Ayurvedic medicine, is known for its cardioprotective and antioxidant properties. Comprehensive phytochemical screening of the ethanolic extract revealed the presence of key bioactive compounds, including flavonoids, tannins, saponins, and glycosides, which are indicative of its therapeutic potential. The anti-cataract activity was assessed using an in vitro model of cataractogenesis induced by hydrogen peroxide. The results demonstrated that the ethanolic extract of Terminalia arjuna significantly inhibited the formation of cataracts, likely due to its potent antioxidant properties that mitigate oxidative stress. These findings suggest that Terminalia arjuna bark extract could be a promising natural agent for the prevention and management of cataracts, warranting further in vivo studies and clinical trials to fully establishits efficacy and safety in ocular health.

Key Words: Terminalia arjuna, ethanolic extract, phytochemical screening, anti-cataractactivity, oxidative stress, antioxidant properties, flavonoids, tannins, saponins, glycosides, cataract prevention, ocular health.

INTRODUCTION:

Cataract is a visual condition that alters the transparency of the lens. It is primarily caused by opacity or cloudiness of the crystalline lens, or by optical malfunction. It appears later in life and is most likely the result of decades of damage to the long-lived lens protein. Cataract is the leading cause of blindness worldwide.

It is believed that cataractogenesis is heavily affected by diabetes mellitus. Approximately 20% of all cataract operations are performed only on patients with diabetes. As a complication of diabetes, lens opacification is often seen in cataract. Oxidative damage to the lens has been linked to the development of cataracts. The decreased activity of antioxidant enzymes in the cataract lens shows the importance of these enzymes in protecting against oxidative damage and the formation of cataracts.

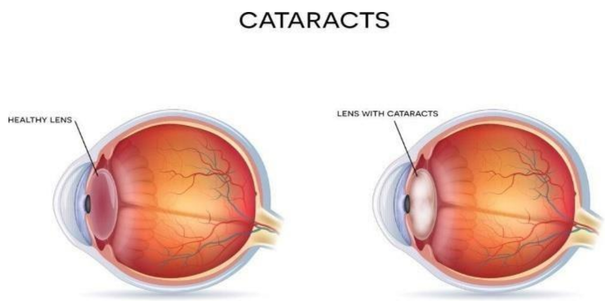

Fig: 1 Normal Eye and Cataract Eye **Fig: 2 Cataracts**

Currently surgery is the sole available treatment for cataract, though it comes with significant postoperative complications including posterior capsule opacity, intraocular lens dislocation, eye inflammation, macular edema, endophthalmitis and ocular hypertension.

The recent report from the WHO warns that without effective and timely measures, the percentage of cataract-related blindness could potentially double in the next two decades. This highlights such an increase in avoidable vision loss[1].

Etiology:

Cataract development is influenced by multiple factors which includes:

1. Congenital cataract
2. Age-related (senile cataract)
3. Traumatic injury[2, 3]
4. Systemic diseases
5. Endocrine diseases[4]
6. primary ocular diseases
7. Drugs
8. Poor nutrition[5]
9. Alcohol use disorder
10. Smoking

Pathophysiology:

The lens, which is made up of fibres (modified epithelial cells) contained in a membrane structure known as the lens capsule, is translucent. The lens matter consists of two primary components.

The cortex, situated on the surface, holds young fibers. While the nucleus, found deeper, contains older fibers.

Many degenerative diseases promote denaturation and coagulation of lens proteins within lens fibers via diverse methods.

These processes lead to transparency loss and ultimately the development of cataracts. [10] The involved mechanisms include:

1. Congenital cataract
2. Sub capsular cataract.
3. Cortical cataract

Treatment /Management:

The treatment approach is determined by the level of opacity that interferes with essential daily tasks. Several treatment options are available including:

Medical treatment:

If the visual acuity is 6/24 or better, routine tasks can be managed with pupillary dilatation (2.5% phenylephrine) or refractive glasses, and surgery may not be required. Cyclopentolate and atropine can also be helpful in this context. Ongoing trails are exploring cataract dissolving drops as a potential solution to dissolve cataracts, providing an alternative to traditional treatments.

