

## RESEARCH ARTICLE

# The Relationship Between Myopia and Hypertension in Open-Angle Glaucoma Patients at Methodist Hospital in 2023

Billy Cristover Tarigan<sup>1</sup>, Lylys Surjani<sup>2</sup>, Inda Meirani Sinaga<sup>3</sup>,  
Mawar Gloria Tarigan<sup>4</sup>, Dwi Lunarta Siahaan<sup>5</sup>

- <sup>1</sup>. Medical Education Study Program, Faculty of Medicine, Methodist University of Indonesia
- <sup>2</sup>. Department of Ophthalmology, Faculty of Medicine, Methodist University of Indonesia
- <sup>3</sup>. Department of Pharmacology and Pharmacy, Methodist Indonesia University
- <sup>4</sup>. Department of Psychiatry, Faculty of Medicine, Methodist University of Indonesia
- <sup>5</sup>. Department of Anesthesia, Methodist Indonesia University

Correspondence:  
[tariganbillycristover@gmail.com](mailto:tariganbillycristover@gmail.com)

### ABSTRACT

**Background:** Glaucoma is the second leading cause of global blindness after cataract. Glaucoma is thought to occur due to increased intraocular pressure (IOP) causing changes in the optic nerve and field of vision.

**Objective:** To find out whether there is a relationship between hypertension and myopia in open angle glaucoma patients at Methodist Hospital in 2023.

**Method:** This research was conducted in an analytical observational manner with an approach using a cross sectional design, namely only for a moment or looking at the relationship between Myopia and Hypertension in Open Angle Glaucoma Patients at Methodist Hospital in 2023 at the time the research took place with medical record data of 74 samples based on inclusion and exclusion criteria. .

**Results:** From the results of this study, it was found that there was a relationship between myopia and open angle glaucoma with  $p$  – value = 0.000 ( $<0.05$ ). There is a relationship between hypertension and open angle glaucoma with  $p$  – value = 0.016 ( $<0.05$ ).

**Conclusion:** There is a relationship between hypertension and myopia in open angle glaucoma patients.

**Keywords:** Myopia, Hypertension, Open-Angle Glaucoma

## INTRODUCTION

After cataracts, glaucoma is the second most common cause of blindness worldwide. In 2010, it accounted for 8% of all cases of blindness. Glaucoma is one of the three leading causes of visual impairment worldwide, along with refractive errors.<sup>1</sup>

Glaucoma, a medical condition that affects vision, is predicted to affect approximately 80 million individuals worldwide in 2020 and is projected to increase to 112 million by 2040. This disease can cause permanent blindness and is untreatable. Glaucoma typically affects one percent of the population over the age of 40, five percent of those over the age of 70, and ten percent of

those over the age of 80. Open-angle glaucoma is the most common type of glaucoma.<sup>1</sup>

Glaucoma is a condition characterized by a decrease in the function of the trabecular meshwork (TM) (the structure responsible for draining fluid from the front chamber of the eye), resulting in increased pressure within the eye. This high eye pressure can damage the axons of the retinal ganglion cells that form the optic nerve, ultimately leading to gradual retinal ganglion cell loss. Symptoms of glaucoma may not be apparent for a long time, so visual symptoms only appear when the eye damage is already permanent.<sup>1</sup>

Elevated intraocular pressure is considered a trigger for glaucoma because it can damage the optic nerve and the visual field. Currently, elevated intraocular pressure is only considered a risk factor, and glaucoma can occur even with normal intraocular pressure. Thus, neurodegeneration and persistent injury to retinal ganglion cells lead to glaucoma.<sup>2</sup>

Myopia causes axial elongation of the eyeball, which results in stretching of the sclera and thinning of the retinal pigment epithelium and choroid. This then leads to an increase in reactive oxygen species and a decrease in antioxidant protection, resulting in open-angle glaucoma.<sup>3</sup>

Increased blood pressure can lead to increased aqueous humor outflow due to increased ciliary artery pressure in the ciliary body, as well as increased episcleral venous pressure, which affects aqueous humor outflow, resulting in increased intraocular pressure.<sup>4</sup>

Based on the above explanation, the researchers wanted to conduct this study to determine the relationship between myopia

and hypertension in open-angle glaucoma patients at Methodist Hospital in 2023.

