Research Article

A Prospective Study on Drug Utilization and Cost-Effective Analysis By Comparing Beta Blockers and Prostaglandin Analogs in Patients Diagnosed With Glaucoma in Ophthalmology Department

Jeevajothi M[1*], Mohashina Parveen M A[1], Mishamol Joseph[1], Mareena B John[1], Vediyappan. A[1], Jeyaprakash Balasubramanian[2], Arul Balasubramanian[1]

[1].Departmentof Pharmacy Practice, Vinayaka Mission's College of Pharmacy, Vinayaka Mission's Research Foundation (Deemed to be university), Salem, Tamil Nadu, India.
+Department of Ophthalmology, Vinayaka Mission's Kirupananda Variyar medical college and hospital, Vinayaka Mission's Research Foundation (Deemed to be university), Salem, Tamilnadu, India

Corresponding author: Jeevajothi Mariappan
Email id: jeevajothipharma10@gmail.com,
ORCID : 0009-0005-6514-4800

Abstract

Background: Glaucoma is a group of eye disorders characterized by progressive optic nerve damage and visual field loss. This study compared the effectiveness, safety, and cost-effectiveness of latanoprost and timolol maleate in primary open-angle glaucoma. Methods: A prospective observational study was conducted among 100 patients in the Ophthalmology Department of a tertiary care hospital in Salem from January to June 2024. Of these, 52 received latanoprost 0.001% and 48 received timolol maleate 0.5%. Intraocular pressure (IOP), visual acuity, cup-to-disc ratio (CDR), and Humphrey Field Analyzer (HFA) findings were evaluated. Medication costs, average cost-effectiveness ratio (ACER), and incremental cost-effectiveness ratio (ICER) were calculated. Results: Mean baseline IOP was 23.42 mmHg in the right eye and 23.31 mmHg in the left eye. IOP reduction was 8.5 mmHg with latanoprost and 7.4 mmHg with timolol ($p<0.05$). Visual acuity differed significantly ($p=0.02$), while CDR and HFA findings showed significant differences ($p<0.01$ and $p=0.0283$, respectively). ACER was ₹69.84 for latanoprost and ₹5.75 for timolol, with an ICER of ₹536.60. Conclusion: Latanoprost demonstrated greater IOP reduction but higher costs. Timolol maleate may be a more affordable initial option, potentially improving treatment adherence.

Keywords: Glaucoma, IOP, Latanoprost, Timolol maleate, CDR, HFA, ACER, ICER

1. Introduction

Eyes are the mirrors of the heart that express a thousand tales. They are like poetry, charming and mysterious. The eyes are vital sensory organs that plays a crucial role in the visual system. Vision has a significant influence in society affecting individuals of all ages. However, this focuses the challenges in maintaining the progressive chronic conditions like glaucoma and cataract causing loss of sight.

In the world of ocular diseases, Glaucoma is a complex eye condition interrupted by elevated intra-ocular pressure results in vision loss overtime as an outcome it damages the second cranial nerve of the eye (which sends visual signals from the retina to the central system)(Dietze et al., 2026)

In glaucoma, gradually the optic nerve gets damaged which leads to sightloss(Sihota & Tandon, 2023). Several factors can influence glaucoma among them, elevation of eye pressure (IOP), which is significant and alterable risk factor. The disease develops gradually, often without any prominent symptoms in its early stages, ultimately leading to permanent blindness. This characteristic has earned glaucoma the nickname "The Silent Thief of Sight".(Abdull et al., 2016)

The second most cause of sight-robbing in the world is glaucoma. It is figured that 80 million people are impacted by glaucoma universally. As in next to 2040,it is predicted that around 111.8 million people will cause the glaucoma (Tham et al., 2014). Epidemiological studies estimate that glaucoma is responsible for blindness in 1.2 million people, accounting for 5.5% of overall blindness and making it a primary cause for permanent vision-loss in India. In southern India, the prevalence of primary open-angle glaucoma (POAG) is 0.41% between more than forty to sixty years of age, according to the (Vellore Eye Survey).(Meller et al., 2025)While almost 50% of people with glaucoma in high-paid countries are unknowing of their condition and it exceeds 90% in middle-income countries, especially in rural areas, shows the urgent need

for improvement in awareness and management of glaucoma in India .(Bourne et al., 2024a)
The goal of the therapy in glaucoma was to reduce the elevated intra-ocular eye pressure(IOP) and minimizing the disease progression. Glaucoma medication was used to improve the eye vision; some might have side effects. Various medical options are possible to treat elevated IOP, where most commonly prescribed medications are topical beta-blockers (Timolol maleate), prostaglandin F2α analogs (latanoprost). Timolol maleate a beta-adrenergic blocker, it minimizes the IOP by lowering the aqueous humor secretion by connecting on ciliary surface. Limit in IOP reduce consequent effect of Timolol noticed at 2h after starting last till 24h. Around 80% topical drug is administered and the report is drained by Naso-lacrimal canal absorbs Systemically. Systemic absorption of timolol can cause adverse effects and contraindicated in Patient's with cardiac disease or asthma(Werpachowski N).
Most recent therapeutic agents in glaucoma medication are, Prostaglandin analogs. Latanoprost reduces IOP by inducing aqueous humor drainage mainly via the uveo-scleral pathway. But major effect was seen on the trabecular outflow which has been observed.(Alm, 2014)
Currently, new era of antiglaucoma medications is constantly add-on to the pharmaceutical clusters. Ophthalmologists were in the difficult situations in decision making to prefer the best choice of drug to the patients among variety of options. Therapeutic decisions for glaucoma treatment should take along with the consideration of its effectiveness, medication cost and its safety measures to maintain the patient therapeutic compliance.
Still observations of prostaglandins are proven to be highly effectual, but, due to its high price this is consider as the main disadvantage of this drug . On looking into this view, we set up the present study to compare the efficacy, safety and cost effectiveness of latanoprost and timolol as antiglaucoma therapy.