Surgery:

Surgical intervention becomes necessary when visual acuity falls below 6/24 or when a medical condition (such as phacolytic glaucoma, phacomorphic glaucoma, or retinal detachment) demonstrates that the cataract is negatively impacting the eye's health.

Currently, surgery is the only established treatment for cataracts, which often involves the removal and replacement of the clouded lens in a technique called as phis. The new, artificial lens often contains some aspect of optical correction (i.e., one or two diopters), which means that the operation, in the case of bilateral cataract removal surgery, frequently renders the patient spectacle-free at near or distant distance.

Because of the prevalence of cataracts and the relative safety of surgery, it is the most routinely done surgical treatment in the NHS. Approximately 400,000 treatments are conducted each year at a cost of more than £290,000,000 (National Institute for Health and Care Excellence, 2017; NHS Improvement, 2017).

In the United Kingdom and many other countries, it is commonplace to perform cataract removal surgery on the first eye (First-Eye Surgery; FES) followed by at least a 2-week interval before removing the cataract from the second eye (Second-Eye Surgery; SES). This procedure is known as delayed sequential bilateral cataract surgery (DSBCS) and is more widely used than the alternative surgical protocol of immediate sequential bilateral cataract surgery (ISBCS), which involves removing and replacing both cataracts in the same surgical session.

This approach has come under some criticism, as in 2012, evidence emerged to suggest that nine-in-ten CCGs were restricting access to SES using criteria that reflected neither evidence nor clinical guidance. This begs the question, are CCGs right to restrict access to SES and what consequences may this be having for patients.

However, clinical vision tests, like as those described in the preceding paragraph, may not always mirror functional results; for example, changes in stereopsis and VA were not associated with changes in fall risk after SES. A well-functioning motor system is essential for persons to conduct ADLs and maintain independence into old age, therefore a thorough understanding of how to do so is critical given the trend of an ageing population.

One could argue that if changes to vision do not affect day-to-day life, they are clinically less significant. It is, therefore, crucial to also consider measures of functional motor performance, such as driving, falls and the ability of the individual to perform activities of daily living (ADLs, e.g. cooking, cleaning and maintaining personal hygiene), when considering the efficacy of SES. For example, in a study investigating the effects of cataract surgery on fall risk at baseline (pre-FES), post-FES and post-SES it was found that, compared to baseline, fall risk increased 114% post-FES and 34% post-SES, although no comparisons were made between the post-FES and post-SES data. This exposes a significant gap in the body of research on the functional impact of

SES; it is usual practice to utilize pre-FES vision or motor function scores as a reference group for statistical analyses. This approach interprets the distinct effects of FES and SES because no difference tests were done between the post-FES and post-SES groups.

These may include glaucoma or macular degeneration. If possible, it is good to evaluate and treat other eye problems before deciding to have cataract surgery.

Types of lenses

- **Fixed focus monofocal.** This type of lens only helps to see far away. Reading glasses will generally be needed for reading.
- **Accommodating-focus monofocal.** This type of lens can respond to eye muscle movements, allowing you to view near or far.
- **Multifocal.** This sort of lens features various sections that assist you view close, medium, and far away.

Making an incision in the eye and removing the lens in one piece, called extracapsular cataract extraction.

Extracapsular cataract extraction is used less frequently. This is because it requires a larger incision than that used for phacoemulsification. Through this larger incision your surgeon uses tools to remove the front capsule of the lens and the cloudy lens. The very back capsule of your lens is left in place to serve as a place for the artificial lens to rest.