## METHOD

The study employed an observational analytical method with a cross-sectional approach, where observations and measurements were made simultaneously on the independent and dependent variables. The purpose of this study was to examine the relationship between myopia and hypertension in open-angle glaucoma patients at Methodist Hospital. The data used in this study were sourced from secondary data contained in patient medical records in 2023.

The sample obtained by the researchers consisted of all patients with suspected open-angle and non-open-angle glaucoma who came for treatment at Methodist Hospital in 2023. The sampling technique used total sampling, where all members of the population were included, resulting in a sample size of 74 individuals.

## RESULTS

### Univariate

Table 1 Frequency Distribution Based on Myopia, Hypertension, Open Angle Glaucoma

<b>Myopia</b>	<b>N</b>	<b>%</b>
Myopia Sufferers	50	67,6
Not Myopia Sufferers	24	32,4

  

<b>Hipertensi</b>		
Hypertension sufferer	48	64,9
Not a hypertensive sufferer	26	35,1

  

Open Angle Glaucoma		
Open Angle Glaucoma	55	74,3
No Open Angle Glaucoma	19	25,7
<b>Total</b>	<b>74</b>	<b>100</b>

Based on the table above, it can be seen that from 74 research medical records, 50 people (67.6%) had myopia, 24 people (32.4%) did not have myopia. 48 patients (64.9%) had hypertension, and 26 people (35.1%) did not have hypertension. 55 patients (74.3%) had open-angle glaucoma, and 19 people (25.7%) did not have open-angle glaucoma.

## Bivariat

Table 2 Relationship between Myopia and Open Angle Glaucoma

Miopia	Glaukoma						Sig (P)
	Sudut Terbuka		Tidak Sudut Terbuka				
	N	%	N	%	N	%	
Penderita Miopia	44	59,5	6	8,1	50	67,6	
Tidak Penderita Miopia	11	14,9	13	17,6	24	32,4	0,000
Total	55	74,3	19	25,7	74	100	

Based on the above, it was found that 55 people had open angle glaucoma, with 44 people suffering from myopia and 11 people not suffering from myopia and 19 people not suffering from open angle glaucoma, with 6 people suffering from myopia and 13 people not suffering from myopia. There is a relationship between myopia and open angle glaucoma, obtained p-value = 0.000 (<0.05).

Table 3 Relationship between Hypertension and Open Angle Glaucoma

Hipertensi	Glaukoma						Sig (P)
	Sudut Terbuka		Tidak Sudut Terbuka				
	N	%	N	%	N	%	
Penderita Hipertensi	40	54,1	8	10,8	48	64,9	0,016
Tidak Penderita Hipertensi	15	20,3	11	14,9	26	35,1	
Total	55	74,3	19	25,7	74	100	

Based on the table above, it was found that 55 people had open-angle glaucoma, 40 people had hypertension, 15 people did not have hypertension, and 19 people did not have open-angle glaucoma, 8 people suffered from hypertension and 11 people did not suffer from hypertension. There is a relationship between hypertension and open-angle glaucoma with a p-value of 0.016 (<0.05).

