

Prevalence and Types Of Retinal Vein Occlusion in Patients Undergoing Green Laser Photocoagulation in Dera Ismail Khan Division, Pakistan

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Abstract:

Objective: To determine the prevalence and type of retinal vein occlusion in patients undergoing green laser photocoagulation.

Methods: A descriptive cross-sectional study was performed at the eye unit of DHQ Teaching Hospital Dera Ismail Khan from January 2017 to December 2022. All patients of retinal vein occlusion (RVO) treated with green laser photocoagulation were included in the study. The sample was analyzed using frequencies and percentages in SPSS version 22.

Results: Out of 2058 patients having green laser, 86 (4.18%) had retinal vein occlusion, while 1972 (95.82%) had other retinal diseases. Out of 86 patients of RVO, 47 (54.65%) were female while 39 (45.35%) were male. A total of 20 (23.26%) were below 40 years and 66 (76.74%) were over 40 years. A total of 56(65.125%) were from urban areas and 30(34.88%) from rural areas. Out of 86 patients with retinal vein occlusion, 70 (3.40%) had branch retinal vein occlusion (BRVO) and 16 (0.78%) had central retinal vein occlusion (CRVO).

Conclusion: Retinal vein occlusion is more prevalent among females, particularly in older patients living in urban areas. These patients typically present with sudden, painless loss of vision. Additionally, branch retinal vein occlusion is significantly more common than central retinal vein occlusion. *Al-Shifa Journal of Ophthalmology 2024; 20(4): 151-156. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Introduction:

Retinal vein occlusion (RVO) is one of the common ocular conditions leading to vision loss. It may occur in the form of central retinal vein occlusion (CRVO) or branch retinal vein occlusion (BRVO)¹. If the obstruction is at the level of lamina cribrosa, then it is CRVO and when the obstruction is in one of the tributaries of the central retinal vein then it is BRVO.^{1,2,3} There is an increased risk of RVO in cases of diabetes mellitus (DM), hypertension, hyperlipidemia, coagulation disorders, inflammatory disorders, glaucoma, hypermetropia, increase body mass index.^{2,3,4,5,6} Ischemic CRVO is much more dangerous than non-ischemic CRVO as it may lead to permanent visual loss⁷. A lot of other factors have been reported to be associated with poor visual outcomes including gender, old age, pre-existing macular disorders, epiretinal

membrane (ERM), glaucoma and long-lasting cystoid macular edema, and neovascularization on the retina.^{7,8} Among the two types (CRVO vs BRVO) visual outcome is better in BRVO.⁹ Anti-VEGF injections have an established role in the management of RVO. After ranibizumab injection, vision improves significantly in cases of BRVO with macular edema¹⁰. Other factors leading to loss of vision include ischemia to ganglion cells, pigmentary degenerations, and ERM¹¹.

Treatment options for macular edema due to RVO include anti-VEGF, steroids, and grid laser. For complications (macular edema/neovascularization) of RVO photocoagulation (PRP) is the standard treatment^{12,13}. PRP is started when complications start to appear, but in some severe cases of retinal ischemia, it may be given prophylactically¹⁴. In macular edema due to BRVO focal laser also shows significant visual benefits¹⁵ but due to the availability of anti-VEGFs, focal laser is used in selected cases^{16,17}.

An extensive literature search, to the best of our knowledge, there is a lack of data on the prevalence and presentation of retinal vein occlusion in the local population of our division.

Methodology:

This descriptive cross-sectional study was performed at the eye unit, DHQ Teaching Hospital D.I.Khan from 2017 to 2022. All the patients having RVO receiving green laser treatment were included in the study. Permission from the institution's ethical review committee was obtained on 23 December 2016.

Pan Retinal Photocoagulation was performed with a mono spot slit-lamp delivery system, Nidek GYC-1000, Japan. Procedures were performed under topical anesthesia, using a wide-field Mainster PRP contact lens. Energy level, spot size and duration was titrated from case to case to obtain the desired effects.

The population of the Dera Ismail Khan Division is 1000000. Using Raosoft@14 online calculator sample size was calculated as 2058, taking the population of patients having green laser treatment as 6500, confidence level of 99%, margin of error of 0.3914, and prevalence of retinal vein occlusion as 0.7%¹⁸ in the green laser treated population.

6500 Green laser treatment patients is our population of interest from which we have drawn a sample of 2058. In the green laser treatment sample of 2058 individuals, we have determined a prevalence of RVO of 84 (4.18%). A consecutive, non-probability sampling technique was employed. The sample was analyzed using frequencies and percentages in SPSS version 22. All the patients having RVO receiving green laser treatment were included in the study. Patients for whom green laser treatment was not possible due to any media opacity like dense cataract or dense vitreous hemorrhage were excluded from the study.