Data Extraction and Coding

The subsequent data were extracted and coded for each study: lead author name, publication year, country, study design (RCT, longitudinal, cross-sectional etc.), measurement points (stage of surgery i.e. pre-FES, post-FES, post-SES, time since surgery etc.) for motor outcomes (i.e. driving performance such as crash rates, mobility scores and fall incidences, questionnaire responses e.g., VF-14, Catquest-95), statistical analysis (i.e., ANOVA, Incidence Risk Ratio, Generalized Estimating Equations) participant characteristics: age, percentage female, and the number of participants included in analysis and attrition (across the entire study).

Data Synthesis

Due to the highly heterogeneous nature of study designs and outcomes measures included in the sample, as well as the small size of the sample, the data were deemed unsuitable for Meta analyses or other advanced statistical techniques. Therefore, no further statistical analysis was planned, and a narrative synthesis was conducted. This demonstrates a key issue identified in the present work that the body of research upon which medical decisions are being based lacks a consistent approach, indicating the need for a unified approach to SES research. In the case where a study contained multiple measures of motor function, all will be reported.

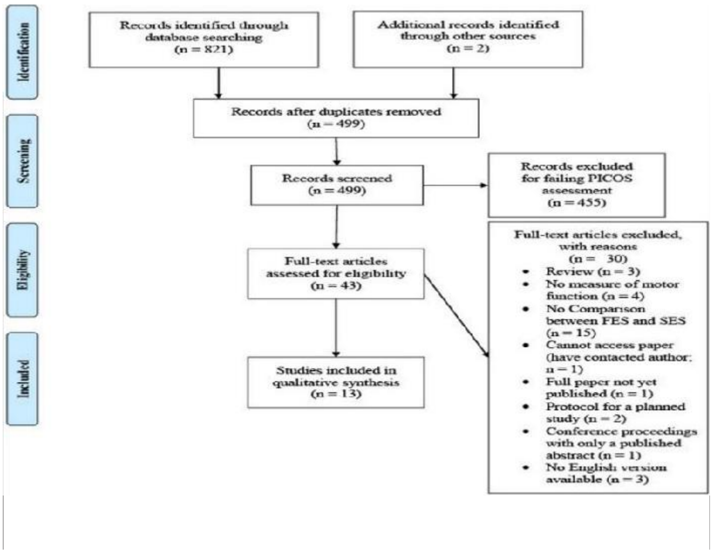

Fig 3: Prisma flow diagram.

- **Congenital cataract:**

Congenital cataracts are birth defects of the eye. Birth defects are structural changes present at birth that can affect almost any part of the body. They may affect how the body looks, works or both. Birth defects can have an impact on overall health, development, and function of the body. A congenital cataract occurs when the lens of the eye is clouded rather than clear from birth, making it difficult to see. The lens is the tissue inside your eye that helps focus the light that enters your eye.

Congenital cataracts can happen in one or both eyes. If congenital cataracts aren't treated early, they can cause vision problems or blindness[6].

There are two kinds of congenital cataracts:

1. **Syndromic**
2. **Non-syndromic**
3. **How are congenital cataracts treated?**

Babies with cataracts require early and ongoing treatment from a paediatric ophthalmologist. Early therapy for 12 eyesight may only require monthly examinations with a paediatric ophthalmologist, especially if the cataracts are in both eyes. However, most babies with cataracts require specialized care, which may include surgery. Most babies with congenital cataracts require surgery.

What are the Symptoms?

Cloudy or blurry vision is the most typical sign of senile cataract. Other symptoms may include:

1. Having trouble seeing at night
2. Having trouble driving at night
3. Heightened sensitivity to brightness and light
4. Halos around lights
5. One eye having two visions
6. Fading or yellowing of colors

In many cases, these symptoms can be corrected with glasses, contact lenses, or surgery. Senile cataracts, however, have the potential to cause blindness and vision loss if addressed. If you think you or a loved one may have a senile cataract, it's important to see an eye care professional right away for a comprehensive eye exam. Early diagnosis and treatment is the key to preserving vision.

