Original Research

SELECTION OF MEDICAL THERAPY IN GLAUCOMA PATIENTS IN THE OUTPATIENT EYE CLINIC SOETOMO GENERAL ACADEMIC HOSPITAL SURABAYA

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ABSTRACT

Glaucoma is the second leading cause of blindness and the third cause of visual impairment. Glaucoma management includes medical therapy, laser, and incisions. This study aims to determine the selection of medical therapy in the outpatient eye clinic Soetomo General Academic Hospital Surabaya. This study was a retrospective descriptive study. The variables were type of glaucoma, visual acuity, intraocular pressure, and drug therapy. Data processing was done by collecting, grouping, and describing data. Glaucoma was mostly common in 50-64 years old (37.66%), male (50.65%), most patients lived in Surabaya (53.68%), the most common type was Primary Open-Angle Glaucoma (32.90%), the most medical therapy given in the first visit in 2019 was single medical therapy (67.97%), the most single drug therapy was latanoprost (49.68%), the most drugs combination was timolol maleat with acetazolamide (35.14%), the most commonly drugs class were prostaglandin analogues (48.48%), most of the visual acuity values were 6/6 - 6/18 (1,00 – 0,33) (37.88%), most intraocular pressure was in the 11-21 mmHg (62.55%). The most common type of glaucoma was primary open angle glaucoma with the most therapy given was prostaglandin analogue.

Keywords: Glaucoma; human & medicine; single drug therapy; combination drugs therapy; prostaglandin analogue; latanoprost; health risk

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Hii j ni j tu
1. Medical therapy selection in the outpatient eye clinic were determined.
2. Treatment of prostaglandin analogue therapyfor primary open angle glaucoma was the most common glaucoma type.

INTRODUCTION

According to World Health Organization, glaucoma is the second leading cause of blindness in the world with a prevalence of 8%. In 2019, World Health Organization declared that glaucoma is the third leading cause of visual impairment in the world. Meanwhile, the Ministry of Health in 2007 stated that the prevalence of glaucoma in Indonesia was 0.46%.

Glaucoma is an optic neuropathy characterized by an increase in intraocular pressure. There are three types of glaucoma, namely primary, secondary, and developmental glaucoma (Japan Glaucoma Society 2006). Glaucoma clinical manifestations usually arise in severe damage. Glaucoma management includes medical therapy, laser therapy, and incisions (Japan Glaucoma Society 2006). Classes of drugs for glaucoma

Glaucoma Society 2006). Classes of drugs for glaucoma include prostaglandin analogues, beta-blockers, α-adrenergic agonists, parasympatomimetics, carbonic anhydrase inhibitors, and hyperosmotic agents (Prum et al. 2016).

Data on the selection of medical therapy in glaucoma patients in Surabaya need to be updated. Based on the previous evidence, we were interested to determine the selection of medical therapy in glaucoma patients. This study was expected to provide information (data) about the selection of medical therapy for glaucoma services, so that it could be the basis for any research related to glaucoma.

MATERIALS AND METHODS

This study was a retrospective descriptive study that involved data from the medical records of glaucoma patients in the Outpatient Eye Clinic Dr. Soetomo General Academic Hospital, Surabaya, in January - December 2019. The variables observed were the type of glaucoma diagnosis, visual acuity, intraocular pressure, and drug therapy given to glaucoma patients. Medical record data were collected and grouped based on the criteria to be studied, then described qualitatively and quantitatively.

RESULTS

231 patient medical records were obtained. The data were recorded in the form of the patient's medical record number, name, age, gender, area of residence of the patient, type of glaucoma diagnosis, selection of medical therapy either singly or in combination, class of drug administered, visual acuity, and intraocular pressure of the patient.

Age

Glaucoma was mostly found in 50-64 years old with 87 patients (37.66%), while the lowest distribution of glaucoma patients was in the ≥80 years age group were 5 patients (2.16%).

Table 1. Frequency distribution based on patient age

Age (Years)	Quantity (People)	Percentage
20-34	11	4.76%
35-49	47	20.35%
50-64	87	37.66%
65-79	81	35.06%
≥80	5	2.16%
Total of Patients	231	100%

Gender

The frequency distribution by gender showed that the total of male patients (50.65%) was more than female (49.35%). The ratio of male and female patients was 1.03: 1.