2. Materials and Methods:

2.1 Study design:

This was an Observational, Prospective study conducted in the department of Ophthalmology of a tertiary care hospital, Salem. This study was supervised throughout a period of 6 months from Jan to Jun 2024. The research protocol was presented in detail to the board members of the institutional ethics committee. It ensures ethical standards and protection to the human subjects were approved (Tracking No: VMKVMC&H/IEC/24/083). Further investigator proceeds with this study according to the guidelines of Helsinki. Prior to the study, written voluntary informed consent was documented from all patients by the investigators. Data of patients regarding treatment and follow-ups were gathered from the hospital for analysis following the approval.

2.2 Sample size calculation:

Patients were screened by ophthalmologists in the department of ophthalmology. A total of 140 patients were selected based on selection criteria. By using Slovin's formula 100 patients were randomly selected.(Mwale et al., 2024) Hence, the sample size was fixed as ~ 100.

2.3 Inclusion and Exclusion criteria:

Subjects with primary open-angle glaucoma are included with age group of forty to sixty-five years old and they should not take prostaglandin analogs or beta-blockers 30 days prior to the study. Patients with stable IOP are included.
This study excludes the subjects who contraindicates with latanoprost or timolol maleate, such as hypersensitivity, Bronchial Asthma, and CAD. Pregnant or lactating women were excluded. Participants with secondary forms of glaucoma and a History of ocular surgery or ocular surface disease in recent times shall be avoided. Those who are experiencing alcohol dependency may not be suitable .Any systemic condition or medication that could influence intraocular pressure or study outcomes are not allowed for trials

2.4 Clinical Assessment:

The enrolled patients were categorized into two groups. Among them, 52 patients
(Rudnicka et al., 2006)(The Advanced Glaucoma Intervention Study (AGIS): In our study IOP was measured in the morning or evening using applanation tonometer. At first, we took the readings at average of three visits ,later on follow-up at 2nd week,4th week, 6th week and 12th week.

Assessing disease through Visual acuity

Visual acuity is the measure that determines how well the patient has eye-sight (normal visual acuity:6/6). We have used Snellen eye chart to detect visual acuity using metric measurements (a test distance of 6 meters). The recorded measurements are changed to logarithm of minimum angle of resolution(log Mar) for statistical analysis

by using given formula.

$$logMAR = log10\ \frac{(snellen\ denominator)}{(snellen\ numerator)}$$

Cup : Disc ratio(CDR)

Cup: Disc ratio (CDR) is used for assessing the progression of glaucoma in the optic nerve head (Normal value:<0.5). here, it is recorded by comparing the diameter of the optic cup and optic disc.(Jonas et al., 2003)

Humphrey field Analysis

Humphrey field Analysis (HFA) is performed to assess the visual field defects i.e. at which extent the eyes are sensitive to lights in various areas of the retina. Here, our measurements are in Within normal limits(WNL) and outside the normal limits (ONL).

Cost-effectiv'e analysis of Latanoprost and Timolol maleate

This analysis of cost-effectiveness while surveying the patients by a designed questionnaire regarding economic of medications. Thus, the questions help us to assess about the affordability, benefits, adjustments and satisfaction with therapeutic costs. We have compared the different brands of both drugs to calculate their average prices and Average cost-effectiveness ratio (ACER) and incremental cost-effectiveness ratio (ICER) to determine cost variations by using these formulas:

$$ACER = [Average\ cost\ of\ the\ drug]/[Average\ reduction\ in\ IOP]$$

$$ICER = \frac{\Delta\{costofdrugA(latanoprost) - costofdrugB(timololmaleate)}{\Delta\{effectivenessofdrugA(latanoprost) - effectivenessofdrugB\ (timololmaleate)}$$

Statistical Analysis:

The gathered details are entered in MS EXCEL 2019 and we have done statistical analysis on patients who were completed their treatment period for 12 weeks by using R(CRAN) version 4.4.2 software. Baseline parameters (age, gender) and drug effects that shows the changes in intraocular pressure, visual acuity and CDR of the both treatment groups were compared using student's independent t-test. Pearson's chi-square test is carried to analyses visual defects (HFA). Cost-effective analysis Data are expressed in frequencies and percentages. The end results were considered statistically significant(P <0.05).