Management

Optimizing general health conditions before surgery is necessary for achieving improved outcomes.

- Diabetes mellitus
- Hypertension
- Angina
- Respiratory infection
- Stroke
- Leg ulcer.
- Viral hepatitis
- AIDS
- Epilepsy
- Parkinson disease
- Rheumatoid arthritis[7]

Diagnosis:

Additional tests may be conducted to eliminate the possibility of other eye conditions such as glaucoma, chronic conjunctivitis and diabetic retinopathy, among others.

1. **Snellen test**
2. **Refraction test**
3. **Slit lamp exam**
4. **Intraocular pressure test**
5. **Dilated eye exam**
6. **Funduscopic exam**
7. **Optical biometry**
8. **Macular function test**
9. **Ultrasounds**[8]

Approaching this from an alternative perspective, cataracts differential diagnosis involves considering a variety of disorders including.

- Glaucoma
- Refractive errors
- Macular regeneration
- Diabetic retinopathy
- Corneal dystrophies and degenerations
- Optic atrophy
- Retinitis pigmentosa[9]

Diagnosis

There are a few ways to treat presenile cataracts. Typical therapy alternatives include the following:

Putting on contact lenses or spectacles: People with presenile cataracts frequently use contact lenses or glasses. This facilitates easier daily tasks and helps to improve vision. For example, if you have this kind of cataract, you can find it challenging to read without glasses or contacts.

Surgery

Eye drops or ointments.

Lifestyle changes

Assessing the ability to prevent or reduce the development of cataracts:

***In-vivo* models:**

1. Selenite induced cataract[10]
2. Galactose induced cataract[11]
3. Grading stages of cataract
4. Streptozotocin induced cataract
5. Naphthalene induced cataract

***In-vitro* models:**

1. Aldose reductase inhibition activity
2. Galactose- induced cataract model
3. Glucose induced cataract model

Bio-chemical analysis:

Sodium and potassium electrolyte levels were determined, using flame photometry. Sodium potassium ATPase activity was assessed by using the Unakar and Tsui method, while protein estimation was carried out through Lowry's method. Additionally, oxidative stress levels were analyzed using Wilbur's method.

Antioxidants like those found in Tamarindus indica Linn. was exposed to a galactose-induced cataract model *in vitro* in order to prevent the formation of cataracts. Goat lenses were cultured in artificial aqueous humor supplemented with Tamarindus indica Linn and 55Mm galactose (cataract genesis). For 72 hours, extract in various concentrations was stored at room temperature. The lens homogenate's biochemical parameters-lipid peroxidase, proteins, and malondialdehyde (MDA)—were examined. Goat lens opacification caused by galactose started 8–10 hours after incubation and took 72–80 hours to finish. Higher MDA ($p<0.0001$) and water-soluble protein levels were found in cataractous lenses. Biochemical data demonstrated that lenses treated with Tamarindus indica Linn extract at 50,75 µg/ml had greater protein (total proteins) content and inhibited the formation and progression of cataract by galactose[12].

Description of the plant:

20 to 30 cm above ground is the height range. Native American cultures have utilized the bark, leaves, and fruits of Terminalia arjuna. its medical system for treating various illnesses. The bark has a flavor that is described as aphrodisiac, expectorant, tonic, styptic, antidysentric, purgative, laxative, acrid, cooling, and therapeutic. The application of T. arjuna has been recommended for tumors, anemia, leukoderma, hyperhidrosis, asthma, and urine discharge.

Taxonomical classification of plant:

Kingdom: Plantae
Division: Magnoliopsida
Order : Myrtales
Family : Combretaceae
Genus : *Terminalia*
Species: Terminalia *arjuna*[13]

Regional names of Terminalia arjuna:

English: White Mudrah, Arjun tree; Hindi: Arjan, Arjun; Kannada: Bilimatti, Maddi, Malayalam: Marutu Marathi: Anjan, Sadaru Gujarati: Sadado, Tamil: Belma, Marudam pattai Telugu: Tella maddi

Morphological characteristics

Arjuna is a huge deciduous tree that can grow up to 35 meters tall with a spreading crown and drooping branches.