Table 2. Frequency distribution by patient's gender

Gender	Quantity (People)	Percentage
Male	117	50.65%
Female	114	49.35%
Total of Patients	231	100%

Residential area

The frequency distribution based on residential area were mostly in Surabaya (53.68%), followed by Sidoarjo (8.23%), Gresik (6.06%), and Bangkalan (6.06%). Glaucoma patients also came from various regions in Indonesia (Table 3).

Table 3. Frequency distribution based on residential area

Residental area	Quantity (People)	Percentage
Bangkalan	12	5.19%
Bojonegoro	4	1.73%
Bondowoso	1	0.43%
Gresik	14	6.06%
Jember	1	0.43%
Jombang	4	1.73%
Kediri	1	0.43%
Konawe Selatan	1	0.43%
Kupang	2	0.87%
Lamongan	5	2.16%
Lumajang	2	0.87%
Madiun	4	1.73%
Magetan	1	0.43%
Malang	1	0.43%
Manokwari	1	0.43%
Mataram Kota	2	0.87%
Mojokerto	7	3.03%
Nganjuk	4	1.73%
Palu Kota	1	0.43%
Pamekasan	3	1.30%
Pasuruan	5	2.16%
Ponorogo	1	0.43%
Sampang	1	0.43%
Sidoarjo	19	8.23%
Sleman	1	0.43%
Sukoharjo	1	0.43%
Sumenep	1	0.43%
Surabaya	124	53.68%
Trenggalek	1	0.43%
Tuban	4	1.73%
Tulungagung	2	0.87%
Total of Patients	231	100%

Table 4. Frequency distribution by type of glaucoma diagnosis

Type of glaucoma	Quantity (People)	Percentage
Glaucoma Suspect	25	10.82%
Primary Open-Angle Glaucoma	76	32.90%
Primary Angle-Closure Glaucoma	41	17.75%
Glaucoma Secondary To Eye Trauma	2	0.87%
Glaucoma Secondary To Eye Inflammation	6	2.60%
Glaucoma Secondary To Other Eye Disorders	41	17.75%
Glaucoma Secondary To Drugs	1	0.43%
Other Glaucoma	19	8.23%
Glaucoma Unspecified	17	7.36%
Absolute Glaucoma	3	1.30%
Total of Patients	231	100%

Type of glaucoma

The most common types of glaucoma diagnosis were primary open-angle glaucoma as many as 76 patients (32.90%). It followed by primary angle-closure disorders with each percentage was 17.75%. Meanwhile, the fewest type of glaucoma diagnosis was glaucoma secondary to drugs as many as 1 patient (0.43%) (Table 4).

Glaucoma medical therapy

Drug class

The most glaucoma medical therapy given at the first visit in 2019 was single drug therapy (68.83%).

Table 5. Distribution of choice of medical therapy in glaucoma patients

Glaucoma Therapy	Quantity (People)	Percentage
Single drug therapy	159	68.83%
Combination drugs therapy	72	31.17%
Total of Patients	231	100%

Single drug therapy

The most single drug therapy given was latanoprost (49.06%) followed by timolol maleate (37.74%), while the fewest was betaxolol (0.63%).

Table 6. Distribution of single drug therapy

Single Drug therapy	Quantity (People)	Percentage
Brinzolamide	3	1.89%
Betaxolol	1	0,63%
Acetazolamide	17	1.69%
Timolol maleat	60	3.74%
Latanoprost	78	49.06%
Total of Patients	159	100%

Combination of drugs therapy

The most common drug combination given was timolol maleate with acetazolamide (36.11%). The fewest combinations of drugs include Latanoprost, Acetazolamide, Brinzolamide with a percentage of 1.39%.