3. Results:

In current study, two-hundred eyes of 100 patients with glaucoma were listed to compare their visual acuity, CDR, HFA and IOP to determine the overall effectiveness, safety and cost-effectiveness of timolol maleate and latanoprost. Finally, there were 52 patients in latanoprost and 48 in Timolol maleate. Patients' age was ranged between 40 to 65 years, the male-to-female ratio was 1:1 [Table 1].

Table : 1 Demographic profile of the participants

Parameter	Category	Latanoprost (n=52)	Timolol Maleate (n=48)
Age (years)	Minimum	42	40
	Maximum	55	65
	Mean ± SD	49.326 ± 3.388	49.875 ± 2.764
Sex	Male	23	27

	Female	29	21
Eyes	Right	50	50
	Left	50	50

EFFICACY:

Table 2: Comparison of Mean IOP and Reduction in IOP of Latanoprost and Timolol Maleate by Student's Independent *t*-Test

Visit	Mean IOP ± SD in Two Groups				Mean IOP ± SD in Two Groups			
	Latanoprost (OD)	Timolol Maleate (OD)	t-value	p-value	Latanoprost (OS)	Timolol Maleate (OS)	t-value	p-value
Average of 3 visits	23.71 ± 3.17	23.59 ± 3.24	-1.455	0.074	23.14 ± 3.81	23.04 ± 2.57	-2.036	0.022
2 weeks	15.92 ± 1.44	16.77 ± 1.29	-3.103	<0.05	16.15 ± 1.42	16.63 ± 1.27	-1.733	<0.05
4 weeks	15.89 ± 1.34	16.46 ± 1.03	-2.305	<0.05	15.85 ± 1.27	16.37 ± 1.16	-2.156	<0.05
8 weeks	15.81 ± 1.24	16.31 ± 1.12	-2.129	<0.05	15.69 ± 1.32	16.23 ± 1.14	-2.168	<0.05
12 weeks	14.86 ± 1.70	15.88 ± 1.37	-3.196	<0.05	14.94 ± 1.69	15.77 ± 1.19	-2.827	<0.05
Mean reduction in IOP from baseline								
2 weeks	7.79	6.82	-1.648	<0.05	6.99	6.41	-0.303	<0.05
4 weeks	7.82	7.13	-0.853	<0.05	7.29	6.67	-0.120	<0.05
8 weeks	7.90	7.28	-0.674	<0.05	7.45	6.81	-0.132	<0.05
12 weeks	8.85	7.71	-1.741	<0.05	8.20	7.27	-0.791	<0.05

P>0.05 – Not significant, P< 0.05 – Significant, P< 0.001- Highly significant
IOP: Intraocular pressure
OD- Right eye
OS- Left eye

The study subjects were analyzed for the IOP measurements [Table 2] .while comparing latanoprost group shows the mean baseline IOP (OD) was 23.71 and 23.59 in timolol maleate (OD) . Then in left eye (OS) the mean baseline IOP of timolol was 23.04 and latanoprost (OS) has 23.14. The mean IOP at 12th week, Latanoprost(OD) and (OS) was 14.86 and 14.94, in Timolol group (OD) and (OS)was 15.88 and15.77 . Patients in both treatment groups showed reduction in the IOP from Avg. of three visits towards the end of 12th week. The difference between the maximum and minimum mean IOP recordings was 8.5 mmHg by latanoprost($p<0.05$) whereas 7.4 mmHg by timolol maleate at the final visit. In comparison to Timolol and Latanoprost therapy shows a higher reduction in mean IOP on every follow-up visits. Statistical analysis of mean reduction in IOP was analyzed by independent samples test ($p<0.05$). [Table 2]

SAFETY

Table 3: Analysis of Studied Eyes According to Log MAR BCVA				
LOGMAR BEST CORRECTED VISUAL ACUITY(BCVA)				
Parameter	**Right Eye (OD)**		**Left Eye (OS)**	
Treatment	**Timolol Maleate**	**Latanoprost**	**Timolol Maleate**	**Latanoprost**
Min–Max	0.0–0.48	0.0–0.30	0.0–0.30	0.0–0.30
Mean ± SD	0.217 ± 0.1171	0.16 ± 0.115	0.1892 ± 0.098	0.136 ± 0.1205
SEM	0.016241	0.016599	0.013526	0.017389
t-value	2.45117	—	2.4049	—
Df.	98	—	91	—
P-value	0.016086	—	0.018198	—
P>0.05 – Not significant, P< 0.05 – Significant, P< 0.001- Highly significant				

Table 3 shows the mean LOGMAR visual acuity of latanoprost for right eye (OD) was (0.16±0.115), compared to (0.217±0.1171) for timolol maleate OD (p= 0.016, t=2.4511). Similarly, for the left eye(OS) the mean LOGMAR visual acuity was (0.136±0.1205) for latanoprost and (0.1892±0.098) for timolol maleate(p=0.018, t=2.4049). Latanoprost has a bit higher improvement compared to timolol maleate in both eyes, were statistically significant at (p<0.05)