• Leaves are usually subopposite, 10–15 cm long and 4–7 cm broad; base is rounded or heart-shaped, often unevenly sided; veins are reticulate.

• Thick, smooth, thin bark that comes off in irregular sheets.

Floral characteristics

- Sessile flowers can be simple spikes or panicled spikes.
- The calyx has five small, triangular lobes and is glabrous.
- The fruit is a 2.5–5 cm, fibrous woody drupe.
- When fully grown, it has five firm, projecting, veined wings that are dark brown in color.
- Fruits ripen from January to March, while flowers bloom in May and June.

Fig 1: ***Terminalia arjuna***

The primary goals of this work are to screen for phytochemicals and assess the anti-cataract properties of an ethanolic bark extract from Terminalia arjuna and Main objectives of the study are:

- To identify the medicinal plant and collect plant material at the local market.
- Drying of the plant material.
- Extraction of the dried powdered plant material with ethanol by using maceration process.
- To perform preliminary phytochemical screening of the extract.
- Screening of anti-cataract activity.

MATERIALS AND METHODS

Plant material:

The plant material is made up of the dried bark of Terminalia arjuna, a member of the Combretaceae family. I got the powdered bark that had been dried from the nearby market.

Preparation of Ethanolic extract of *Terminalia arjuna*:

This study utilized 400grams of coarsely powdered bark soaked in 1000ml of ethanol solution for 72 hours. And then followed by maceration process with additional shaking. Afterward, the mixture was passed through muslin fabric filter, and any excess solvent was removed using rotary evaporator. The dried extract was then employed for this study[14].

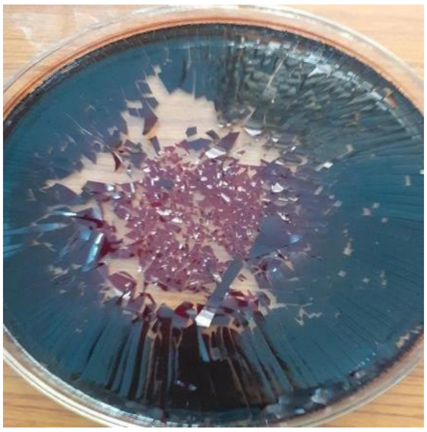

Fig 2: Bark of Terminalia arjuna, dried extract

Phytochemical screening for ethanolic extracted plant material:

Numerous phytochemicals, including alkaloids, glycosides, saponins, tannins, carbohydrates, proteins, and flavonoids, have been found using a variety of phytochemical screening techniques[15].

1. Test for Alkaloids:

Dragendroff's test: After adding 2 milliliters of diluted hydrochloric acid to 5 milliliters of extract and treating it with Dragendroff's reagent, the presence of alkaloids was shown by the formation of an orange-brown precipitate.

2. Test for carbohydrates:

Benedict’s test: To the 5ml of Benedict’s reagent, add 8 drops of solution under examination. Mix well, boil the mixture in a water bath for 2 mins, and then cool, Red - precipitate is obtained.

3. Test for Saponins:

Forth test: A stable, persistent froth that forms after adding 15 milliliters of distilled water to the extract and aggressively shaking it is a sign that saponins are present in the plant extract.

4. Test for triterpenoids and steroids:

Salkowski test: After well shaking the mixture of crude extract, 2 milliliters of chloroform, and a few drops of concentrated sulfuric acid, it was left to stand for a while. The presence of triterpenoids was indicated by the formation of a yellow-colored layer, whereas the appearance of red color in the lower layer indicated the presence of steroids.