Table 7. Distribution of combination drugs therapy

Combination Drugs Therapy	Quantity (People)	Percentage
Timolol Maleat, Acetazolamide	26	36.11%
Timolol Maleat, Acetazolamide, Brinzolamide	4	5.56%
Timolol Maleat, Latanoprost	3	4.17%
Timolol Maleat, Latanoprost, Brinzolamide		
Latanoprost, Brinzolamide	6	8.33%
Latanoprost, Pilokarpin	2	2.78%
Latanoprost, Acetazolamide	20	27.78%
Latanoprost, Acetazolamide, Brinzolamide		
Total of Patients	72	100.00%

The most widely administered drug group was prostaglandin analogues (48.48%), followed by beta blockers (45.02%), carbonic anhydrase inhibitors (37.66%) and the least administered was parasympathomimetic (0.87%).

Table 8. Distribution of the drug class

Drug Class	Quantity (People)	Percentage
Beta-blockers	104	45.02%
Prostaglandin analogues	112	48.48%
Carbonic anhydrase inhibitor	87	37.66%
Parasympathomimetic	2	0.87%

Visual acuity

The most visual acuity value of the right eye was in the range of 6/6 - 6/18 (1.00 – 0.33) as many as 34.63%, while the fewest was in the range of 3/60 - 1/60 (0.049 – 0.02) equal to 5.19%. The most visual acuity of the left eye was in the range of 6/6 - 6/18 (1.00 – 0.33) as many as 41.13%, while the fewest was in the range of 3/60 - 1/60 (0.049 – 0.02) equal to 5.19%. The highest visual cewkv{ y cu 8l8. cpf vj g nqy y guvxkuwcncewkv{ y cu vq jki j vr gt gr vkqp0

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Visual Acuity of Oculi Dextra		
6/6 - 6/18 (1,00 – 0,33)	80	34,63%
6/18 - 6/60 (0,32 – 0,10)	44	19,05%
6/60 - 3/60 (0,09 – 0,05)	15	6,49%
3/60 - 1/60 (0,049 – 0,02)	12	5,19%
1/60 - LP+ (0,019 – LP+)	56	24,24%
LP-	24	10,39%
Total of Patients	231	100%
Visual Acuity of Oculi Sinistra		
6/6 - 6/18 (1,00 – 0,33)	95	41.13%
6/18 - 6/60 (0,32 – 0,10)	37	16.02%
6/60 - 3/60 (0,09 – 0,05)	22	9.52%
3/60 - 1/60 (0,049 – 0,02)	12	5.19%
1/60 - LP+ (0,019 – LP+)	47	20.35%
LP-	18	7.79%
Total	231	100.00%

LP: Light Perception

Intraocular pressure

The most intraocular pressure of the right eye was in the range of 11-21 mmHg, as many as 62.77%, while the fewest was in the range of <11 mmHg, as many as 2.16%. The highest value was 81.7 mmHg, and the nqy guvxcnwg y cu 0 7 o o J i 0Vj g cxgtci g xcnwg y cu 99. cpf vj g o gf kcp xcnwg cu 30

Table 10. Frequency distribution based on intraocular pressure on treatment

		Quantity (People)	Percentage
Intraocular	Pressure		
Oculi Dextra			
<11		5	2,16%
11 - 21		145	62,77%
>21		81	35,06%
Total of Patients		231	100%
Intraocular	Pressure		
Oculi Sinistra			
<11		5	2,16%
11 - 21		144	62,34%
>21		82	35,50%
Total of Patients		231	100,00%

The most intraocular pressure of the left eye was in the range of 11-21 mmHg, as many as 62.34%. The fewest was in the range of <11 mmHg, as many as 2.16%. The highest intraocular pressure value was 81.7 mmHg and the lowest intraocular pressure value was 4 mmHg. The average value was 77, and the median value was 82.

DISCUSSION

Age

The distribution of glaucoma patients in the Outpatient Eye Clinic, Dr. Soetomo General Academic Hospital, Surabaya in the period of January - December 2019 was mostly in the 50-64 years age group (37.66%), while the fewest was in the ≥80 years age group (2.16%). Based on the study of Ashica et al. (2011), the higher the age of the patient, the higher the incidence of glaucoma, the peak was at the age of 60-69 years and decreased at the age of 70 years.