Table 4: Analysis of Studied Eyes According to Log MAR BCVA				
LOGMAR BEST CORRECTED VISUAL ACUITY(BCVA)				
Parameter	**Right Eye (OD)**		**Left Eye (OS)**	
Treatment	**Timolol Maleate**	**Latanoprost**	**Timolol Maleate**	**Latanoprost**
Min–Max	0.40–0.70	0.40–0.75	0.40–0.65	0.40–0.75
Mean ± SD	0.5576 ± 0.082	0.6177 ± 0.1098	0.5442 ± 0.0843	0.5927 ± 0.097
SEM	0.0114	0.0158	0.011704	0.014044
t-value	3.10003	—	2.65175	—
df	85	—	93	—
P-value	0.002624	—	0.00941	—
P>0.05 – Not significant, P< 0.05 – Significant, P< 0.001- Highly significant CDR – Cup to Disc ratio				

Participants were treated with latanoprost and timolol maleate is observed with the cup: disc ratio in both eyes. Particularly, for the right eye(OD), the mean C:D ratio of timolol maleate was (0.6177±0.1098) in contrast to (0.5576±0.082) latanoprost ,with a p-value of 0.002624. similarly for left eye(OS), the recorded mean ratio of timolol maleate is (0.5927±0.097), whereas the latanoprost group shows a mean of (0.5442±0.0843), with a p-value of 0.00941. This indicates timolol maleate shows somewhat lesser stabilization compared to latanoprost in set of eyes, with significantly proven differences (p <0.05).[Table 4]

Table 5: Analysis of Visual Field Defects Based on HFA					
Pearson's Chi-square test	**Chi-square (χ^2)**	**χ^2 Critical**	**df**	**P-value**	**α**
	4.808	3.841	1	0.028324	0.05

P>0.05 – Not significant, P< 0.05 – Significant, P< 0.001- Highly significant HFA – Humphrey field Analyzer

The above data provides the comparison of HFA between latanoprost and Timolol maleate. Thus, the patients were categorized as WNL (within normal limits) and ONL(outside normal limits). The outcome from the Pearson's chi-square test yields a value of 4.808 (x-critical = 3.841, df= 1,p=0.0283), was significant at α =0.05.[Table 5]

Cost-Analysis of latanoprost and timolol maleate

In this cost-analysis, we came to know that latanoprost treatment was more expensive than timolol maleate based on the cost-effectiveness assessment. Question.1,2,4 has the highest percentages (89.58%, 81.25%,91.67%) of yes in timolol whereas Question.3 yields high percentage(97.92%) in NO of timolol maleate. Results show that more patients found timolol maleate as least cost-effective drug compared to latanoprost over all questions (Q1-Q4). Latanoprost had a higher number of "No" responses, pointing the lack of cost-effectiveness.[Table 6]

Table 7: Comparison of Average Costs of Different Brands of Latanoprost (LT) and Timolol Maleate (TM)

Brands of Timolol Maleate (TM)	Cost of TM (5 mL) (₹)	Brands of Latanoprost (LT)	Cost of LT (5 mL) (₹)
Glucomol	49.78	Xalaton	498.95
Iotim	44.00	Opticular	477.00
Nyolol	47.50	Latobest	524.90
Optilax	22.00	Latocom	594.32
Average	**40.82**	**Average**	**523.79**
LT- Latanoprost **TM- Timolol maleate**			

Table 8: Cost-Effectiveness Ratio Using ACER and ICER

Difference in Effectiveness	Conc. (%)	Volume (mL)	Average Cost (₹)	IOP Reduction (mmHg)	ACER (₹/mm Hg Reduction)	Average Fall in IOP	Difference in Cost (₹)	Difference in Effectiveness	ICER (₹/mm Hg)
Latanoprost	0.005	2.5	523.79	8.0	69.84	7.5	482.90	0.90	536.60
Timolol Maleate	0.5	5	40.82	7.1	5.75	5.84	—	—	—
ACER – Average cost- effectiveness ratio ICER – Incremental cost- effectiveness ratio									

Estimation of average cost of 5 ml shows latanoprost 0.005% w/v is ₹523.79, with individual brand prices ranging from ₹477.0 to ₹594.32 . In contrast, the average cost of 5 ml of timolol maleate 0.5% w/v was ₹40.82, with individual brand prices ranging from ₹22.00 to ₹49.78. resulting in a significant cost difference of approximately ₹482.97. The cost-effectiveness ratio was calculated to evaluate and compare the two treatment alternatives

Q. No.	Cost-Effectiveness Assessment	Latanoprost – Yes (%)	Latanoprost – No (%)	Timolol Maleate – Yes (%)
Q1	Is this medication being affordable?	21.15	71.15	89.58

Q2	When making decisions about treatment, do the benefits outweigh the cost?	42.31	50.00	81.25
Q3	Have you made any sacrifices or adjustments due to the cost of the medication?	65.38	26.92	10.42
Q4	Are you satisfied with the cost of this medication?	32.69	59.62	91.67