Results:

Out of 2058 patients of green laser, 86 (4.18%) had Retinal Vein Occlusion, while 1972 (95.82%) had other retinal diseases. The estimated prevalence in the population is shown below (Table I).

Table I: Prevalence of Retinal vein occlusion in patients receiving green laser treatment in D.I. Khan.

Variable	Attributes	Sample statistics		99% CI for Proportion for population	
		Total	Percentage	Lower	upper
Presence of retinal vein occlusion	Yes	86	4.18%	0.03162	0.05451
	No	1972	95.82%	0.08038	0.1139
Total		2058	100.0	Population parameters	

Among these 86 retinal vein occlusions, 47 (54.65%) were in female, while 39 (45.35%) were in male patients (Table II).

Table II: Distribution of RVO by Gender among green laser treatment in D.I. Khan.

Variable	Attributes	Size	Sample statistics %	99% CI for Proportion for population	
				Lower	Upper
Gender	Male	39	45.35%	0.3236	0.5901
	Female	47	54.65%	0.4099	0.6764
Total		86	100.00	Population parameters	

Out of a sample of 86 patients of retinal vein occlusion (RVO), 20 (23.26%) cases were in age group ≤40 years and 66 cases (76.74%) were in age group >40 years (Table III).

Table III: Distribution of patients of retinal vein occlusion undergoing green laser photocoagulation by age groups of D.I. Khan.

Variable	Attributes	Total	Percentage	95% CI for proportion	
				Lower	Upper
Age groups	≤40 years	20	20*100/86=23.26 %	14.33	32.18
	>40 years	66	66*100/86=76.74 %	67.82	85.67
Total		86	100%	Population parameters	

Out of a sample of 86 patients of retinal vein occlusion (RVO), 56 (65.12%) cases were of urban residence and 30 cases (34.88%) were of rural.

Among 2058 patients of green laser 86 were of retinal vein occlusion, among these RVO patients 70 (3.40%) were of BRVO and 16(0.78%) were of CRVO (Table IV).

Table IV. Distribution of RVO by Type (BRVO and CRVO)

Variable	Attributes	Sample statistics		99% CI for Proportion for population	
		Total	Percentage	Lower	Upper
Green laser treatment population (2058)	BRVO	70	3.4%	0.02512	0.04588
	CRVO	16	0.78%	0.00415	0.01461
RVO(BRVO+CRVO)		86	4.18%	Population Parameters	

Discussion:

Similar to our findings are from Sophie Roger, *et al*¹⁹ showing prevalence was 5.2

per 1000 for any RVO. This study was comprised of a Pooled Data from Population Studies from the United States, Europe, Asia, and Australia. M

Laouri, *etal*²⁰ reported in a review, the age and sex standardized prevalence of 5.2 per 1000 published in May 2011.

Miho Yasuda, *et al*²¹ findings suggested lower prevalence of RVO then our study 2.1%. Similar lower results were seen by Raba Thapa *et al*²² in Nepal, September 2017, where overall population of RVO was 2.95% .

These patients usually presented with sudden painless loss of vision. The gender based distribution of RVO in our research was 45.35% for male and 54.65% for female . Ko Un Shin, *et al*²³ in 2018 observed that RVO distribution was more common among females, and it increases with age. After 50 years of age, the chances of RVO increased nearly 3 folds for both genders. While in a study by Joo Yong Lee *et al*²⁴ established that there is no difference in the prevalence of CRVO between males and females. K.A. Ponto *et al*²⁶ shows a contrast gender-based distribution of RVO to our study. In this study males were 1.7 times more frequently affected by RVO than females.

Age-based distribution of RVO in our research was 23.26% for less than or equal to 40 years and 76.74% for patients more than 40 years. Ko Un Shin *et al*²³ in 2018 observed that after 50 years of age, chances of RVO increased nearly 3 folds for both genders. In 2022, Yangjian Li and colleagues demonstrated that the incidence of RVO increases with advancing age²⁶. In our study the residence-based distribution of RVO showed that 65.12% of cases occurred in the urban population, while 34.88% were in the rural population. Similar findings regarding the impact of urbanization on RVO^{27,28}.

The type-based distribution of RVO in our study showed that BRVO accounted for 3.4% out of 4.18% of cases, while CRVO accounted for 0.78% out of 4.18% of cases. These findings are consistent with those of Sophie Roger *et al*, who reported a BRVO prevalence of 4.42 per 1000 cases and a CRVO prevalence of 0.80 per 1000 cases, indicating that BRVO is

approximately four times more prevalent than CRVO.