Aging is a risk factor for glaucoma (Hashemi et al. 2019). Aging can be associated with tissue aging, duration of exposure to other risk factors, and duration of illness (Ismandari & Helda 2011). The increasing age is correlated with degeneration of retinal ganglion cells and their axons which also causes vision loss. The natural aging associated with changes in the extracellular matrix results in a stiffer extracellular environment throughout the body. The trabecular meshwork and optic nerve head undergo extensive extracellular matrix remodeling characterized by fibrotic changes associated with cellular and molecular events (including myofibroblast activation) that promote fibrosis and further tissue ossification (Liu et al. 2018).

The result of increased deposition of extracellular matrix is hardening of the trabecular meshwork which causes an increase in outflow resistance and contributes to an increase in intraocular pressure. Age and glaucoma are also associated with ossification of the lamina cribrosa. Although tissue hardening is strongly correlated with fibrosis, the initiation of this molecular cascade further inhibits the character of healthy living cells and mediates the differentiation of various precursors into fibrogenic myofibroblasts. Although the normal contractile properties of myofibroblasts are central to wound healing and regulation of tissue architecture, a stiffer matrix enhances myofibroblast differentiation and contractility in a TGF- dependent manner leading to pathological wound healing (Liu et al. 2018). It can be concluded that age is associated with an increased risk of developing glaucoma and is in line with our research.

Gender

In this study, the number of male patients (50.65%) was slightly more than female (49.35%). The results of a study at Dr. M. Djamil Hospital, Padang also showed that the gender of most glaucoma patients was male (Ariesti & Herriadi 2018). Based on a study in Saudi Arabia, glaucoma profile by gender showed that men were higher (52.9%) than women (47.1%) (Helayel 2021). Other studies showed different results. Hashemi et al. (2019) showed that 57.1% of glaucoma patiens were women and 42.9% were men. Meanwhile, Dizayang et al. (2019) showed that the majority of primary glaucoma patients were women (57.8%)

Several studies had shown that the prevalence of women was more than men in angle closure glaucoma, because the anterior chamber angle of women was shallower than men (Stamper et al. 2009). Meanwhile, in open-angle glaucoma, the prevalence of gender varied. However, several studies had shown a higher prevalence of males than females (Stamper et al. 2009).

Residential area

The data obtained from this study indicated that the most glaucoma patients lived in Surabaya (53.68%), followed by Sidoarjo and Gresik. Based on the data on Center for Statistics, East Java in 2021, the population of Surabaya in 2019 is the highest in East Java. Meanwhile, East Java is the province with the second largest population in Indonesia. That is why the incidence of glaucoma from Surabaya to be higher than other areas.

Type of glaucoma

The results of this study indicated that the most common type of glaucoma diagnosis was primary open-angle glaucoma (32.90%). Primary open-angle glaucoma often occurred with a prevalence of 3.05% (Tham et al. 2014). A study by Pratista (2018) in Dr. Soetomo General Academic Hospital in the period of January – December 2017, found that the most common type of glaucoma was open angle glaucoma (29.03%). In addition, a study on a Chinese urban population in Singapore, showed that primary open-angle glaucoma was the most common type of glaucoma with a prevalence of 1.4% (Baskaran et al. 2015), while in Saudi Arabia, primary open-angle glaucoma was the most common (Helayel et al., 2021).

Other studies showed different results. Pusvitasari and Triningrat (2018) resulted that primary open-angle glaucoma was the second most common type of glaucoma (33%) after secondary glaucoma (37%), while in Nigeria, was unclassified glaucoma (56.6%) (Kyari et al. 2015).

Based on the literature, primary open-angle glaucoma is a type of glaucoma that is often found in both black and white races, because primary open-angle glaucoma often causes bilateral visual field narrowing, slow onset, progressive, asymptomatic, and often undetected until extensive visual field narrowing occurs (Riordan-Eva & Whitcher 2007).

Glaucoma medical therapy

Medical therapy is still the first-line therapy in glaucoma patients (Schehlein et al. 2017). In this study, the highest selection of medical therapy given to glaucoma patients at the first visit in 2019 was single drug therapy (68.83%), while the selection of combination drugs therapy was 31.17%. A study by Schwartz et al. (2021) proved that the combination therapy group was less than the single therapy group, while a study in Zimbabwe showed that the administration of single drug therapy was 71.8% of the total antiglaucoma drug prescriptions (Kyei et al. 2020).