Table 7 highlights, the Average Cost-Effectiveness Ratio of latanoprost and timolol maleate was Rs. 69.84 and Rs. 5.75 . Along with, the Incremental cost-effectiveness ratio of timolol versus latanoprost in between 536.6 rupees per patient depending on Average fall in IOP (8 mmHg and 7.1 mmHg). Which shows that for each outcome consumes extra cost per unit obtained in contrast to select any one of those treatments. [Table 8]

Discussion :

The findings from the study shows majority of the patients attending the ophthalmology department were in the age range of forty to sixty-five years and had an equal male population 50(50%) and female population 50(50%) which is in concordance with the study by Ntim-Amponsah et al.,.(Ntim-Amponsah et al., 2005) This literature report highlights, advancement in age is the major triggering factor of Primary-open angle Glaucoma.Singh et al., (2017)(Bourne et al., 2024b) and buys et al., (2012)(Buys et al., 2012) states that latanoprost was superior in reducing IOP than Timolol. Additionally, a meta-analysis done by Zhang et al.,(2001)(Zhang et al., 2010)has also confirmed that latanoprost provides a greater reduction in IOP and better stabilization compared to timolol maleate. The findings were aligned with previous studies, that has demonstrated that timolol maleate has more or less same effect over latanoprost was shown in Figure 1. The current study notices, the efficacy in reducing intra-eye pressure(IOP) of latanoprost, administered OD (once a day), shows slightly higher to that of timolol 0.5%, administered BD (twice a day) also reported the similar results with previous studies

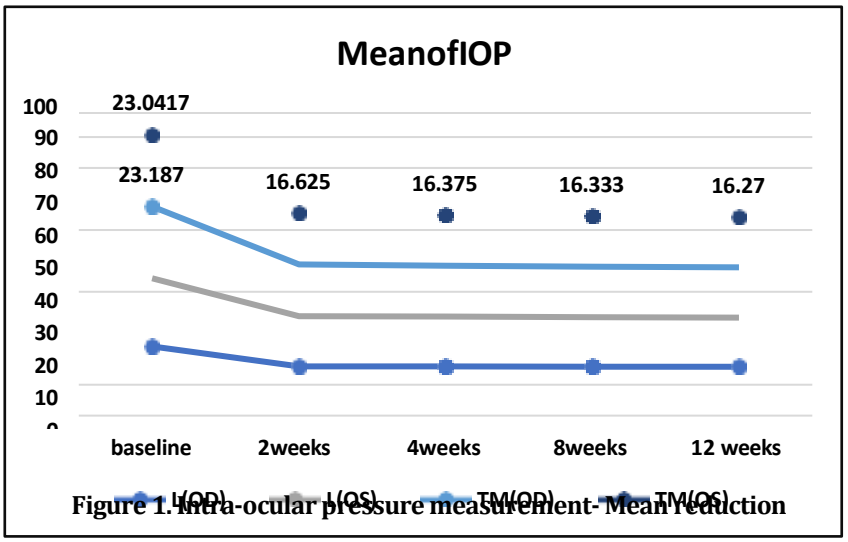


Figure 1. Intra-ocular pressure measurement- Mean reduction

Sood et al., (2005) proved that Visual field progression or defects are recognized as one of the ocular complications in glaucoma. In this investigation, visual acuity, Humphrey field analyses and cup-to- disc ratio

was used as safety measures to compare latanoprost and timolol maleate.(Thomas et al., 2005)

Results from the current study demonstrates an improvement or maintenance in mean log MAR visual acuity with latanoprost compared to timolol maleate (Figure 2).which is in accordance with the findings by David W. Evans, (2008) in that they conclude latanoprost appears to be significantly maintains the visual function by improving the visual acuity. (Sood et al., 2005)

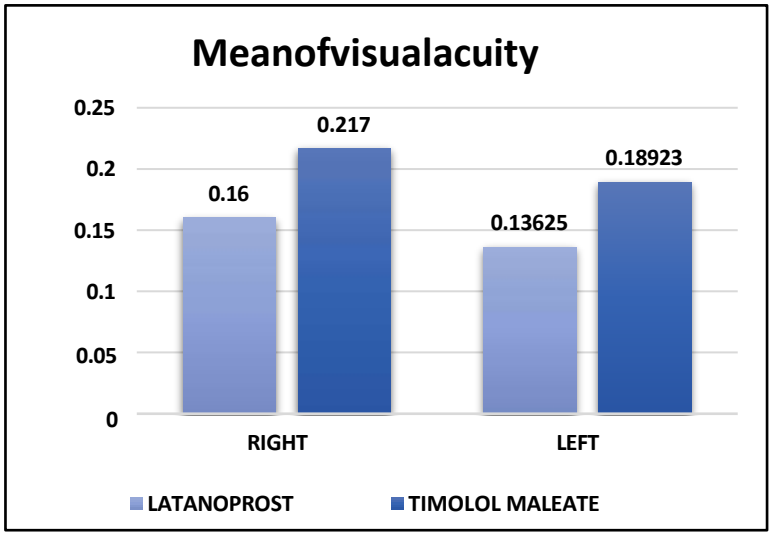


Figure 2: Visual acuity assessment- Mean improvement

According to M Fadhil Syafridon et al, (2022)(Rohmah, 2024), their study was done on the progression of the visual loss depends upon the intra-ocular pressure, that shows latanoprost is effective in reducing Cup: Disc ratio than timolol which correlates with our analysis, visual field detected by using the cup: disc ratio which shows latanoprost is marginally effective in preventing and stabilizing glaucomatous visual field progression than timolol maleate.