5. **Test for Glycosides:**

Legal test:

On a water bath, the extract was hydrolyzed for a few hours using diluted hydrochloric acid. After adding a few drops of sodium nitroprusside solution and one milliliter of pyridine, two drops of sodium hydroxide were added. Glycosides were present as shown by the pink tint that turned crimson.

6. **Test for flavonoids:**

Alkaline reagent test or sodium hydroxide test:

A small amount of sodium hydroxide was applied to each extract separately. The presence of flavonoids is indicated by the formation of a bright yellow hue that turns colorless when a few drops of diluted acid are added.

7. **Test for phenols:**

Fecl$_3$ test: The presence of phenols is indicated by the blue-green or black coloration obtained from mixing 2 milliliters of 2% $FeCl_3$ solution with crude extract.

8. **Test for proteins:**

Ninhydrin test: To the extract, add two drops of recently made 0.2% ninhydrin reagent, then heat. A blue hue appears, signifying the existence of protein[16].

Collection of Eyeballs:

Fresh goat eyeballs from young, healthy goats were gathered right after the killing from the Tirupati local market and slaughterhouse. These eyeballs were sent right away to a laboratory set at 0–40 degrees Celsius. cut the cornea of the front eye to reach the lens.

Preparation of lens culture:

The lenses were incubated for 72 hours at room temperature with a pH of approximately 7.8 maintained in artificial aqueous humor (NaCl 140mM, KCl 5mM, MgCl2 i2mM, NaHCO3 i0.5mM, Na2HPO4 i0.5mM, CaCl2 i0.4mM, Glucose 5.5mM). To further avoid bacterial contamination, 32 mg of penicillin and 250 mg of streptomycin were added. As a cataract inducer, 55 mM glucose was used[17].

Experimental design:

Group I: Normal - glucose 5.5mM

Group II: Control - Glucose 55mM (induced)

Group III: Glucose 55mM + *T. arjuna* bark extract (250 mg/ml)- (Treated)

Group IV: Glucose 55mM + *T. arjuna* bark extract (500 mg/ml) (Treated)

Photographic Evaluation:

Following a 72-hour incubation period, the opacity of the lenses was assessed. To obtain an image of the opacity of the lenses, the posterior surface of the lenses was placed on wire meshes and the pattern of the mesh was examined through the lens.

Homogenate preparation:

The lenses were homogenized using 0.25X10-3 M EDTA and Tri's buffer (0.23M pH 7.8). A 10% W/V adjustment was made to the homogenate. The homogenate was centrifuged for one hour at 10,000 g and 4^0C. The supernatant was utilized to measure the levels of potassium, sodium, and NA+/K+ ATPase using flame photometry[18].

Statistical Analysis:

The mean SD was used to express all data. The student version of SPSS/10 was used to analyze all the data. LSD was used after one-way analysis of variance (ANOVA) in hypothesis testing. $p<0.05$ was used to determine whether the results were statistically different. The values are given as mean ± S.D.

The statistical differences are contrasted in this way:

Normal goat lens against goat lens plus 55 mM glucose, as well as goat lens plus 55 mM glucose with bark extract from Terminalia arjuna.

RESULTS:

Preliminary phytochemical analysis:

Plant T. arjuna's ethanolic extract was subjected to phytochemical analysis, which identified a number of compounds including flavonoids, alkaloids, and carbohydrates. These constituents are listed in **Table 1** below.