Other studies had shown that combination drugs therapy was used more often than single drug therapy (Pratista 2018). Research in India also proved that single drug therapy was only used by 15% of patients (Mittal & Mittal 2020). Approximately, 50-75% of glaucoma and ocular hypertension patients required combination of drugs therapy to achieve the target of lowering intraocular pressure (Mittal & Mittal 2020).

Single drug therapy reduces intraocular pressure by up to 35%. Meanwhile, combination drug therapy can reduce intraocular pressure by up to 50% (Mittal & Mittal 2020). Reduction of intra ocular pressure as a target of glaucoma therapy should be achieved using drugs and minimal side effects (Yu et al. 2020). Combination of drugs therapy with different mechanisms of action can be given if single drug therapy is not able to achieve the target of lowering intra ocular pressure (Yu et al. 2020). Combination therapy should enhance the therapeutic effect and patient comfort (Yu et al. 2020).

Single drug therapy

The most single drug therapy given was latanoprost as much as 49.06% of 159 patients, followed by timolol maleate as much as 37.74%, while the fewest was betaxolol as much as 0.63%. Latanoprost is a prostaglandin analogue. These drugs decrease intraocular pressure by increasing uveoscleral outflow with a 25-33% decrease in intraocular pressure (Li et al. 2014; Prum et al. 2016). The efficacy of lowering intraocular pressure persists for up to 24 hours after a single topical dose, which allows once-daily use (Perry et al. 2003).

A meta-analysis of the comparison of the use of latanoprost and timolol in patients with chronic angle-closure glaucoma in the Asian population showed that once-daily latanoprost reduced intraocular pressure less than twice-daily timolol, so that patient adherence to the drug was higher (Li et al. 2014). The systemic side effects of latanoprost are also lower than the systemic side effects of timolol (Li et al. 2014). In a multicenter study of glaucoma therapy in the United Kingdom, primary open-angle glaucoma patients receiving latanoprost therapy demonstrated longer visual field maintenance (Garway-Heath et al. 2015). In addition, a study on clinical and sociodemographic characteristics in Zimbabwe showed that prostaglandin analogue single therapy was most commonly prescribed in glaucoma patients (Kyei et al. 2020).

Meanwhile, a study in the RS Mata Masyarakat Jawa Timur in the period of January - December 2015 showed that the single drug that was often given was timolol (32.67%) followed by acetazolamide (30.99%), while the percentage of latanoprost therapy was 8.87% (Mustofa et al. 2016). On the other hand, a study conducted in Dr. Soetomo General Academic Hospital in 2017, found that the single drug therapy that was often used was timolol (65.91%), the least used were betaxolol (6.82%) and acetazolamide (6.82%) (Pratista 2018).

Based on the explanation above, latanoprost is an antiglaucoma drug that is often used. In some places, latanoprost has become the first-line antiglaucoma drug because of its advantages, including once-daily use, so that patient compliance is higher, lower intraocular pressure reduction compared to timolol, longer visual field maintenance, and lower systemic side effects.

Combinations drugs therapy

The most commonly given drug combination was timolol maleate with acetazolamide (36.11%). The second most common drug combination was the combination of latanoprost and acetazolamide (27.78%). The results of this study are in accordance with Hazhar (2017) who gave the results that the most widely administered drug combination was beta-blocker + carbonic anhydrase inhibitor with a percentage of 39.50%. In addition, in research in Soetomo General Academic Hospital regarding the Effectiveness of Medical, Surgery, and Combination Therapy on Reducing Intraocular Pressure in Glaucoma Patients, the combination of drugs that is often given was timolol with acetazolamide (30.61%) (Pratista 2018).

In a cohort study in Japan, most patients were prescribed a combination of a prostaglandin analogue and a beta-blocker (Shirai et al. 2021). The study also showed that the fixed combination of latanoprost + timolol was high with a percentage of 54.5% (Shirai et al. 2021). The combination of prostaglandin analogues and beta-blockers is a good combination because of the high effectiveness of each drug class. Both classes of drugs are first-line antiglaucoma therapy.