Inatani, (2008)(Inatani et al., 2008)stated that latanoprost decreases and maintains the vision loss than timolol maleate by using Humphrey field Analyzer. This research finding focusses the progression of the visual defect is somewhat maintained by latanoprost than timolol maleate which equates with the above study. Which is also similar with the other findings.(Thomas et al., 2011a)(Yohannan et al., 2021)

A contrast findingwasreported in other studies by Inoue, (2014)(Inoue, 2014) and Thom J. Zimmerman, (1977)(Thomas et al., 2011b), found that their study subjects with latanoprost has local adverse effects like conjunctival hyperemia and iris pigmentation while timolol maleate shows systemic side-effects like bradycardia, asthma, hypotension and most of the cardio vascular diseases. It also outlines techniques to minimize or prevent the therapy -related adverse events. Here, the study could not come across any kind of contradiction and adverse events like iris pigmentation or conjunctival hyperemia in patients treated with both the drugs due to the very short duration of study. So, following study could not correlate with the above study because of the short-span of time.In India, though therapy is reasonably priced, the regular purchase of anti-glaucoma regimens remains a financial burden to patients in rural areas, significantly increasing their monthly expenses beyond their income , which is in line with the findings from the study by Nayak et al., (2015)(Nayak et al., n.d.).In the present investigation, the results show cost-effectiveness analysis of latanoprost and timolol maleate was conducted by surveying patients using a designed questionnaire to gather data on medication costs Figure 3 and also evaluates the Average Cost-Effectiveness Ratio based on the average cost of various brands. These finding confirms that the study subjects from the rural areas could not afford high therapy cost which is similar to the above study.

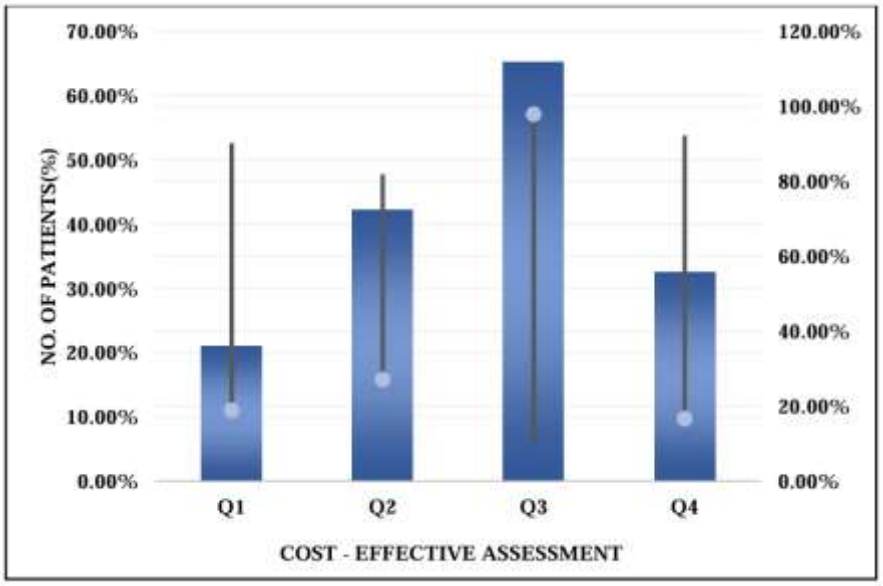


Figure 3: Cost-effective Assessment

This study outcome showed that the treatment of latanoprost was over-priced than timolol with the average cost of different brands was ₹ 523.79 and ₹ 40.82 for latanoprost and timolol maleate. The ACER of both drugs in our study was measured by average of cost/ reduction in IOP was assessed to be ₹ 69.84 and ₹ 5.75. According to ACER ,timolol was more cost-effective in contrast to latanoprost.

In the medical care system, the cost of the prescribing medication plays an important role .For improvement in the patient adherence and proper drug usage by the patients , a cost-evaluation is crucial. various studies which were done by Day G et al., (2004)(Jabs et al., 2000), Holmstrom et al., (2006)(of Allergan & Europe Holmstrom, 2026), Jietze et al., (2015)(Kumbar et al., 2015) and Stewart et al., (2009)(Thelen et al., 2013)revealed that beta-blocker group provides with least overall cost of the medication. This study also reports the additional cost per unit of IOP reduction in mmHg, calculated using the Incremental Cost-Effectiveness Ratio. Compared to timolol, latanoprost provided a greater reduction in IOP with an ICER of 536.6 . However, the additional fall in IOP is achieved with latanoprost group came at a cost higher than the average cost per mmHg reduction achieved with beta-blocker group. This exceeds the patients willing to pay, indicating timolol is the better cost-effective treatment alternative contrast to latanoprost. These findings are reliable with previous studies.(Vareilles et al., 1977)