No RVO patient included in our study required surgical intervention. Joo Yong Lee *et al*. (2010) reported that among 557 RVO patients, 36.4% had CRVO and 63.6% had BRVO, which aligns with the findings of our study.²⁴ Similarly, M. Laouriet *al*. reported in a population-based study that the distribution of BRVO ranged from 0.5% to 2.0%, while CRVO ranged from 0.1% to 0.2%, slightly lower than the rates observed in our study.²⁰

Conclusion:

The findings of this study indicates that retinal vein occlusion is more prevalent among females, particularly in older patients living in urban areas. While branch retinal vein occlusion is reported more common than central retinal vein occlusion.

References:

1. Romano F, Lamanna F, Gabrielle PH, Teo KY, Parodi MB, Iacono P, *et al* Update on retinal vein occlusion. *The Asia-Pacific Journal of Ophthalmology*. 2023 Mar 1;12(2):196-210. doi: 10.1097/APO.0000000000000598
2. Frederiksen KH, Stokholm L, Frederiksen PH, Jørgensen CM, Möller S, Kawasaki R, *et al*. Cardiovascular morbidity and all-cause mortality in patients with retinal vein occlusion: a Danish nationwide cohort study. *British Journal of Ophthalmology*. 2023 Sep 1;107(9):1324-30. doi:10.1136/bjophthalmol-2022-321225
3. Nicholson L, Talks SJ, Amoaku W, Talks K, Sivaprasad S. Retinal vein occlusion (RVO) guideline: executive summary. *Eye*. 2022 May;36(5):909-12. doi :10.1038/s41433-022-02007-4
4. Ørskov M, Vorum H, Larsen TB, Lip GY, Bek T, Skjøth F. Similarities and differences in systemic risk factors for retinal artery occlusion and retinal vein

- occlusion: A nationwide case-control study. *International ophthalmology*. 2023 Mar;43(3):817-24.doi:10.21203/rs.3.rs-1385242/v1
5. Ponto KA, Scharrer I, Binder H, Korb C, Rosner AK, Ehlers TO, Rieser N, et al. Hypertension and multiple cardiovascular risk factors increase the risk for retinal vein occlusions: results from the Gutenberg Retinal Vein Occlusion Study. *Journal of hypertension*. 2019 July 1;37(7):137283. doi:10.1097/HJH.0000000000002057
 6. Nicholson L, Talks SJ, Amoaku W, Talks K, Sivaprasad S. Retinal vein occlusion (RVO) guideline: executive summary. *Eye*. 2022 May;36(5):909-12.doi:10.1038/s41433-022-02007-4
 7. Zhang XT, Zhong YF, Xue YQ, Li SQ, Wang BY, Zhang GQ, et al. Clinical features of central retinal vein occlusion in young patients. *Ophthalmology and Therapy*. 2022 Aug;11(4):1409-22.doi:10.1007/s40123-022-00534-7
 8. Yin S, Cui Y, Jiao W, Zhao B. Potential prognostic indicators for patients with retinal vein occlusion. *Frontiers in Medicine*. 2022 May 25;9:839082.doi:10.3389/fmed.2022.839082
 9. Iftikhar M, Mir TA, Hafiz G, Zimmer-Galler I, Scott AW, Solomon SD, et al. Loss of peak vision in retinal vein occlusion patients treated for macular edema. *American journal of ophthalmology*. 2019 Sep 1;205:17-26.doi:10.1016/j.ajo.2019.03.029
 10. Maggio E, Mete M, Maraone G, Attanasio M, Guerriero M, Pertile G. Intravitreal injections for macular edema secondary to retinal vein occlusion: long-term functional and anatomic outcomes. *Journal of Ophthalmology*. 2020 Feb 13;2020.doi:10.1155/2020/7817542
 11. Thapa R, Khanal S, Tan HS, Thapa SS, van Rens GH. Prevalence, pattern and risk factors of retinal diseases among an elderly population in Nepal: the bhaktapur retina study. *Clinical Ophthalmology*. 2020 Jul 24;2109-18.
 12. Hayreh SS. Photocoagulation for retinal vein occlusion. *Progress in retinal and eye research*. 2021 Nov 1;85:100964.doi:10.1016/j.preteyeres.2021.100964
 13. Casselholm de Salles M, Lindberg C, Epstein D. Neovascular glaucoma in patients with central retinal vein occlusion: A real-life study in the anti-VEGF era. *Acta Ophthalmologica*. 2021 Feb;99(1):e7-12.doi:10.1111/aos.14500
 14. Li C, Wang R, Liu G, Ge Z, Jin D, Ma Y, et al. Efficacy of panretinal laser in ischemic central retinal vein occlusion: a systematic review. *Experimental and Therapeutic Medicine*. 2019 Jan 1;17(1):901-10.doi:10.3892/etm.2018.7034
 15. Rehak M, Storch MW, Hattenbach LO, Feltgen N. Ischemia and laser photocoagulation in retinal vein occlusion. *Die Ophthalmologie*. 2022 Nov 10.doi:10.1007/s00347-022-01750-z
 16. Song S, Yu X, Zhang P, Gu X, Dai H. Combination of Ranibizumab with macular laser for macular edema secondary to branch retinal vein occlusion: one-year results from a randomized controlled double-blind trial. *BMC ophthalmology*. 2020 Dec;20:1-9.doi:10.1186/s12886-020-01498-7
 17. Thomley ME, Gross CN, Preda-Naumescu A, Chen KS, Swain T, Mason III JO, et al. Real-world outcomes in patients with branch retinal vein occlusion-(BRVO-) related macular edema treated with anti-VEGF injections alone versus anti-VEGF injections combined with focal laser. *Journal of Ophthalmology*. 2021 May 19;2021:1-5.doi:10.1155/2021/6641008
 18. Klein R, Klein BE, Moss SE, Meuer SM. The epidemiology of retinal vein occlusion: the Beaver Dam Eye Study.