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However, in this study, the most common drug combination was timolol maleate + acetazolamide, which is a combination of a beta-blocker with a carbonic anhydrase inhibitor. Timolol maleate is an antiglaucoma drug that is available at level 3 health facilities, such as Dr. Soetomo General Academic Hospital, because it is guaranteed by government health insurance and the price is affordable (Ministry of Health, Republic of Indonesia, 2013). Some drugs are given if the patient does not respond to timolol (Ministry of Health, Republic of Indonesia 2013). Acetazolamide is an oral carbonic anhydrase inhibitor available at level 3 health facilities. This drug is able to reduce intraocular pressure by 20-30% (Prum et al. 2016). Based on the Regulation of the Ministry of Health, No. 5 of 2014, the management of acute glaucoma at first-level health care facilities is to simultaneously give several drugs to reduce intraocular pressure, including acetazolamide HCl 500 mg followed by 4x250 mg/day, KCl 0.5 g 3x/day, timolol 0.5%, eye drops a combination of corticosteroids + antibiotics, as well as symptomatic therapy (Ministry of Health, Republic of Indonesia 2014). Based on this explanation, timolol maleate and acetazolamide are drugs that are often used in health facilities in Indonesia because of their availability and regulated in health regulations in Indonesia.

Drug class

The data in this study showed that the highest drug class administered were prostaglandin analogues (48.48%), followed by beta-blockers (45.02%), carbonic anhydrase inhibitors (37.66%), and the fewest was parasympathomimetics (0,87%). Based on a study in China, prostaglandin analogues were prescribed 30.21% of all visits and beta-blockers were prescribed 27.1% of all visits (Yu et al. 2020). Analysis by class of antiglaucoma drugs in 2013 showed

Timur for the January-December 2015 period showed that the non-selective beta-blocker group was the most widely used drug class (34.6%) and was followed by carbonic anhydrase inhibitors (32.03%) (Mustofa et al. 2016).

Prostaglandin analogues decrease the resistance to aqueous humor out of the eye, thereby increasing its flow in the uveoscleral pathway. Prostaglandin analogs have a higher effectiveness in lowering intraocular pressure than beta-blockers and have lower side effects (Conlon et al. 2017). Prostaglandin analogues are given once a day (at bedtime), because their duration of action can last for several days (Bowling & Kanski 2016). Prostaglandin analogs can be used as monotherapy or in combination therapy to control intraocular pressure (DiPiro et al. 2008). This class of drugs can be an effective sole therapy or adjunct therapy for patients who do not respond to other classes of antiglaucoma drugs (DiPiro et al. 2008). Because of these advantages, prostaglandin analogues are the first-line therapy of choice for glaucoma, especially for primary open-angle glaucoma (Bowling & Kanski 2016; DiPiro et al. 2008). The choice of medical therapy in glaucoma patients should pay attention to various things, such as intra ocular pressure target, eye structure, systemic side effects, quality of life, cost, and patient comfort (Kyei et al. 2020).

Prostaglandin analogues have high effectiveness in lowering intraocular pressure, but topical ocular side effects and low cost should be considered when prescribing to patients (Mittal & Mittal 2020). In this case timolol maleate, beta-blockers are less expensive than prostaglandin analogs. In addition, if the target for intraocular pressure reduction is about 20% from baseline, beta-blockers may be the first choice (Mittal & Mittal 2020). If a reduction of 30-35% is desired, a prostaglandin analogue is an appropriate choice. If a person wants a higher reduction in intraocular pressure and consider other aspects, such as cost, a combination of drug classes with different mechanisms can be an option (Mittal & Mittal 2020).

Visual acuity

From the results of this study, the most visual acuity values in the right eye were in the range of 6/6 - 6/18 (1.00 – 0.33), which was 34.63%. The visual acuity value of the left eye was mostly in the range of 6/6 -6/18 (1.00 – 0.33), which was 41.13%. The visual acuity value was in the normal range to mild visual impairment. The highest visual acuity was 6/6 and the lowest visual acuity was LP-.

This study was in line with a study in RS Khusus Mata in Medan Baru, the visual acuity of the right eye 6/6-6/18 was the highest at 48% and the visual acuity of the left eye was 6/6-6/18; the highest with a percentage of 50% (Fadly, 2020). According to Mokhles et al. (2020), the average visual acuity was 0.61 for the right eye and 0.63 for the left eye.