Conclusion:

From the analysis, it concludes that while comparing latanoprost and timolol maleate for primary open -angle glaucoma in the selected patients, both drug shows similar efficacy, effectiveness and safety based on the measurement of visual acuity, Cup: Disc ratio, Humphrey field analysis and assessment of Cost-effectiveness. Where latanoprost exhibits slight variations in its efficacy and safety. On the basis of pharmacoeconomic analysis, latanoprost has high cost, this can lead the patients to discontinue the medication and also the patients from the rural areas could not afford high therapy cost which corresponds with the above study. Thus, the Patients could not reach the desired therapeutic action due to patient non-compliance. Through the knowledge, the present study suggests initiating treatment with timolol maleate as the preferred option ,as it shows satisfactory in patient-compliance and positive therapeutic outcome for the disease. Latanoprost should be considered as adjunct therapy when treatment goals are not attained or there is a Contraindications using timolol maleate. This research encourages to cautiously consider appropriate treatment regimens according to patient's clinical needs and financial limitations.

Bibliography:

1. Abdull, M. M., Chandler, C., & Gilbert, C. (2016). Glaucoma, "the silent thief of sight": Patients' perspectives and health seeking behaviour in Bauchi, northern Nigeria. BMC Ophthalmology, 16(1), 1–9. https://doi.org/10.1186/s12886-016-0220-6

2. Alm, A. (2014). Latanoprost in the treatment of glaucoma. In Clinical Ophthalmology (Vol. 8, pp. 1967–1985). Dove Medical Press Ltd. https://doi.org/10.2147/OPTH.S59162
3. Bourne, R. R. A., Jonas, J. B., Friedman, D., Nangia, V., Bron, A., Tapply, I., Fernandes, A. G., Cicinelli, M. V., Arrigo, A., Leveziel, N., Resnikoff, S., Taylor, H. R., Sedighi, T., Bikbov, M. M., Braithwaite, T., Cheng, C. Y., Congdon, N., Del Monte, M. A., Ehrlich, J. R., … Steinmetz, J. D. (2024a). Global estimates on the number of people blind or visually impaired by glaucoma: A meta-analysis from 2000 to 2020. Eye (Basingstoke), 38(11), 2036–2046. https://doi.org/10.1038/s41433-024-02995-5
4. Bourne, R. R. A., Jonas, J. B., Friedman, D., Nangia, V., Bron, A., Tapply, I., Fernandes, A. G., Cicinelli, M. V., Arrigo, A., Leveziel, N., Resnikoff, S., Taylor, H. R., Sedighi, T., Bikbov, M. M., Braithwaite, T., Cheng, C. Y., Congdon, N., Del Monte, M. A., Ehrlich, J. R., … Steinmetz, J. D. (2024b). Global estimates on the number of people blind or visually impaired by glaucoma: A meta-analysis from 2000 to 2020. Eye (Basingstoke), 38(11), 2036–2046. https://doi.org/10.1038/s41433-024-02995-5
5. Buys, Y. M., Harasymowycz, P., Gaspo, R., Kwok, K., Hutnik, C. M. L., Blondeau, P., Birt, C. M., Piemontesi, R. L. G., Gould, L. F., Lesk, M. R., & Ahmed, I. K. (2012). Comparison of newly diagnosed ocular hypertension and open-angle glaucoma: Ocular variables, risk factors, and disease severity. Journal of Ophthalmology, 2012, 17–20. https://doi.org/10.1155/2012/757106
6. Complications of Topical Timolol in the Management of Infantile Hemangiomas: A Systematic.
7. Dietze, J., Blair, K., Zeppieri, M., Havens, S. J., & Adams, M. (2026). Glaucoma (Nursing).
8. Inatani, M., Iwao, K., Inoue, T., Awai, M., Muto, T., Koga, T., Ogata-Iwao, M., Hara, R., Futa, R., & Tanihara, H. (2008). Long-term relationship between intraocular pressure and visual field loss in primary open-angle glaucoma. Journal of Glaucoma, 17(4), 275–279. https://doi.org/10.1097/IJG.0b013e31815c3ab7
9. Inoue, K. (2014). Managing adverse effects of glaucoma medications. Clinical Ophthalmology, 8, 903–913. https://doi.org/10.2147/OPTH.S44708
10. Jabs, D. A., Rosenbaum, J. T., Foster, C. S., Holland, G. N., Jaffe, G. J., Louie, J. S., Nussenblatt, R. B., Stiehm, E. R., Tessler, H., Van Gelder, R. N., Whitcup, S. M., & Yocum, D. (2000). PERSPECTIVE Guidelines for the Use of Immunosuppressive Drugs in Patients With Ocular Inflammatory Disorders: Recommendations of an Expert Panel.
11. Jonas, J. B., Thomas, R., George, R., & Jonas, J. (2003). Optic disc morphology in south India: the Vellore Eye Study. In Br J Ophthalmol (Vol. 87). www.bjophthalmol.com
12. Kumbar, S. K., Mirje, M., Moharir, G., & Bharatha, A. (2015). Cost analysis of commonly used combination of drugs in primary open angle Glaucoma. Journal of Clinical and Diagnostic Research, 9(5), FC05–FC08. https://doi.org/10.7860/JCDR/2015/12491.5966
13. Meller, L. L. T., Saseendrakumar, B. R., Mahmoudinezhad, G., Tavakoli, K., Wu, J. H., Parikh, A., Bhanvadia, S., Moghimi, S., Zangwill, L., Weinreb, R. N., & Baxter, S. L. (2025). Association Between Alcohol Use and Primary Open Angle Glaucoma. Journal of Glaucoma, 34(2), 69–76. https://doi.org/10.1097/IJG.0000000000002529
14. Nayak, B., Gupta, S., Kumar, G., Dada, T., Gupta, V., & Sihota, R. (n.d.). Original Article Socioeconomics of long term glaucoma therapy in India. Indian Journal of Ophthalmology, 63(1), 20–24.
15. Ntim-Amponsah, C. T., Amoaku, W. M. K., Ewusi, R. K., Idirisuriya-Khair, R., Nyatepe-Coo, E., & Ofosu-Amaah, S. (2005). Evaluation of risk factors for advanced glaucoma in Ghanaian patients. Eye, 19(5), 528–534. https://doi.org/10.1038/sj.eye.6701533
16. of Allergan, F. R., & Europe Holmstrom, D. (2026). The cost-effectiveness of bimatoprost, latanoprost and timolol in treatment of primary open angle glaucoma in five European countries.
17. Rohmah, S. (2024). Sriwijaya Journal of Ophthalmology. Sriwijaya Journal Of Opthalmology, 7(1), 178–189. https://pdfs.semanticscholar.org/b79b/d9eddfd891f52e3b498e9e7993f826c587a4.pdf
18. Rudnicka, A. R., Mt.-Isa, S., Owen, C. G., Cook, D. G., & Ashby, D. (2006). Variations in primary open-angle glaucoma prevalence by age, gender, and race: A Bayesian meta-analysis. Investigative Ophthalmology and Visual Science, 47(10), 4254–4261. https://doi.org/10.1167/iovs.06-0299
19. Sihota, R., & Tandon, R. (2023). Parsons' Diseases of the Eye. Parsons' Diseases of the Eye, 1–628. https://doi.org/10.3928/0191-3913-19780901-22
20. Sood, M. D., Vijaya, M. L., Sekhar, M. G. C., Sood, M. N. N., Baskaran, F. M., & Prasad, D. K. K. (2005). Efficacy and Safety of Latanoprost for Glaucoma Treatment: A Three-Month Multicentric Study in India Original Article.
21. Tham, Y. C., Li, X., Wong, T. Y., Quigley, H. A., Aung, T., & Cheng, C. Y. (2014). Global prevalence of glaucoma and projections of glaucoma burden through 2040: A systematic review and meta-analysis. Ophthalmology, 121(11), 2081–2090. https://doi.org/10.1016/j.ophtha.2014.05.013
22. The Advanced Glaucoma Intervention Study (AGIS): 7. The Relationship Between Control of Intraocular Pressure and Visual Field Deterioration. (2000).