## DISCUSSION

Table 2 shows 55 patients with open-angle glaucoma, with 44 having myopia, 11 without myopia, and 19 without open-angle glaucoma, with 6 having myopia and 13 without myopia. There is a relationship between myopia and open-angle glaucoma with a p-value of 0.000 (<0.05), consistent with research by Jian Wu (2022) on the relationship between myopia and open-angle glaucoma. 23

Table 3 shows 55 patients with open-angle glaucoma, with 40 having hypertension, 15 without hypertension, and 19 without open-angle glaucoma, with 8 having hypertension and 11 without hypertension. There is a relationship between hypertension and open-angle glaucoma with a p-value of 0.016 (<0.05), indicating that hypertension is a high-risk factor for open-angle glaucoma. This research aligns with research conducted by Satria Adi Nugraha (2022) that identified hypertension as a risk factor for open-angle glaucoma. 22

Glaucoma is a condition in which pressure within the eye increases. This can be caused by myopia, which leads to a decrease in the retina's ability to function properly. This results in thinning of the retinal pigment layer and choroid. Furthermore, increased

arterial pressure in the ciliary body leads to increased venous pressure in the episclera, which affects the outflow of ocular fluid and leads to increased intraocular pressure, which can lead to open-angle glaucoma.<sup>19</sup>

## CONCLUSION

1. The research results revealed that 41 (55.4%) were female, while 33 (44.6%) were male.
2. The research obtained medical record data for patients aged 10-18 years (27) (36.5%), 44 (59.5%) were 19-59 years old, and 3 (4.1%) were <60 years old.
3. There were 55 open-angle glaucoma patients, 40 of whom had hypertension and 15 of whom did not have hypertension.

## References

- [1]. Mélik Parsadaniantz S, Réaux-le Goazigo A, Sapienza A, Habas C, Baudouin C. Glaucoma: A Degenerative Optic Neuropathy Related to Neuroinflammation? Cells [Internet]. 2020 Feb 25;9(3):535. Available from: <https://www.mdpi.com/2073-4409/9/3/535>
- [2]. Nislawati R, Taufik Fadillah Zainal A, Ismail A, Waspodo N, Kasim F, Gunawan AMAK. Role of hypertension as a risk factor for open-angle glaucoma: a systematic review and meta-analysis. BMJ Open Ophthalmology [Internet]. 2021 Sep 28;6(1):e000798. Available from: <https://bmjophth.bmj.com/lookup/doi/10.1136/bmjophth-2021-000798>
- [3]. Aliviana B. Hubungan antara Panjang Aksial Bola Mata dan Derajat Miopia dengan Tekanan Intraokular. Medical and Health Science Journal [Internet]. 2020 Feb 29;4(1):13–8. Available from: <https://journal2.unusa.ac.id/index.php/MSJ/article/view/1444>
- [4]. Pileggi C, Papadopoli R, De Sarro C, Nobile CGA, Pavia M. Obesity, Blood Pressure, and Intraocular Pressure: A Cross-Sectional Study in Italian Children. Obesity Facts [Internet]. 2021;14(2):169–77. Available from: <https://www.karger.com/Article/FullText/514096>
- [5]. Flitcroft DI, He M, Jonas JB, Jong M, Naidoo K, Ohno-Matsui K, et al. IMI – Defining and Classifying Myopia: A Proposed Set of Standards for Clinical and Epidemiologic Studies. Investigative Ophthalmology & Visual Science [Internet]. 2019 Feb 28;60(3):M20. Available from: <http://iovs.arvojournals.org/article.aspx?doi=10.1167/iovs.18-25957>
- [6]. Ilyas S. Ilmu Penyakit Mata. 5th ed. Anggota IKAPI & APPTI J, editor. Jakarta: Fakultas Kedokteran Universitas Indonesia; 2022. 310 p.
- [7]. James B. Oftamologi. 9th ed. Erlangga; 2006. 216 p.
- [8]. Anthony L M. Histologi Dasar Junqueira: Teks & Atlas. 14th ed. Susanti F, editor. Jakarta: Buku Kedokteran EGC; 2017. 626 p.
- [9]. Daniel K. Sunderland AS. Physiology, Aqueous Humor Circulation. StatPearls Publishing, Treasure Island (FL); 2023.
- [10]. Dietze J. StatPearls [Internet]. treasure island; 2020.
- [11]. Hashemi H, Mohammadi M, Zandvakili N, Khabazkhoob M, Emamian MH, Shariati M, et al. Prevalence and risk factors of glaucoma in an adult population from Shahroud, Iran. Journal of Current Ophthalmology [Internet]. 2019 Dec;31(4):366–72. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S2452232518300465>
- [12]. Navid M. Glaukoma Sudut Terbuka [Internet]. statpearls: StatPearls Publishing, Treasure Island (FL); 2022.