In primary open-angle glaucoma, visual acuity examination results are usually normal except in advanced glaucoma (Bowling & Kanski 2016). In chronic primary angle-closure glaucoma, visual acuity examination results are usually normal except in advanced glaucoma (Bowling & Kanski 2016). In acute primary angle-closure glaucoma, visual acuity was 6/60-hand waving (Bowling & Kanski 2016).

Normal visual acuity to mild visual impairment occurs in glaucoma patients is quite common. Normal visual acuity to mild visual impairment in glaucoma patients may be caused by the slow course of the disease, so that the decrease in visual acuity has not been seen.

Intraocular pressure

The frequency distribution based on intraocular pressure which was measured under anti glaucoma treatment at the first visit in 2019 in the right eye was mostly in the range of 11 - 21 mmHg, which was 62.77%. In the left eye the most were in the range of 11-21 mmHg, which was 62.34%.

The results of this study are in line with Hazhar's research (2017) at RSUD Dr. Soetomo Surabaya, the majority of the intraocular pressure of the right and left eyes is between 10.5-20.5 mmHg. The majority of respondents with glaucoma at the Medan Baru Eye Special Hospital had intraocular pressure in the right eye in the range of 10-21 mmHg/normal with a percentage of 88% and intraocular pressure in the left eye within the normal range as much as 86% of the total respondents (Fadly 2020). The study of Helayel et al. (2021) also indicated that the average intraocular pressure of glaucoma patients was 14.5 mmHg, which meant that the patient's intraocular pressure was in the normal range.

The results of other studies showed that intraocular pressure >21 mmHg was more common than intraocular pressure <21 mmHg (normal) (Dizayang et al. 2019). Glaucoma patients generally had a high intraocular pressure, except in normal-tension glaucoma. A study by Dienda et al. (2013) at Muhammadiyah Hospital Palembang observed intraocular pressure when first coming and after being given therapy. Most of the intraocular pressure when it firstly came was in the

range of 20-50 mmHg. After treatment, the intraocular pressure was checked for the second and the third time. Most patients had decreased intraocular pressure. Some glaucoma patients did not experience a decrease in intraocular pressure, because there was differences in glaucoma severity and drug use factors (Dienda et al. 2013).

The distribution of intraocular pressure in glaucoma patients in this study was slightly different from the above studies. This study evaluated the first-visit patients in 2019 who were given glaucoma therapy in the Outpatient Eye Clinic, Dr. Soetomo General Academic Hospital, Surabaya, for the period of January – December 2019. It was possible that the first visit in 2019 was the patient's visit to the eye clinic for the umpteenth time. Therefore, it as also possible that the patient had received therapy from previous visits, so that the patient's intraocular pressure had been controlled with this therapy.

In addition, Dr. Soetomo General Academic Hospital is a level 3 hospital and most glaucoma patients are referred patients from other hospitals in Surabaya and other areas, so that the patient's intraocular pressure has been controlled from previous glaucoma therapy.

Strength and limitation

This study was retrospective, and it did not record the use of previous anti glaucoma therapy. It also did not assess the success of therapy by comparing intraocular pressure before and after therapy. Drug administration in the hospital follows the procedures and regulations that had been determined, so that latanoprost and timolol maleate could be given simultaneously in one visit. Some drugs, such as latanoprost and travoprost, were sometimes not available, because their availability was highly dependent on the health insurance that coverd the patient. It means that it will affect the choice of antiglaucoma drugs by the doctor.

Future studies were recommended to evaluate the success of glaucoma therapy and discuss the selection of glaucoma therapy based on drugs provided by health insurance.

CONCLUSION

The most common type of glaucoma was primary open angle glaucoma with the most therapy given was single drug therapy. The choice of single drug therapy for glaucoma was prostaglandin analogue, while the choice of combination drugs therapy was timolol maleate with acetazolamide.

Author contribution

VMP, YP, and MFP- collected and analyzed the data, VMP- conceptualized, wrote and revised the manuscript. RL-validatied the final manuscript.

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