23. Thelen, U., Schnober, D., Schölzel, S., Kristoffersen, M. S., Nelson, L. A., Stewart, J. A., & Stewart, W. C. (2013). Long-term cost and efficacy analysis of latanoprost versus timolol in glaucoma patients in Germany. International Journal of Ophthalmology, 6(2), 155–159. https://doi.org/10.3980/j.issn.2222-3959.2013.02.09
24. Thomas, R., Loibl, K., & Parikh, R. (2011a). Evaluation of a glaucoma patient. Indian Journal of Ophthalmology, 59(SUPPL. 1). https://doi.org/10.4103/0301-4738.73688
25. Thomas, R., Loibl, K., & Parikh, R. (2011b). Evaluation of a glaucoma patient. Indian Journal of Ophthalmology, 59(SUPPL. 1). https://doi.org/10.4103/0301-4738.73688
26. Thomas, R., Parikh, R., Sood, D., Vijaya, L., Sekhar, G. C., Sood, N. N., Baskaran, M., & Prasad, K. K. (2005). Efficacy and safety of latanoprost for glaucoma treatment: A three-month multicentric study in India. Indian Journal of Ophthalmology, 53(1), 23–30. https://doi.org/10.4103/0301-4738.15281
27. Vareilles, P., Silverstone, D., Plazonnet, B., Le Douarec, J.-C., Sears, M. L., & Stone, C. A. (1977). Articles Comparison of the effects of timolol and other adrenergic agents on intraocular pressure in the rabbit. In A Journal of Clinical (Vol. 16, Number 11).
28. Yohannan, J., Boland, M. V., &Ramulu, P. (2021). The Association between Intraocular Pressure and Visual Field Worsening in Treated Glaucoma Patients. Journal of Glaucoma, 30(9), 759–768. https://doi.org/10.1097/IJG.0000000000001906
29. Zhang, W. Y., Po, A. L. W., & Dua, H. S. (2010). UGC - NATIONAL ELIGIBILITY TEST June-27 , 2010. 2015(April), 58559704.