Table 1: Preliminary phytochemical analysis of ethanolic extract of plant *T. arjuna.*

S. No	Class of Phytoconstituents	Ethanolic extract of plant *T. arjuna*
1	Alkaloids	+Ve
2	Carbohydrates	-Ve
3	Polyphenols	+Ve
4	Saponins	+ Ve
5	Reducing sugars	+Ve
6	Flavonoids	+Ve
7	Triterpenoids	+Ve
8	Glycosides	+Ve
9	Tannins	+Ve

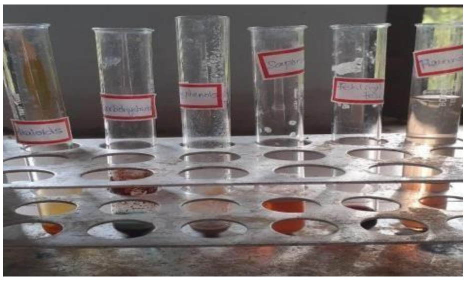

Fig: 6 Phytochemical analysis of ethanolic extract of plant *T. arjuna*

A photographic analysis of the lenses indicates that the control lenses remained in their usual state for the whole duration of the experiment. After eight hours, opacification began at the periphery of the lenses that had been treated with glucose (55 mM), indicating various degrees of cataractogenic alterations. (**Figure 1**). Two-concentration treatment. The extract from Terminalia arjuna slowed down the opacification process of the lens, as seen by the ability to clearly see gridlines through the lens.

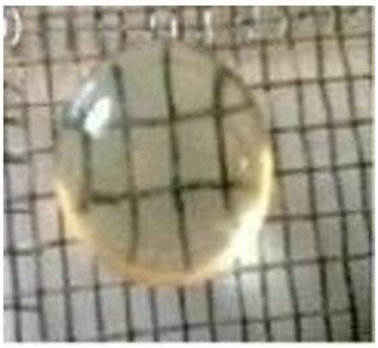

Figure 7. Group I: Glucose 5.5mM

Figure 8. Group II: Glucose 55mM.

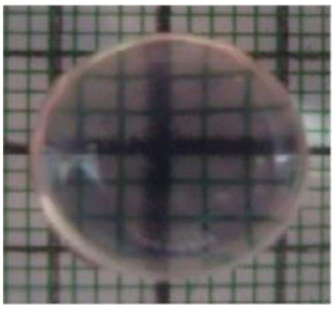

Figure 9. Group III: Glucose 55mM+ *Terminalia arjuna* extract (250 mg/ml)

Figure 10. Group IV: Glucose 55mM+ *Terminalia arjuna* extract (500 mg/ml)

When compared to normal lenses, lenses treated with glucose (55 mM) had considerably higher Na+ ($P<0.05$) and lower K+ & Na+ K+ ATPase activity ($P<0.001$). Na+, K+, and Na+ K+ ATPase activity was considerably elevated in lenses treated with 500 mg of Terminalia arjuna extract ($P<0.001$).

Table 2: Na+, K+ iand Na+ iK+ iATPase activity in lens homogenate after 72 hours of incubation.

Groups	**Treatment**	**Na+ (meq/g m)**	**K+ (meq/gm)**	**Na+ iK+ iATPase activity (µg/g lens)**
Group I	Glucose 5.5 Mm	124±42.4	13.5±2.5	44.5±3.2
Group II	Glucose 55 mM	223.4±18.6	6.2±0.6	22.3±2.6
Group III	Glucose55mM +TEST (250 mg/ml)	138.4±10.4	12.3±0.32	36.3±2.4
Group IV	Glucose 55mM+TEST (500 mg/ml)	129.4±12.5	12.5±06	38.4±4.3

Values mean ±S.D. n=5 for each group.

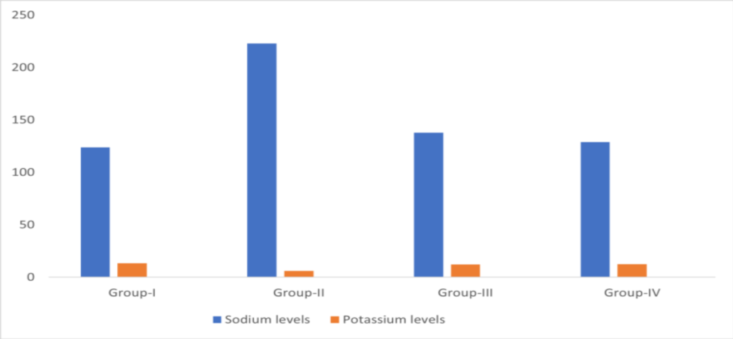

Fig Sodium and potassium levels of various groups. P<0.001 as compared to group-I, P< 0.05 as compared to group-II.