- Transactions of the American Ophthalmological Society.* 2000;98:133 .doi:10.1016/s0002-9394(01)00903-5
19. Rogers S, McIntosh RL, Cheung N, Lim L, Wang JJ, Mitchell P, Kowalski JW, Nguyen H, Wong TY, International Eye Disease Consortium. The prevalence of retinal vein occlusion: pooled data from population studies from the United States, Europe, Asia, and Australia. *Ophthalmology.* 2010 Feb 1;117(2):313-9.doi:10.1016/j.ophtha.2009.07.017
 20. Laouri M, Chen E, Looman M, Gallagher M. The burden of disease of retinal vein occlusion: review of the literature. *Eye.* 2011 Aug;25(8):981-8.doi:10.1038/eye.2011.92
 21. Yasuda M, Kiyohara Y, Arakawa S, Hata Y, Yonemoto K, Doi Y, *et al.* Prevalence and systemic risk factors for retinal vein occlusion in a general Japanese population: the Hisayama study. *Investigative ophthalmology & visual science.* 2010 Jun 1;51(6):3205-9.doi:10.1167/iovs.09-4453
 22. Thapa R, Bajimaya S, Paudyal G, Khanal S, Tan S, Thapa SS, *et al.* Prevalence, pattern and risk factors of retinal vein occlusion in an elderly population in Nepal: the Bhaktapur retina study. *BMC ophthalmology.* 2017 Dec;17:1-8.doi:10.1186/s12886-017-0552-x
 23. Shin KU, Lee JY, Han K, Song SJ. Sex-specific age threshold for increased risk of retinal vein occlusion in Koreans. *Thrombosis research.* 2018 Jul 1;167:60-3.doi:10.1016/j.thromres.2018.05.020
 24. Lee JY, Yoon YH, Kim HK, Yoon HS, Kang SW, Kim JG, *et al.* Baseline characteristics and risk factors of retinal vein occlusion: a study by the Korean RVO Study Group. *Journal of Korean medical science.* 2013 Jan 1;28(1):136-44.doi:10.3346/jkms.2013.28.1.136
 25. Ponto KA, Elbaz H, Peto T, Laubert-Reh D, Binder H, Wild PS, *et al.* Prevalence and risk factors of retinal vein occlusion: the Gutenberg Health Study. *Journal of Thrombosis and Haemostasis.* 2015 Jul 1;13(7):1254-63.doi:10.1111/jth.12982
 26. Li Y, Hall NE, Pershing S, Hyman L, Haller JA, Lee AY, *et al.* Age, gender, and laterality of retinal vascular occlusion: a retrospective study from the IRIS® Registry. *Ophthalmology Retina.* 2022 Feb 1;6(2):161-71.doi:10.1016/j.oret.2021.05.004
 27. Shahsuvaryan ML, Melkonyan AK. Central retinal vein occlusion risk profile: a case-control study. *European journal of ophthalmology.* 2003 Jun;13(5):445-52.doi:10.1177/112067210301300505
 28. Marianne Shahsuvaryan MD. Vaso-occlusive disorder of the Central Retinal Vein: Urbanization Impact. *Application of Laser for the Treatment of Diabetic Macular Edema.* 2016 Jul;14(3):54.

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