- Available from:  
<https://www.ncbi.nlm.nih.gov/books/NBK441887/>
- [13]. Weinreb RN, Aung T, Medeiros FA. The Pathophysiology and Treatment of Glaucoma. *JAMA* [Internet]. 2014 May 14;311(18):1901. Available from: <http://jama.jamanetwork.com/article.aspx?doi=10.1001/jama.2014.3192>
- [14]. Belamkar A, Harris A, Oddone F, Verticchio Vercellin A, Fabczak-Kubicka A, Siesky B. Asian Race and Primary Open-Angle Glaucoma: Where Do We Stand? *Journal of Clinical Medicine* [Internet]. 2022 Apr 28;11(9):2486. Available from: <https://www.mdpi.com/2077-0383/11/9/2486>
- [15]. Lin J, Vasudevan B, Gao TY, Zhou HJ, Ciuffreda KJ, Liang YB, et al. Intraocular Pressure and Myopia Progression, Axial Length Elongation in Rural Chinese Children. *Optometry and Vision Science* [Internet]. 2023 Oct;100(10):708–14. Available from: <https://journals.lww.com/10.1097/OPX.0000000000002065>
- [16]. Lubis Rodiah. Aqueous Humor. Departemen Ilmu Kesehatan Mata Universitas Sumatera Utara. 2019;6–12.
- [17]. Al Dinari N. Miopia: Etiologi dan Terapi. *Cermin Dunia Kedokteran*. 2022;49(10):556–9.
- [18]. Hamria, Mien, Saranani M. Hubungan Pola Hidup Penderita Hipertensi Dengan Kejadian Hipertensi Di Wilayah Kerja Puskesmas Batalaiworu Kabupaten Muna. *Jurnal Keperawatan* [Internet]. 2020;4(1):17–21. Available from: <https://stikesks-kendari.e-journal.id/JK/article/view/239>
- [19]. Yasukawa T, Hanyuda A, Yamagishi K, Yuki K, Uchino M, Ozawa Y, et al. Relationship between blood pressure and intraocular pressure in the JPHC-NEXT eye study. *Scientific Reports* [Internet]. 2022;12(1):1–8. Available from: <https://doi.org/10.1038/s41598-022-22301-1>
- [20]. Ananda EP. Hubungan Pengetahuan, Lama Sakit Dan Tekanan Intraokuler Terhadap Kualitas Hidup Penderita Glaukoma. *Jurnal Berkala Epidemiologi*. 2016;4(2):288–300.
- [21]. Amelia ER, Himayani R, Kedokteran F, Lampung U, Ilmu B, Mata K, et al. Faktor-Faktor Yang Berhubungan Dengan Kejadian Glaukoma Di Rumah Sakit Mata Lampung Eye Center Bandar Lampung Factors Related To The Incidence Of Glaucoma In Eye Hospital Lampung Eye Center Bandar Lampung. 2024;14(2014):1011–22.
- [22]. Adi Nugraha S, Himayani R, Imanto M, Apriliana E, Yusran M, Studi Pendidikan Dokter P, et al. Faktor Risiko Hipertensi Terhadap Kejadian Glaukoma. *Jurnal MedikaHutama*. 2022;3(4):3007–13.
- [23]. Wu J, Hao J, Du Y, Cao K, Lin C, Sun R, et al. The Association between Myopia and Primary Open-Angle Glaucoma: A Systematic Review and Meta-Analysis. *Ophthalmic Research* [Internet]. 2022;65(4):387–97. Available from: <https://karger.com/ORE/article/doi/10.1159/000520468>