DISCUSSION

Cataract, or clouding of the lens, is a later-life condition that is most likely the result of decades of cumulative damage to the long-lived lens protein. Cataracts are the primary cause of blindness in the globe. Diabetes mellitus has been shown to have a significant impact on cataract genesis and is a key risk factor. Lens opacification in cataracts, a consequence of diabetes mellitus, is linked to elevated oxidative and hyperosmolar stress. Approximately 20% of cataract procedures are reportedly conducted only for individuals with diabetes. The development of cataracts has been linked to oxidative damage to the lens. The decrease in antioxidant enzyme activity in the cataractous lens highlights the importance of these enzymes in averting oxidative damage and the consequent cataract formation.

The following characteristics are frequently taken into account in cataract genesis: proteins (total proteins and water-soluble proteins), MDA, GSH, and electrolytes (Na+ and K+). It has been demonstrated that incubating a lens in medium with a high concentration of glucose (55 mM) significantly reduces Na+ K+ ATPase activity as opacity advances. The Na+ K+ ATPase is crucial for preserving the ionic balance in the lens; when it malfunctions, Na+ accumulates and K+ is lost, causing the lens fibers to enlarge and get hydrated, which results in cataract genesis. The protein content of the lens changes as a result of this change in the Na+ K+ ratio, with an increase in insoluble proteins and a decrease in water-soluble proteins.

It opacifies the lens as a result. In the current investigation, the amount of Na+ and K+ ions as well as Na+ K+ ATPase activity in cataract lenses treated with Terminalia arjuna was significantly higher. This demonstrated unequivocally that T. arjuna appears to inhibit the change of the Na+ and K+ imbalance. This may be because of their direct influence on the Na+ K+ ATPase in the lens membrane or their indirect action in scavenging free radicals.

The only treatment for cataracts at the moment is surgery, which has serious side effects such as posterior capsule opacity, intraocular lens dislocation, inflammation of the eyes, macular edema, endophthalmitis, and ocular hypertension. Indeed, there are several obstacles to effective cataract surgery and care, including socioeconomic issues including poverty, illiteracy, and difficulty accessing healthcare services. These elements may make it more difficult for afflicted people to get the care they need and may also impair their overall prognosis. Numerous studies have shown a strong correlation between oxidative stress and the development of cataracts.

The formation of cataracts can be caused by an imbalance between antioxidants and free radicals, which damages lens cells. Globally, cataracts are the primary cause of occurrences involving avoidable blindness. This demonstrates how important it is to catch vision loss early and receive the right care to avoid it. According to a new WHO assessment, the percentage of blindness attributable to cataracts may quadruple over the next 20 years if appropriate action is not taken now. This demonstrates the rise in preventable vision loss.

CONCLUSION

The ethanolic extract of T. arjuna bark was found to include biologically active chemicals and significant phytochemical elements. These findings warrant additional study and clarification. Additionally, this study demonstrated the anti-cataract properties of the bark of Terminalia arjuna when combined with an ethanolic extract. Regarding the ant-cataract action of Terminalia arjuna bark on goat lenses, this study offers pertinent information. The eye is a special organ that is always exposed to oxidative stress, so shielding the lens from these conditions is vital. Despite numerous compounds being evaluated, no single one has gained widespread approval for this indication thus far. Therefore, more research in this field is required. As a result, this research plays a crucial role in the advancement of cataract therapy medications. Therefore, the results of this study provided new opportunities for the use of Terminalia arjuna bark extract in the treatment of cataracts.

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